

# Annex A

## Energy and commodity balances, conversion factors and calorific values

### Balance principles

A.1 This Annex outlines the principles behind the balance presentation of energy statistics. It covers these in general terms. Fuel specific details are given in the appropriate chapters of this publication.

A.2 Balances are divided into two types, each of which performs a different function.

a) *commodity balance* – a balance for each energy commodity that uses the units usually associated with that commodity. By using a single column of figures, it shows the flow of the commodity from its sources of supply through to its final use. Commodity balances are presented in the individual fuel chapters of this publication.

b) *energy balance* - presents the commodity balances in a common unit and places them alongside one another in a manner that shows the dependence of the supply of one commodity on another. This is useful as some commodities are manufactured from others. The layout of the energy balance also differs slightly from the commodity balance. The energy balance format is used in table 1.1.

A.3 Energy commodities can be either primary or secondary. Primary energy commodities are drawn (extracted or captured) from natural reserves or flows, whereas secondary commodities are produced from primary energy commodities. Crude oil and coal are examples of primary commodities, whilst petrol and coke are secondary commodities manufactured from them. For balance purposes, electricity may be considered to be both primary electricity (for example, hydro, wind) or secondary (produced from steam turbines using steam from the combustion of fuels).

A.4 Both commodity and energy balances show the flow of the commodity from its production, extraction or import through to its final use.

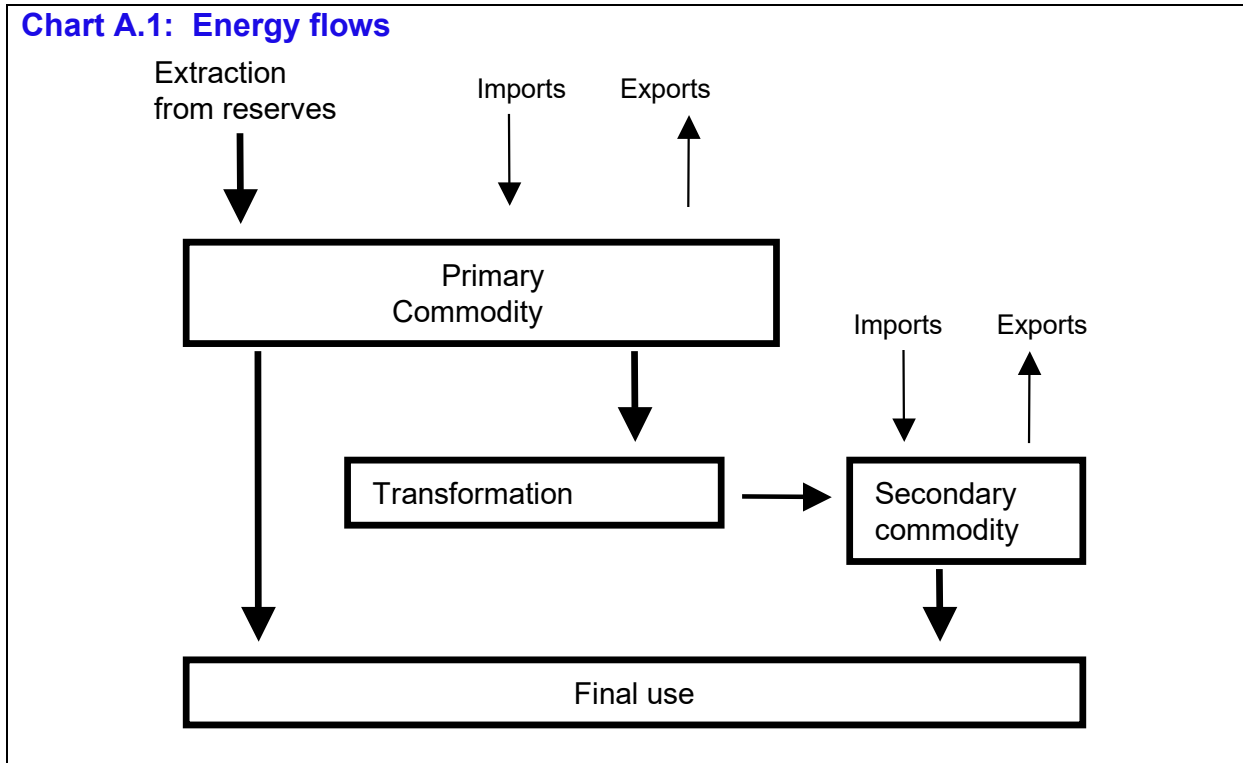
A.5 A simplified model of the commodity flow underlying the balance structure is given in Chart A.1. It illustrates how primary commodities may be used directly and/or be transformed into secondary commodities. The secondary fuels then enter final consumption or may also be transformed into another energy commodity (for example, electricity produced from fuel oil). To keep the diagram simple these “second generation” flows have not been shown.

A.6 The arrows at the top of the chart represent flows to and from the “pools” of primary and secondary commodities, from imports and exports and, in the case of the primary pool, extraction from reserves (e.g. the production of coal, gas and crude oil).

### Commodity balances (Tables 2.1, 3.1, 3.2, 4.1, 5.1, 5.2 and 6.1)

A.7 A commodity balance comprises a supply section and a demand section. The supply section gives available sources of supply (i.e., exports are subtracted). The demand section is divided into a transformation section, a section showing uses in the energy industries (other than for transformation) and a section covering uses by final consumers for energy or non-energy purposes. Final consumption for energy purposes is divided into use by sector of economic activity. The section breakdowns are described below.

**Chart A.1: Energy flows**



## Supply

### Production

A.8 Production, within the commodity balance, covers indigenous production (extraction or capture of primary commodities) and generation or manufacture of secondary commodities. Production is always gross, that is, it includes the quantities used during the extraction or manufacturing process.

### Other sources

A.9 Production from other sources covers sources of supply that do not represent “new” supply. These may be recycled products, recovered fuels (slurry or waste coal), or electricity from pumped storage plants. The production of these quantities will have been reported in an earlier accounting period or have already been reported in the current period of account. Exceptionally, the *Other sources* row in the commodity balances for ethane, propane and butane is used to receive transfers of these hydrocarbons from gas stabilisation plants at North Sea terminals. In this manner, the supplies of primary ethane, propane and butane from the North Sea are combined with the production of these gases in refineries, so that the disposals may be presented together in the balances.

### Imports and exports

A.10 The figures for imports and exports relate to energy commodities moving into or out of the United Kingdom as part of transactions involving United Kingdom companies. Exported commodities are produced in the United Kingdom and imported commodities are for use within the United Kingdom (although some may be re-exported before or after transformation). The figures thus exclude commodities either exported from or imported into HM Revenue and Customs bonded areas or warehouses. These areas, although part of the United Kingdom, are regarded as being outside of the normal United Kingdom’s customs boundary, and so goods entering into or leaving them are not counted as part of the statistics on trade used in the balances.

A.11 Similarly, commodities that only pass through the United Kingdom on their way to a final destination in another country are also excluded. However, for gas these transit flows are included because it is difficult to identify this quantity separately, without detailed knowledge of the contract information covering the trade. This means that for gas, there is some over statement of the level of imports and exports, but the net flows are correct.

A.12 The convention in these balances is that exports are shown with a negative sign.

### **Marine bunkers**

A.13 These are deliveries of fuels (usually fuel oil or gas oil) to ships of any flag (including the United Kingdom) for consumption during their voyage to other countries. Marine bunkers are treated rather like exports and shown with a negative sign.

### **Stock changes**

A.14 Additions to (- sign) and withdrawals from stocks (+ sign) held by producers and transformation industries correspond to withdrawals from and additions to supply, respectively.

### **Transfers**

A.15 There are several reasons why quantities may be transferred from one commodity balance to another:

- a commodity may no longer meet the original specification and be reclassified;
- the name of the commodity may change through a change in use;
- to show quantities returned to supply from consumers. These may be by-products of the use of commodities as raw materials rather than fuels.

A.16 A quantity transferred from a balance is shown with a negative sign to represent a withdrawal from supply and with a positive sign in the receiving commodity balance representing an addition to its supply. The transfers' row in table 1.1 should ideally sum to zero with transfers from primary oils to petroleum products amounting to a net figure of zero. Similarly the manufactured gases and natural gas transfers should sum to zero. However, differences in calorific values between the transferred fuels can result in non-zero values.

### **Total supply**

A.17 The total supply available for national use is obtained by summing the flows above this entry in the balance.

### **Total demand**

A.18 The various figures for the disposals and/or consumption of the commodities are summed to provide a measure of the demand for them. The main categories or sectors of demand are described in paragraphs A.31 to A.42.

### **Statistical difference**

A.19 Any excess of supply over demand is shown as a statistical difference. A negative figure indicates that demand exceeds supply. Statistical differences arise when figures are gathered from a variety of independent sources and reflect differences in timing, in definition of coverage of the activity, or in commodity definition. Differences also arise for methodological reasons in the measurement of the flow of the commodity e.g. if there are differences between the volumes recorded by the gas producing companies and the gas transporting companies. A non-zero statistical difference is normal and, provided that it is not too large, is preferable to a statistical difference of zero as this suggests that a data provider has adjusted a figure to balance the account.

### **Transformation**

A.20 The transformation section of the balance covers those processes and activities that transform the original primary (and sometimes secondary) commodity into a form which is better suited for specific uses than the original form. Most of the transformation activities correspond to particular energy industries whose main business is to manufacture the product associated with them. Certain activities involving transformation take place to make products that are only partly used for energy needs (coke oven coke) or are by-products of other manufacturing processes (coke oven and blast furnace gases). However, as these products and by-products are then used, at least in part, for their energy content they are included in the balance system.

A.21 The figures given under the activity headings of this section represent the quantities used for transformation. The production of the secondary commodities will be shown in the Production row of the corresponding commodity balances. The transformation section of the energy balance shows, for each fuel, the net inputs for transformation uses.

## Electricity generation

A.22 The quantities of fuels burned for the generation of electricity are shown in their commodity balances under this heading. The activity is divided into two parts, covering the major power producers (for whom the main business is the generation of electricity for sale) and autogenerators (whose main business is not electricity generation but who produce electricity for their own needs and may also sell surplus quantities). The amounts of fuels shown in the balance represent the quantities consumed for the gross generation of electricity. Where a generator uses combined heat and power plant, the figures include only the part of the fuel use corresponding to the electricity generated.

A.23 In relation to autogenerators' data, the figures for quantities of fuel used for electricity generation appear under the appropriate fuel headings in the *Transformation* section heading for *Autogenerators*, whilst the electricity generated appears in the *Electricity* column under *Production*. A breakdown of the information according to the branch of industry in which the generation occurs is not shown in the balance but is given in table 5.4. The figures for energy commodities consumed by the industry branches shown under final consumption include all use of electricity, but exclude the fuels combusted by the industry branches to generate the electricity.

## Heat generation

A.24 The quantities of fuel burned to generate heat that is sold under the provision of a contract to a third party are shown in their commodity balances under this heading. It includes heat that is generated and sold by combined heat and power plants and by community heating schemes (also called district heating).

## Petroleum refineries

A.25 Crude oil, natural gas liquids and other oils needed by refineries for the manufacture of finished petroleum products are shown under this heading.

## Coke manufacture and blast furnaces

A.26 Quantities of coal for coke ovens and all fuels used within blast furnaces are shown under this heading. The consumption of fuels for heating coke ovens and the blast air for blast furnaces are shown under *Energy industry use*.

## Patent fuel manufacture

A.27 The coals and other solid fuels used for the manufacture of solid patent fuels are reported under this heading.

## Other

A.28 Any minor transformation activities not specified elsewhere are captured under this heading.

## Energy industry use

A.29 Consumption by both extraction and transformation industries to support the transformation process (but not for transformation itself) are included here according to the energy industry concerned. Typical examples are the consumption of electricity in power plants (e.g. for lighting, compressors and cooling systems) and the use of extracted gases on oil and gas platforms for compressors, pumps and other uses. The headings in this section are identical to those used in the transformation section with the exception of *Pumped storage*. In this case, the electricity used to pump the water to the reservoir is reported. This section also includes consumption by those parts of the iron and steel industry which behave like an energy industry i.e., they are involved in the transformation processes (see paragraph A.20).

## Losses

A.30 This heading covers the intrinsic losses that occur during the transmission and distribution of electricity and gas (including manufactured gases). Other metering and accounting differences for gas and electricity are within the statistical difference, as are undeclared losses in other commodities.

## Final consumption

A.31 *Final consumption* covers both final energy consumption (by different consuming sectors) and the use of energy commodities for non-energy purposes, that is *Non energy use*. Final consumption occurs when the commodities used are not for transformation into secondary commodities. The energy concerned disappears from the account after use. Any fuel used for electricity generation by final consumers is identified and reported separately within the transformation section. When an enterprise generates electricity, the figure for final consumption of the industrial sector to which the enterprise belongs includes its use of the electricity it generates itself (as well as supplies of electricity it purchases from others) but does not include the fuel used to generate that electricity.

A.32 The classification of consumers according to their main business follows, as far as practicable, the *Standard Industrial Classification (SIC2007)*. The qualifications to, and constraints on, the classification are described in the technical notes to Chapter 1. Table 1G in Chapter 1 of DUKES 2020 shows the breakdown of final consumers used, and how this corresponds to the SIC2007.

## Industry

A.33 Two sectors of industry (iron and steel and chemicals) require special mention because the activities they undertake fall across the transformation, final consumption and non-energy classifications used for the balances. Also, the data permitting an accurate allocation of fuel use within each of these major divisions are not readily available.

## Iron and steel

A.34 The iron and steel industry is a heavy energy user for transformation and final consumption activities. Figures shown under final consumption for this industry branch reflect the amounts that remain after quantities used for transformation and energy sector own use have been subtracted from the industry's total energy requirements. Use of fuels for transformation by the industry may be identified within the transformation section of the commodity balances.

A.35 The amounts of coal used for coke manufacture by the iron and steel industry are in the transformation section of the coal balance. Included in this figure is the amount of coal used for coke manufacture by the companies outside of the iron and steel industry, i.e. solid fuel manufacturers. The corresponding production of coke and coke oven gas may be found in the commodity balances for these products. The use of coke in blast furnaces is shown in the commodity balance for coke, and the gases produced from blast furnaces and the associated basic oxygen steel furnaces are shown in the production row of the commodity balance for blast furnace gas.

A.36 Fuels used for electricity generation by the industry are included in the figures for electricity generation by autogenerators and are not distinguishable as being used by the iron and steel sector in the balances. Electricity generation and fuel used for this by broad industry group are given in table 5.4.

A.37 Fuels used to support coke manufacture and blast furnace gas production are included in the quantities shown under *Energy industry use*. These gases and other fuels do not enter coke ovens or blast furnaces, but are used to heat the ovens and the blast air supplied to furnaces.

## Chemicals

A.38 The petro-chemical industry uses hydrocarbon fuels (mostly oil products and gases) as feedstock for the manufacture of its products. Distinguishing the energy use of delivered fuels from their non-energy use is complicated by the absence of detailed information. The procedures adopted to estimate the use are described in paragraphs A.41 and A.42 under *Non energy use*.

## Transport

A.39 Figures under this heading are almost entirely quantities used strictly for transport purposes. However, the figures recorded against road transport may include some fuel that is actually consumed

in some “off-road” activities. Similarly, figures for railway fuels may include some amounts of burning oil not used directly for transport purposes. Transport sector use of electricity includes electricity used by rail companies (both over and underground) for traction purposes, and electricity used by electric road vehicles. The electricity used for non-traction purposes in industries classified to SIC2007 Groups 49 to 51 is included within the commercial sector. Fuels supplied to cargo and passenger ships undertaking international voyages are reported as *Marine bunkers* (see paragraph A.13). Supplies to fishing vessels are included under “agriculture”.

## Other sectors

A.40 The classification of all consumers groups under this heading, except *domestic and transport*, follows *SIC2007* and is described in table 1G in DUKES 2020 Chapter 1. The consistency of the classification across different commodities cannot be guaranteed because the figures reported are dependent on what the data suppliers can provide.

## Non energy use

A.41 The non energy use of fuels may be divided into two types. They may be used directly for their physical properties e.g. lubricants or bitumen used for road surfaces, or by the petro-chemical industry as raw materials for the manufacture of goods such as plastics. In their use by the petro-chemical industry, relatively little combustion of the fuels takes place and the carbon and/or hydrogen they contain are largely transferred into the finished product. However, in some cases heat from the manufacturing process or from combustion of by-products may be used. Data for this energy use are rarely available. Depending on the feedstock, non energy consumption is either estimated or taken to be the deliveries to the chemicals sector.

A.42 Both types of non energy use are shown under the *Non energy use* heading at the foot of the balances.

## The energy balance (Table 1.1)

### Principles

A.43 The energy balance conveniently presents:

- an overall view of the United Kingdom’s energy supplies;
- the relative importance of each energy commodity;
- dependence on imports;
- the contribution of our own fossil and renewable resources;
- the interdependence of commodities on one another.

A.44 The energy balance is constructed directly from the commodity balances by expressing the data in a common unit, placing them beside one another and adding appropriate totals. Heat sold is also included as a fuel. However, some rearrangements of the commodity balance format is required to show transformation of primary into secondary commodities in an easily understood manner.

A.45 Energy units are widely used as the common unit, and the current practice for the United Kingdom and the international organisations which prepare balances is to use the tonne of oil equivalent or a larger multiple of this unit, commonly thousands. One tonne of oil equivalent is defined as  $10^7$  kilocalories (41.868 gigajoules). The tonne of oil equivalent is another unit of energy like the gigajoule, kilocalorie or kilowatt hour, rather than a physical quantity. It has been chosen as it is easier to visualise than the other units. Due to the natural variations in heating value of primary fuels such as crude oil, it is rare that one tonne of oil has an energy content equivalent to one tonne of oil equivalent, however it is generally within a few per cent of the heating value of a tonne of oil equivalent. The energy figures are calculated from the natural units of the commodity balances by multiplying by the factors representing the calorific (heating) value of the fuel. The gross calorific values of fuels are used for this purpose. When the natural unit of the commodity is already an energy unit (electricity in kilowatt hours, for example) the factors are just constants, converting one energy unit to another.

A.46 Most of the underlying definitions and ideas of commodity balances can be taken directly over into the energy balance. However, production of secondary commodities and, in particular, electricity

are treated differently and need some explanation. The components of the energy balance are described below, drawing out the differences of treatment compared with the commodity balances.

## Primary supply

A.47 Within the energy balance, the production row covers only extraction of primary fuels and the generation of primary energy (hydro, nuclear, wind, solar photovoltaics). Note the change of row heading from *Production* in the commodity balances to *Indigenous production* in the energy balance. Production of secondary fuels and secondary electricity are shown in the transformation section and not in the indigenous production row at the top of the balance.

A.48 For fossil fuels, indigenous production represents the marketable quantity extracted from the reserves. Indigenous production of *Primary electricity* comprises hydro-electricity, wind, solar photovoltaics and nuclear energy. The energy value for hydro-electricity is taken to be the energy content of the electricity produced from the hydro power plant and not the energy available in the water driving the turbines. A similar approach is adopted for electricity from wind generators and photovoltaics. The electricity is regarded as the primary energy form because there are currently no other uses of the energy resource “upstream” of the generation. The energy value attached to nuclear electricity is discussed in paragraph A.52.

A.49 The other elements of the supply part of the balance are identical to those in the commodity balances. In particular, the sign convention is identical, so that figures for exports and international marine bunkers carry negative signs. A stock build carries a negative sign to denote it as a withdrawal from supply whilst a stock draw carries a positive sign to show it as an addition to supply.

A.50 The *Primary supply* is the sum of the figures above it in the table, taking account of the signs, and expresses the national requirement for primary energy commodities from all sources and foreign supplies of secondary commodities. It is an indicator of the use of indigenous resources and external energy supplies. Both the amount and mixture of fuels in final consumption of energy commodities in the United Kingdom will differ from the primary supply. The “mix” of commodities in final consumption will be much more dependent on the manufacture of secondary commodities, in particular electricity.

## Transformation

A.51 Within an energy balance the presentation of the inputs to and outputs from transformation activities requires special mention, as it is carried out using a compact format. The transformation section also plays a key role in moving primary electricity from its own column in the balance into the electricity column, so that it can be combined with electricity from fossil fuelled power stations and the total disposals shown.

A.52 Indigenous production of primary electricity comprises nuclear electricity, hydro electricity, electricity from wind generation and from solar photovoltaics. Nuclear electricity is obtained by passing steam from nuclear reactors through conventional steam turbine sets. The heat in the steam is considered to be the primary energy available and its value is calculated from the electricity generated using the average thermal efficiency of nuclear stations, see table 5.10. The electrical energy from hydro and wind is transferred from the *Primary electricity* column to the *Electricity* column using the *transfers* row because this electricity is in the form of primary energy and no transformation takes place. However, because the form of the nuclear energy is the steam from the nuclear reactors, the energy it contains is shown entering electricity generation and the corresponding electricity produced is included with all electricity generation in the figure, in the same row, under the *Electricity* column.

A.53 Quantities of fuels entering transformation activities (fuels into electricity generation and heat generation, crude oil into petroleum product manufacture (refineries), or coal into coke ovens) are shown with a negative sign to represent the input and the resulting production is shown as a positive number.

A.54 For electricity generated by major power producers, the inputs are shown in the *major power producers’* row of the *coal, manufactured fuel, primary oils, petroleum products, gas, bioenergy and waste* and *primary electricity* columns. The total energy input to electricity generation is the sum of the values in these first seven columns. The *Electricity* column shows total electricity generated from these inputs and the transformation loss is the sum of these two figures, given in the *Total* column.

A.55 Within the transformation section, the negative figures in the *Total* column represent the losses in the various transformation activities. This is a convenient consequence of the sign convention chosen for the inputs and outputs from transformation. Any positive figures represent a transformation gain and, as such, are an indication of incorrect data.

A.56 In the energy balance, the columns containing the input commodities for electricity generation, heat generation and oil refining are separate from the columns for the outputs. However, for the transformation activities involving solid fuels this is only partly the case. Coal used for the manufacture of coke is shown in the coke manufacture row of the transformation section in the coal column, but the related coke and coke oven gas production are shown combined in the *Manufactured fuels* column. Similarly, the input of coke to blast furnaces and the resulting production of blast furnace gas are not identifiable and have been combined in the *Manufactured fuels* column in the *Blast furnace* row. As a result, only the net loss from blast furnace transformation activity appears in the column.

A.57 The share of each commodity or commodity group in primary supply can be calculated from the table. This table also shows the demand for primary as well as foreign supplies. Shares of primary supplies may be taken from the *Primary supply* row of the balance. Shares of fuels in final consumption may be calculated from the final consumption row.

### **Energy industry use and final consumption**

A.58 The figures for final consumption and energy industry use follow, in general, the principles and definitions described under commodity balances in paragraphs A.29 to A.42.



## Standard conversion factors

|                                     |   |
|-------------------------------------|---|
| 1 tonne of oil equivalent (toe)     | = 10 <sup>7</sup><br>kilocalories<br>= 396.83 therms<br>= 41.868 GJ<br>= 11,630 kWh |
| 100,000 British thermal units (Btu) | = 1 therm   |

This Digest follows UK statistical practice and uses the term "billion" to refer to one thousand million or 10<sup>9</sup>

The following prefixes are used for multiples of joules, watts and watt hours:

|          |                         |                     |
|----------|-------------------------|---------------------|
| kilo (k) | = 1,000                 | or 10 <sup>3</sup>  |
| mega (M) | = 1,000,000             | or 10 <sup>6</sup>  |
| giga (G) | = 1,000,000,000         | or 10 <sup>9</sup>  |
| tera (T) | = 1,000,000,000,000     | or 10 <sup>12</sup> |
| peta (P) | = 1,000,000,000,000,000 | or 10 <sup>15</sup> |

### WEIGHT

|                       |   |
|-----------------------|---|
| 1 kilogramme (kg)     | = 2.2046 pounds (lb)  |
| 1 pound (lb)          | = 0.4536 kg   |
| 1 tonne (t)           | = 1,000kg<br>= 0.9842 long ton<br>= 1.102 short ton (sh tn) |
| 1 Statute or long ton | = 2,240 lb<br>= 1.016 t<br>= 1.120 sh tn                    |

### LENGTH

|                  |                     |
|------------------|---------------------|
| 1 mile           | = 1.6093 kilometres |
| 1 kilometre (km) | = 0.62137 miles     |

### VOLUME

|                      |   |
|----------------------|---|
| 1 cubic metre (cu m) | = 35.31 cu ft   |
| 1 cubic foot (cu ft) | = 0.02832 cu m  |
| 1 litre              | = 0.22 Imperial gallons (UK gal)                                |
| 1 UK gallon          | = 8 UK pints<br>= 1.201 US gallons (US gal)<br>= 4.54609 litres |
| 1 barrel             | = 159.0 litres<br>= 34.97 UK gal<br>= 42 US gal                 |

### TEMPERATURE

|  |                                    |
|--|------------------------------------|
| 1 scale degree Celsius (C)   | = 1.8 scale degrees Fahrenheit (F) |
| For conversion of temperatures: °C = 5/9 (°F –32); °F = 9/5 °C +32 |                                    |

## Average conversion factors for petroleum 2021

|                                | Litres per tonne |                               | Litres per tonne |
|--------------------------------|------------------|-------------------------------|------------------|
| Crude oil:                     |                  | DERV fuel:                    |                  |
| Indigenous                     | 1,199            | 0.005% or less sulphur        | 1,205            |
| Imported                       | 1,181            |                               |                  |
| Average of refining throughput | 1,192            | Gas /Marine diesel oil        | 1,187            |
| Ethane                         | 2,730            |                               |                  |
| Propane                        | 1,941            | Fuel oil (1% or less sulphur) |                  |
| Butane                         | 1,742            | All grades:                   | 1,028            |
| Naphtha                        | 1,477            | Light:                        | ..               |
| Aviation gasoline              | 1,324            | Medium                        | ..               |
| Motor spirit:                  |                  | Heavy:                        | ..               |
| All grades                     | 1,345            | Lubricating oils:             |                  |
| Super                          | 1,354            | White                         | 1,194            |
| Premium                        | 1,347            | Greases                       | ..               |
| Middle distillate feedstock    | ..               | Bitumen                       | 976              |
| Kerosene:                      |                  | Petroleum coke                | ..               |
| Aviation turbine fuel          | 1,253            | Petroleum waxes               | 1,184            |
| Burning oil                    | 1,245            | Industrial spirit             | 1,247            |
|                                |                  | White spirit                  | 1,251            |

Note: The above conversion factors, which for refined products have been compiled by BEIS using data from UK Petroleum Industry Association companies, apply to the year 2021. The litres to tonnes conversions are made at a standard temperature of 15°C.

.. Denotes commercially sensitive because too few companies are producing this to be able to report it.

## Fuel conversion factors for converting fossil fuels to carbon dioxide

|                       | kg CO <sub>2</sub><br>per tonne | kg CO <sub>2</sub><br>per kWh | kg CO <sub>2</sub><br>per litre |
|-----------------------|---------------------------------|-------------------------------|---------------------------------|
| <b>Gases</b>          |                                 |                               |                                 |
| Natural Gas           |                                 | 0.182                         |                                 |
| LPG                   |                                 | 0.214                         | 1.555                           |
| <b>Liquid fuels</b>   |                                 |                               |                                 |
| Gas oil               | 3190                            | 0.254                         | 2.724                           |
| Fuel oil              | 3216                            | 0.267                         |                                 |
| Burning oil           | 3150                            | 0.246                         | 2.528                           |
| Naphtha               | 3131                            | 0.236                         |                                 |
| Petrol                | 3135                            | 0.240                         | 2.326                           |
| Diesel                | 3164                            | 0.250                         | 2.661                           |
| Aviation spirit       | 3128                            | 0.239                         | 2.283                           |
| Aviation turbine fuel | 3150                            | 0.245                         | 2.520                           |
| <b>Solid fuels</b>    |                                 |                               |                                 |
| Industrial coal       | 2386                            | 0.321                         |                                 |
| Domestic coal         | 2632                            | 0.315                         |                                 |
| Coking coal           | 3144                            | 0.356                         |                                 |

All emission factors are based on a Gross Calorific Value basis

The information above is based on the 2022 Greenhouse gas conversion factors for company reporting, available at: [www.gov.uk/government/collections/government-conversion-factors-for-company-reporting](http://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting). The information on this website also provide emission factors on a Net Calorific Basis.

The figures are derived by Ricardo E&E based on data contained in the 2021 edition of this Digest, available at: [www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes](http://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes) together with information from the National Atmospheric Emissions Inventory. More information on the Inventory is available at: <http://naei.beis.gov.uk/reports/>. For liquid fuels, the "kg CO<sub>2</sub> per tonne" figure remains fairly constant on a year to year basis, so it is possible to derive "kg CO<sub>2</sub> per kWh" and "kg CO<sub>2</sub> per litre" figures for other years using the average conversion factors for petroleum data contained annually in Annex A of the Digest.

# Annex B

## Glossary and Acronyms

|                              |  |
|------------------------------|--|
| <b>Anthracite</b>            | Within this publication, anthracite is coal classified as such by UK coal producers and importers of coal. Typically it has a high heat content making it particularly suitable for certain industrial processes and for use as a domestic fuel. |
| <b>Associated gas</b>        | Natural gas found in association with crude oil in a reservoir, either dissolved in the oil or as a cap above the oil.   |
| <b>Autogeneration</b>        | Generation of electricity by companies whose main business is not electricity generation, the electricity being produced mainly for that company's own use.  |
| <b>Aviation spirit</b>       | A light hydrocarbon oil product used to power piston-engined aircraft power units.   |
| <b>Aviation turbine fuel</b> | The main aviation fuel used for powering aviation gas-turbine power units (jet aircraft engine).   |
| <b>Backflows</b>             | These are finished or semi-finished products, which are returned from final consumers to refineries for processing, blending or sale. They are usually by-products of petrochemical manufacturing.   |
| <b>BEIS</b>                  | Department for Business, Energy and Industrial Strategy  |
| <b>Benzole</b>               | A colourless liquid, flammable, aromatic hydrocarbon by-product of the iron and steel making process. It is used as a solvent in the manufacture of styrenes and phenols but is also used as a constituent of motor fuel.                        |
| <b>BG</b>                    | British Gas  |
| <b>Biodiesel</b>             | (FAME - biodiesel produced to BS EN 14214). Produced from vegetable oils or animal fats by mixing them with ethanol or methanol to break them down.  |
| <b>Bioenergy</b>             | Bioenergy is renewable energy made from material of recent biological origin derived from plant or animal matter.  |
| <b>Bioethanol</b>            | Created from crops rich in starch or sugar by fermentation, distillation and finally dehydration.  |
| <b>Biogas</b>                | Energy produced from the anaerobic digestion of sewage and industrial waste.   |
| <b>Biomass</b>               | Renewable organic materials, such as wood, agricultural crops or wastes, and municipal wastes. Biomass can be burned directly or processed into biofuels such as ethanol and methane   |
| <b>Bitumen</b>               | The residue left after the production of lubricating oil distillates and vacuum gas oil for upgrading plant feedstock. Used mainly for road making and construction purposes.  |

|                               |  |
|-------------------------------|--|
| <b>Blast furnace gas</b>      | Mainly produced and consumed within the iron and steel industry. Obtained as a by-product of iron making in a blast furnace, it is recovered on leaving the furnace and used partly within the plant and partly in other steel industry processes or in power plants equipped to burn it. A similar gas is obtained when steel is made in basic oxygen steel converters; this gas is recovered and used in the same way.   |
| <b>Breeze</b>                 | Breeze can generally be described as coke screened below 19 mm ( $\frac{3}{4}$ inch) with no fines removed but the screen size may vary in different areas and to meet the requirements of particular markets.   |
| <b>Burning oil</b>            | A refined petroleum product, with a volatility in between that of motor spirit and gas diesel oil primarily used for heating and lighting.   |
| <b>Butane</b>                 | Hydrocarbon (C <sub>4</sub> H <sub>10</sub> ), gaseous at normal temperature but generally stored and transported as a liquid. Used as a component in Motor Spirit to improve combustion, and for cooking and heating (see LPG).   |
| <b>Calorific values (CVs)</b> | The energy content of a fuel can be measured as the heat released on complete combustion. The SI (Système International) derived unit of energy and heat is the Joule. This is the energy in a given quantity of the fuel and is often measured in GJ per tonne. The energy content can be expressed as an upper (or gross) value and a lower (or net) value. The difference between the two values is due to the release of energy from the condensation of water in the products of combustion. Gross calorific values are used throughout this publication. |
| <b>CO<sub>2</sub></b>         | Carbon dioxide. Carbon dioxide contributes about 60 per cent of the potential global warming effect of man-made emissions of greenhouse gases. Although this gas is naturally emitted by living organisms, these emissions are offset by the uptake of carbon dioxide by plants during photosynthesis; they therefore tend to have no net effect on atmospheric concentrations. The burning of fossil fuels, however, releases carbon dioxide fixed by plants many millions of years ago, and thus increases its concentration in the atmosphere.              |
| <b>Co-firing</b>              | The burning of biomass products in fossil fuel power stations  |
| <b>Coke oven coke</b>         | The solid product obtained from carbonisation of coal, principally coking coal, at high temperature. It is low in moisture and volatile matter. Used mainly in iron and steel industry.  |
| <b>Coke oven gas</b>          | Gas produced as a by-product of solid fuel carbonisation and gasification in coke ovens, but not from low temperature carbonisation plants. Synthetic coke oven gas is mainly natural gas which is mixed with smaller amounts of blast furnace and basic oxygen steel furnace gas to produce a gas with almost the same qualities as coke oven gas.  |
| <b>Coking coal</b>            | Within this publication, coking coal is coal sold by producers for use in coke ovens and similar carbonising processes. The definition is not therefore determined by the calorific value or caking qualities of each batch of coal sold, although calorific values tend to be higher than for steam coal. Not all coals form cokes. For a coal to coke it must exhibit softening and agglomeration properties, i.e. the end product must be a coherent solid.   |
| <b>Colliery methane</b>       | Methane released from coal seams in existing and abandoned deep mines and from coal beds which is piped to the surface and consumed at the colliery or transmitted by pipeline to consumers.   |

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| <b>Combined Cycle Gas Turbine (CCGT)</b>   | Combined cycle gas turbine power stations combine gas turbines and steam turbines which are connected to one or more electrical generators in the same plant. The gas turbine (usually fuelled by natural gas or oil) produces mechanical power (to drive the generator) and heat in the form of hot exhaust gases. These gases are fed to a boiler, where steam is raised at pressure to drive a conventional steam turbine, which is also connected to an electrical generator.   |
| <b>Combined Heat and Power (CHP)</b>       | CHP is the simultaneous generation of usable heat and power (usually electricity) in a single process. The term CHP is synonymous with cogeneration and total energy, which are terms often used in the United States or other Member States of the European Community. The basic elements of a CHP plant comprise one or more prime movers driving electrical generators, where the steam or hot water generated in the process is utilised via suitable heat recovery equipment for use either in industrial processes or in community heating and space heating. |
| <b>CHPQA</b>                               | Combined Heat and Power Quality Assurance Scheme  |
| <b>Conventional thermal power stations</b> | These are stations which generate electricity by burning fossil fuels to produce heat to convert water into steam, which then powers steam turbines.  |
| <b>Cracking/conversion</b>                 | A refining process using combinations of temperature, pressure and in some cases a catalyst to produce petroleum products by changing the composition of a fraction of petroleum, either by splitting existing longer carbon chains or combining shorter carbon chain components of crude oil or other refinery feedstocks. Cracking allows refiners to selectively increase the yield of specific fractions from any given input petroleum mix depending on their requirements in terms of output products.  |
| <b>Crude oil</b>                           | A mineral oil consisting of a mixture of hydrocarbons of natural origins, yellow to black in colour, of variable density and viscosity.   |
| <b>DEFRA</b>                               | Department for Environment, Food and Rural Affairs  |
| <b>DERV</b>                                | Diesel engined road vehicle fuel used in internal combustion engines that are compression-ignited.  |
| <b>DFT</b>                                 | Department for Transport  |
| <b>Distillation</b>                        | A process of separation of the various components of crude oil and refinery feedstocks using the different temperatures of evaporation and condensation of the different components of the mix received at the refineries.  |
| <b>DNC</b>                                 | Declared net capacity and capability are used to measure the maximum power available from generating stations at a point in time.   |
| <b>DNO</b>                                 | Distribution Network Operator   |
| <b>Downstream</b>                          | Used in oil and gas processes to cover the part of the industry after the production of the oil and gas. For example, it covers refining, supply and trading, marketing and exporting.  |
| <b>DUKES</b>                               | Digest of United Kingdom Energy Statistics.   |

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| <b>Embedded Generation</b>      | Embedded generation is electricity generation by plant which has been connected to the distribution networks of the public electricity distributors rather than directly to the National Grid Company's transmission systems. Typically they are either smaller stations located on industrial sites, or combined heat and power plant, or renewable energy plant such as wind farms, or refuse burning generators. The category also includes some domestic generators such as those with electric solar panels.                      |
| <b>Energy use</b>               | Energy use of fuel mainly comprises use for lighting, heating or cooling, motive power and power for appliances. See also non-energy use.  |
| <b>Ethane</b>                   | A light hydrocarbon gas (C <sub>2</sub> H <sub>6</sub> ) in natural gas and refinery gas streams (see LPG).  |
| <b>EUROSTAT</b>                 | Statistical Office of the European Commission.   |
| <b>Exports</b>                  | For some parts of the energy industry, statistics on trade in energy related products can be derived from two separate sources. Firstly, figures can be reported by companies as part of systems for collecting data on specific parts of the energy industry (e.g. as part of the system for recording the production and disposals of oil from the UK continental shelf). Secondly, figures are also available from the general systems that exist for monitoring trade in all types of products operated by HM Revenue and Customs. |
| <b>Feedstock</b>                | In the refining industry, a product or a combination of products derived from crude oil, destined for further processing other than blending. It is distinguished from use as a chemical feedstock etc.  |
| <b>Final energy consumption</b> | Energy consumption by final user – i.e. which is not being used for transformation into other forms of energy.   |
| <b>Fossil fuels</b>             | Coal, natural gas and fuels derived from crude oil (for example petrol and diesel) are called fossil fuels because they have been formed over long periods of time from ancient organic matter.  |
| <b>Fuel oils</b>                | The heavy oils from the refining process; used as fuel in furnaces and boilers of power stations, industry, in domestic and industrial heating, ships, locomotives, metallurgic operation, and industrial power plants etc.  |
| <b>Fuel oil - Light</b>         | Fuel oil made up of heavier straight-run or cracked distillates and used in commercial or industrial burner installations not equipped with pre-heating facilities.  |
| <b>Fuel oil - Medium</b>        | Other fuel oils, sometimes referred to as bunker fuels, which generally require pre-heating before being burned, but in certain climatic conditions do not require pre-heating.  |
| <b>Fuel oil - Heavy</b>         | Other heavier grade fuel oils which in all situations require some form of pre-heating before being burned.  |
| <b>Gas diesel oil</b>           | The medium oil from the refinery process; used as a fuel in diesel engines (i.e. internal combustion engines that are compression-ignited), burned in central heating systems and used as a feedstock for the chemical industry.   |
| <b>Gigajoule (GJ)</b>           | A unit of energy equal to 10 <sup>9</sup> joules.  |

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| <b>Gigawatt (GW)</b>                     | A unit of electrical power, equal to 10 <sup>9</sup> watts.   |
| <b>Heat pumps</b>                        | Heat pumps use a heat exchanger (much like that installed in fridges and freezers – although running in reverse) to take heat from the ground or air and convert it into heating in the home (either radiators, underfloor heating or warm air heating systems and hot water). Ground source heat pumps use pipes which are buried in the ground to extract heat. Air source heat pumps absorb heat from the outside air. Heat pumps need electricity to run, but the heat they extract from the ground or air is constantly being renewed naturally. |
| <b>Heat sold</b>                         | Heat (or steam) that is produced and sold under the provision of a contract. Heat sold is derived from heat generated by Combined Heat and Power (CHP) plants and from community heating schemes without CHP plants.  |
| <b>HMRC</b>                              | HM Revenue and Customs.   |
| <b>Imports</b>                           | Before the 1997 edition of the Digest, the term "arrivals" was used to distinguish figures derived from the former source from those import figures derived from the systems operated by HM Revenue and Customs. To make it clearer for users, a single term is now being used for both these sources of figures (the term imports) as this more clearly states what the figures relate to, which is goods entering the UK.   |
| <b>Indigenous production</b>             | The extraction or capture of primary fuels: for oil this includes production from the UK Continental Shelf, both onshore and offshore.  |
| <b>Industrial spirit</b>                 | Refined petroleum fractions with boiling ranges up to 200°C dependent on the use to which they are put – e.g. seed extraction, rubber solvents, perfume etc.  |
| <b>International Energy Agency (IEA)</b> | The IEA is an autonomous body located in Paris which was established in November 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme.   |
| <b>ISSB</b>                              | International Steel Statistics Bureau   |
| <b>Joules</b>                            | A joule is a generic unit of energy in the conventional SI system. It is equal to the energy dissipated by an electrical current of 1 ampere driven by 1 volt for 1 second; it is also equal to twice the energy of motion in a mass of 1 kilogram moving at 1 metre per second.  |
| <b>Kilowatt (kW)</b>                     | 1,000 watts   |
| <b>Landfill gas</b>                      | The methane-rich biogas formed from the decomposition of organic material in landfill.  |
| <b>LDF</b>                               | Light distillate feedstock  |
| <b>LDZ</b>                               | Local distribution zone   |
| <b>Lead Replacement Petrol (LRP)</b>     | An alternative to Leaded Petrol containing a different additive to lead (in the UK usually potassium based) to perform the lubrication functions of lead additives in reducing engine wear.   |
| <b>Liquefied Natural Gas (LNG)</b>       | Natural gas that has been converted to liquid form for ease of storage or transport.  |

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| <b>Liquefied Petroleum Gas (LPG)</b> | Gas, usually propane or butane, derived from oil and put under pressure so that it is in liquid form. Often used to power portable cooking stoves or heaters and to fuel some types of vehicle, e.g. some specially adapted road vehicles, forklift trucks.  |
| <b>Lubricating oils</b>              | 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.  |
| <b>Major Power Producers (MPPs)</b>  | Companies whose prime purpose is the generation of electricity.  |
| <b>Megawatt (MW)</b>                 | 1,000 kilowatts. MWe is used to emphasise when electricity is being measured. MWt is used when heat (“thermal”) is being measured.   |
| <b>Micro CHP</b>                     | Micro CHP is a new technology that is expected to make a significant contribution to domestic energy efficiency in the future.   |
| <b>Motor spirit</b>                  | Blended light petroleum product used as a fuel in spark-ignition internal combustion engines (other than aircraft engines).  |
| <b>Naphtha</b>                       | (Light distillate feedstock) – Petroleum distillate boiling predominantly below 200°C.   |
| <b>Natural gas</b>                   | Natural gas is a mixture of naturally occurring gases found either in isolation, or associated with crude oil, in underground reservoirs. The main components are methane, ethane, propane and butane. Hydrogen sulphide and carbon dioxide may also be present, but these are mostly removed at or near the well head in gas processing plants.   |
| <b>Natural gas - compressed</b>      | Natural gas that has been compressed to reduce the volume it occupies to make it easier to transport other than in pipelines. Whilst other petroleum gases can be compressed such that they move into liquid form, the volatility of natural gas is such that liquefaction cannot be achieved without very high pressures and low temperatures being used. As such, the compressed form is usually used as a “half-way house”. |
| <b>Natural gas liquids (NGLs)</b>    | A mixture of liquids derived from natural gas and crude oil during the production process, including propane, butane, ethane and gasoline components (pentanes plus).  |
| <b>NIE</b>                           | Northern Ireland Electricity   |
| <b>Non-energy use</b>                | Includes fuel used for chemical feedstock, solvents, lubricants, and road making material.   |
| <b>OFGEM</b>                         | The regulatory office for gas and electricity markets  |
| <b>OFT</b>                           | Office of Fair Trading   |
| <b>ONS</b>                           | Office for National Statistics   |
| <b>OTS</b>                           | Overseas Trade Statistics of the United Kingdom  |
| <b>Patent fuel</b>                   | A composition fuel manufactured from coal fines by shaping with the addition of a binding agent (typically pitch). The term manufactured solid fuel is also used.  |



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| <b>Petrochemical feedstock</b>             | 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.   |
| <b>Petroleum cokes</b>                     | Carbonaceous material derived from hydrocarbon oils, uses for which include metallurgical electrode manufacture and in the manufacture of cement.  |
| <b>Photovoltaics</b>                       | The direct conversion of solar radiation into electricity by the interaction of light with the electrons in a semiconductor device or cell.  |
| <b>Plant capacity</b>                      | The maximum power available from a power station at a point in time.   |
| <b>Plant loads, demands and efficiency</b> | Measures of how intensively and efficiently power stations are being used.   |
| <b>PPRS</b>                                | Petroleum production reporting system. Licensees operating in the UK Continental Shelf are required to make monthly returns on their production of hydrocarbons (oil and gas) to BEIS. This information is recorded in the PPRS, which is used to report flows, stocks and uses of hydrocarbon from the well-head through to final disposal from a pipeline or terminal (see DUKES annex F on the BEIS energy statistics website for further information).   |
| <b>Primary electricity</b>                 | Electricity obtained other than from fossil fuel sources, e.g. nuclear, hydro and other non-thermal renewables. Imports of electricity are also included.  |
| <b>Primary fuels</b>                       | Fuels obtained directly from natural sources, e.g. coal, oil and natural gas.  |
| <b>Process oils</b>                        | Partially processed feedstocks which require further processing before being classified as a finished product suitable for sale. They can also be used as a reaction medium in the production process.   |
| <b>Propane</b>                             | Hydrocarbon containing three carbon atoms (C <sub>3</sub> H <sub>8</sub> ), gaseous at normal temperature, but generally stored and transported under pressure as a liquid.  |
| <b>Refinery fuel</b>                       | Petroleum products produced by the refining process that are used as fuel at refineries.   |
| <b>Reforming</b>                           | Processes by which the molecular structure of different fractions of petroleum can be modified. It usually involves some form of catalyst, most often platinum, and allows the conversion of lower grades of petroleum product into higher grades, improving their octane rating. It is a generic term for processes such as cracking, cyclization, dehydrogenation and isomerisation. These processes generally led to the production of hydrogen as a by-product, which can be used in the refineries in some desulphurization procedures. |
| <b>Renewable energy sources</b>            | Renewable energy includes solar power, wind, wave and tide, and hydroelectricity. Solid renewable energy sources consist of wood, straw, short rotation coppice, other biomass and the biodegradable fraction of wastes. Gaseous renewables consist of landfill gas and sewage gas. Non-biodegradable wastes are not counted as a renewables source but appear in the Renewable sources of energy chapter of this Digest for completeness.   |

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| <b>Reserves</b>                    | With oil and gas these relate to the quantities identified as being present in underground cavities. The actual amounts that can be recovered depend on the level of technology available and existing economic situations. These continually change; hence the level of the UK's reserves can change quite independently of whether or not new reserves have been identified.  |
| <b>RESTATS</b>                     | The Renewable Energy Statistics database for the UK.  |
| <b>Ricardo-AEA</b>                 | Formerly known as AEA Energy & Environment.   |
| <b>RO</b>                          | Renewables Obligation – this is an obligation on all electricity suppliers to supply a specific proportion of electricity from eligible renewable sources.  |
| <b>ROCs</b>                        | Renewables Obligation Certificates  |
| <b>Seasonal Performance Factor</b> | The Seasonal Performance Factor (SPF) of a heat pump is the total useful heat delivered during a year divided by the annual electricity consumption of the pump. The SPF gives an indication of the efficiency of the pump, with values greater than 1 implying that more useful heat is produced than the electricity used to power the pump.  |
| <b>Secondary fuels</b>             | Fuels derived from natural primary sources of energy. For example electricity generated from burning coal, gas or oil is a secondary fuel, as are coke and coke oven gas.   |
| <b>SIC</b>                         | <p>The United Kingdom Standard Industrial Classification of Economic Activities (SIC) is used to classify business establishments and other standard units by the type of economic activity in which they are engaged. It provides a framework for the collection, tabulation, presentation and analysis of data and its use promotes uniformity. In addition, it can be used for administrative purposes and by non-government bodies as a convenient way of classifying industrial activities into a common structure.</p> <p>The system is identical to the EUROSTAT System NACE at the four digit class level and the United Nations system ISIC at the two digit Divisional level.</p> |
| <b>SO<sub>2</sub></b>              | Sulphur Dioxide. Sulphur dioxide is a gas produced by the combustion of sulphur-containing fuels such as coal and oil.  |
| <b>Steam coal</b>                  | Within this publication, steam coal is coal classified as such by UK coal producers and by importers of coal. It tends to be coal having lower calorific values; the type of coal that is typically used for steam raising.   |
| <b>Synthetic coke oven gas</b>     | Mainly a natural gas, which is mixed with smaller amounts of blast furnace, and BOS (basic oxygen steel furnace) gas to produce a gas with almost the same quantities as coke oven gas.   |
| <b>Tars</b>                        | Viscous materials usually derived from the destructive distillation of coal which are by-products of the coke and iron making processes.  |
| <b>Temperature correction</b>      | The temperature corrected series of total inland fuel consumption indicates what annual consumption might have been if the average temperature during the year had been the same as the average for the years 1991 to 2020.   |
| <b>Terawatt (TW)</b>               | 1,000 gigawatts   |

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| <b>Therm</b>                           | A common unit of measurement similar to a tonne of oil equivalent which enables different fuels to be compared and aggregated.  |
| <b>Thermal efficiency</b>              | The thermal efficiency of a power station is the efficiency with which heat energy contained in fuel is converted into electrical energy. It is calculated for fossil fuel burning stations by expressing electricity generated as a percentage of the total energy content of the fuel consumed (based on average gross calorific values). For nuclear stations it is calculated using the quantity of heat released as a result of fission of the nuclear fuel inside the reactor.            |
| <b>Thermal sources of electricity</b>  | These include coal, oil, natural gas, nuclear, landfill gas, sewage gas, municipal solid waste, farm waste, tyres, poultry litter, short rotation coppice, straw, coke oven gas, blast furnace gas, and waste products from chemical processes.   |
| <b>Tonne of oil equivalent (toe)</b>   | A common unit of measurement which enables different fuels to be compared and aggregated  |
| <b>TWh</b>                             | Terawatt hour   |
| <b>UKCS</b>                            | United Kingdom Continental Shelf  |
| <b>UKPIA</b>                           | UK Petroleum Industry Association. The trade association for the UK petroleum industry.   |
| <b>UKSA</b>                            | UK Statistics Authority   |
| <b>Ultra low sulphur Diesel (ULSD)</b> | A grade of diesel fuel which has a much lower sulphur content (less than 0.005 per cent or 50 parts per million) and of a slightly higher volatility than ordinary diesel fuels. As a result it produces fewer emissions when burned, and initially enjoyed a lower rate of hydrocarbon oil duty in the UK than ordinary diesel to promote its use, although duty rates on standard diesel and ULSD have since been equalised. Virtually 100 per cent of sales of DERV fuel in the UK are ULSD. |
| <b>Ultra low sulphur Petrol (ULSP)</b> | A grade of motor spirit with a similar level of sulphur to ULSD (less than 0.005 per cent or 50 parts per million). ULSP initially enjoyed a lower rate of hydrocarbon oil duty in the UK than ordinary petrol to promote its use, although duty rates on standard petrol and ULSP have since been equalised. It has quickly replaced ordinary premium grade unleaded petrol in the UK market place.  |
| <b>Upstream</b>                        | A term to cover the activities related to the exploration, production and delivery to a terminal or other facility of oil or gas for export or onward shipment within the UK.   |
| <b>VAT</b>                             | Value added tax   |
| <b>Watt (W)</b>                        | The conventional unit to measure a rate of flow of energy. One watt amounts to 1 joule per second.  |
| <b>White spirit</b>                    | A highly refined distillate with a boiling range of about 150°C to 200°C used as a paint solvent and for dry cleaning purposes etc.   |

# Annex C

## Further sources of United Kingdom energy publications

Some of the publications listed below give shorter term statistics, some provide further information about energy production and consumption in the United Kingdom and in other countries, and others provide more detail on a country or fuel industry basis. The list also covers recent publications on energy issues and policy, including statistical information, produced or commissioned by BEIS. The list is not exhaustive and the titles of publications and publishers may alter. All titles can be found on the GOV.UK website.

### Department for Business, Energy and Industrial Strategy publications on energy statistics

#### Energy Statistics

Monthly, quarterly and annual statistics on production and consumption of overall energy and individual fuels in the United Kingdom together with energy prices is available in MS Excel format at: [www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics](http://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics)

#### Energy Trends

A quarterly publication covering all major aspects of energy. It provides a comprehensive picture of energy production and use and contains analysis of data and articles covering energy issues. Available at: [www.gov.uk/government/collections/energy-trends](http://www.gov.uk/government/collections/energy-trends).

#### Energy Prices

A quarterly publication containing tables, charts and commentary covering energy prices to domestic and industrial consumers for all the major fuels as well as presenting comparisons of fuel prices in the European Union and G7 countries. Available at: [www.gov.uk/government/collections/quarterly-energy-prices](http://www.gov.uk/government/collections/quarterly-energy-prices).

#### Energy Flow Chart

An annual publication illustrating the flow of primary fuels from home production and imports to their eventual final uses. They are shown in their original state and after being converted into different kinds of energy by the secondary fuel producers. Available at: [www.gov.uk/government/collections/energy-flow-charts](http://www.gov.uk/government/collections/energy-flow-charts).

#### UK Energy in Brief

An annual publication summarising the latest statistics on energy production, consumption and prices in the United Kingdom. The figures are taken from "Digest of UK Energy Statistics". Available at: [www.gov.uk/government/collections/uk-energy-in-brief](http://www.gov.uk/government/collections/uk-energy-in-brief)

#### Energy Consumption in the United Kingdom

Energy consumption in the United Kingdom brings together statistics from a variety of sources to produce a comprehensive review of energy consumption and changes in intensity and output since the 1970s, with a particular focus on trends since 2000. Available at: [www.gov.uk/government/collections/energy-consumption-in-the-uk](http://www.gov.uk/government/collections/energy-consumption-in-the-uk)

### **Sub-National Energy Consumption statistics**

Sub-National data are produced by BEIS to emphasise the importance of local and regional decision making for energy policy in delivering a number of national energy policy objectives. Data is available at:

[www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics](http://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics)

### **Fuel Poverty statistics**

An annual report detailing the latest statistics on fuel poverty in England. Available at:

[www.gov.uk/government/collections/fuel-poverty-statistics](http://www.gov.uk/government/collections/fuel-poverty-statistics)

### **Household Energy Efficiency statistics**

BEIS publishes a range of information relating to the Energy Company Obligation (ECO) and Green Deal (GD). The headline release presents monthly updates of ECO measures and quarterly updates of in-depth ECO statistics, carbon savings and the Green Deal schemes. The detailed report presents annual updates on in-depth Green Deal statistics and insulation levels. Data is available at:

[www.gov.uk/government/collections/household-energy-efficiency-national-statistics](http://www.gov.uk/government/collections/household-energy-efficiency-national-statistics)

### **National Energy Efficiency Data-framework (NEED)**

BEIS has constructed a National Energy Efficiency Data-framework (NEED) to enable detailed statistical analysis of energy efficiency. The data framework matches the gas and electricity consumption data collected for BEIS sub-national energy consumption statistics and records of energy efficiency measures in the Homes Energy Efficiency Database (HEED) run by the Energy Saving Trust (EST), as well as typographic data about dwellings and households. Data is available at:

[www.gov.uk/government/collections/national-energy-efficiency-data-need-framework](http://www.gov.uk/government/collections/national-energy-efficiency-data-need-framework)

### **Smart Meters statistics**

Data produced by BEIS on the roll-out of smart meters in Great Britain, covering both operating and installed meters.

[www.gov.uk/government/collections/smart-meters-statistics](http://www.gov.uk/government/collections/smart-meters-statistics)

### **UK Greenhouse Gas Emissions statistics**

Emissions data are produced by BEIS to show progress against the UK's goals, both international and domestic, for reducing greenhouse gas emissions. Data is available at:

[www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics](http://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics)

### **UK Energy and CO2 emissions projections**

The Updated Energy Projections (UEP) are published annually by BEIS. They provide updated projections and analysis of energy use and carbon dioxide emissions in the UK. The UEP exercise incorporates all firm environmental policy measures and is based on updated assumptions consistent with the most recent UK Budget announcements. The latest report is available at:

[www.gov.uk/government/collections/energy-and-emissions-projections](http://www.gov.uk/government/collections/energy-and-emissions-projections)

## **Department for Business, Energy and Industrial Strategy policy publications on energy and climate change**

### **The Clean Growth Strategy**

On 12 October 2017 The Clean Growth Strategy was published. The strategy sets out proposals for decarbonising all sectors of the UK economy through the 2020s. It explains how the whole country can benefit from low carbon opportunities, while meeting national and international commitments to tackle climate change. The strategy is available at:

[www.gov.uk/government/publications/clean-growth-strategy](http://www.gov.uk/government/publications/clean-growth-strategy)

### **Energy Act 2016**

The Energy Act 2016 was given Royal Assent on 12 May 2016. The Act is available at:

[www.legislation.gov.uk/ukpga/2016/20/contents/enacted](http://www.legislation.gov.uk/ukpga/2016/20/contents/enacted)

### **Annual Energy Statement**

The Annual Energy Statement fulfilled the commitment in the Coalition Programme for the Government to present an annual statement of energy policy to Parliament. The first statement was delivered to Parliament on 27 June 2010, with subsequent statements delivered on 23 November 2011, 29 November 2012 and 31 October 2013. The last Statement, delivered on 6 November 2014, is available at: [www.gov.uk/government/publications/annual-energy-statement-2014](http://www.gov.uk/government/publications/annual-energy-statement-2014)

### **Energy Act 2013**

The Energy Act 2013 was given Royal Assent on 18 December 2013. The Act is available at:

[www.legislation.gov.uk/ukpga/2013/32/contents](http://www.legislation.gov.uk/ukpga/2013/32/contents)

### **Energy Act 2011**

The Energy Act 2011 was given Royal Assent on 18 October 2011. The Act is available at:

[www.legislation.gov.uk/ukpga/2011/16/contents](http://www.legislation.gov.uk/ukpga/2011/16/contents)

### **Electricity Market Reform (EMR) White Paper**

On 12 July 2011 'Planning our electric future: a White Paper for secure, affordable and low-carbon electricity' was published. The White Paper sets out key measures to attract investment, reduce the impact on consumer bills, and create a secure mix of electricity sources including gas, new nuclear, renewables, and carbon capture and storage. The White Paper is available at:

[www.gov.uk/government/publications/planning-our-electric-future-a-white-paper-for-secure-affordable-and-low-carbon-energy](http://www.gov.uk/government/publications/planning-our-electric-future-a-white-paper-for-secure-affordable-and-low-carbon-energy)

### **Energy Act 2010**

The Energy Act 2010 was given Royal Assent on 8 April 2010. The Act is available at:

[www.legislation.gov.uk/ukpga/2010/27/contents](http://www.legislation.gov.uk/ukpga/2010/27/contents)

### **UK Low Carbon Transition Plan**

The UK Low Carbon Transition Plan was published on 15 July 2009. The Plan is available at:

[www.gov.uk/government/publications/the-uk-low-carbon-transition-plan-national-strategy-for-climate-and-energy](http://www.gov.uk/government/publications/the-uk-low-carbon-transition-plan-national-strategy-for-climate-and-energy)

### **Energy Act 2008**

The Energy Act 2008 was granted Royal Assent on 26 November 2008. The Act is available at:

[www.legislation.gov.uk/ukpga/2008/32/contents](http://www.legislation.gov.uk/ukpga/2008/32/contents)

### **Climate Change Act 2008**

The Climate Change Act 2008 was granted Royal Assent on 26 November 2008. The Act is available at: [www.legislation.gov.uk/ukpga/2008/27/contents](http://www.legislation.gov.uk/ukpga/2008/27/contents)

## Other publications including energy information

### General

Overseas Trade Statistics (OTS) of the United Kingdom; *H.M. Revenue and Customs*

- OTS trade with EU countries (monthly)

- OTS trade with non-EU countries (monthly)

UK Index of Production (monthly); *Office for National Statistics*

United Kingdom Minerals Yearbook; *British Geological Survey*

### Energy

BP Statistical Review of World Energy (annual); *BP*

Energy Balances (annual); *United Nations Statistical Office*

Energy Statistics Yearbook (annual); *United Nations Statistical Office*

Energy Statistics Pocketbook (annual); *United Nations Statistical Office*

World Energy Statistics and Balances (annual); *International Energy Agency*

### Coal

Annual Reports and Accounts of The Coal Authority and the private coal companies; (*apply to the Headquarters of the company concerned*)

Coal Information (annual); *International Energy Agency*

### Oil and Gas

Annual Reports and Accounts of National Grid, Centrica and the independent oil and gas supply companies; (*contact the Headquarters of the company concerned directly*)

National Grid – Gas Ten Year Statement - (annual); *National Grid*

Oil and Gas Information (annual); *International Energy Agency*

Petroleum Review (monthly); *Energy Institute*

### Electricity

Annual Reports and Accounts of the Electricity Supply Companies, Distributed Companies and Generators; (*apply to the Headquarters of the company concerned*)

Annual Report and Accounts of The Office of Gas and Electricity Markets; *OFGEM*

Electricity Information (annual); *International Energy Agency*

National Grid – Electricity Ten Year Statement - (annual); *National Grid*

### Renewables

Renewables Information (annual); *International Energy Agency*

### Prices

Energy Prices and Taxes (quarterly); *International Energy Agency*

# Useful energy related websites

The BEIS section of the GOV.UK website can be found at:

[www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy](http://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy)

## Other Government web sites

|  |  |
|--|--|
| Department for Environment, Food and Rural Affairs   | <a href="http://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs">www.gov.uk/government/organisations/department-for-environment-food-rural-affairs</a>             |
| Department for Levelling Up, Housing and Communities | <a href="http://www.gov.uk/government/organisations/department-for-levelling-up-housing-and-communities">www.gov.uk/government/organisations/department-for-levelling-up-housing-and-communities</a> |
| Department for Transport                             | <a href="http://www.gov.uk/government/organisations/department-for-transport">www.gov.uk/government/organisations/department-for-transport</a>   |
| HM Government Online (GOV.UK)                        | <a href="http://www.gov.uk">www.gov.uk</a>   |
| HM Revenue & Customs                                 | <a href="http://www.gov.uk/government/organisations/hm-revenue-customs">www.gov.uk/government/organisations/hm-revenue-customs</a>   |
| Northern Ireland Executive                           | <a href="http://www.northernireland.gov.uk">www.northernireland.gov.uk</a>   |
| Office for National Statistics                       | <a href="http://www.ons.gov.uk/">www.ons.gov.uk/</a>   |
| Ofgem (The Office of Gas and Electricity Markets)    | <a href="http://www.ofgem.gov.uk">www.ofgem.gov.uk</a>   |
| Scottish Government                                  | <a href="http://www.gov.scot">www.gov.scot</a>   |
| Scottish Parliament                                  | <a href="http://www.parliament.scot/index.aspx">www.parliament.scot/index.aspx</a>   |
| UK Parliament  | <a href="http://www.parliament.uk">www.parliament.uk</a>   |
| UK Statistical System                                | <a href="http://www.statisticsauthority.gov.uk">www.statisticsauthority.gov.uk</a>   |
| Welsh Government                                     | <a href="https://gov.wales">https://gov.wales</a>  |

## Other useful energy related web sites

|  |  |
|--|--|
| BP   | <a href="http://www.bp.com">www.bp.com</a>   |
| British Geological Survey                    | <a href="http://www.bgs.ac.uk">www.bgs.ac.uk</a>   |
| BRE (Building Research Establishment)        | <a href="http://www.bregroup.com">www.bregroup.com</a>   |
| Coal Authority                               | <a href="http://www.gov.uk/government/organisations/the-coal-authority">www.gov.uk/government/organisations/the-coal-authority</a> |
| Energy Institute                             | <a href="http://www.energyinst.org/home">www.energyinst.org/home</a>   |
| Energy Networks Association                  | <a href="http://www.energynetworks.org">www.energynetworks.org</a>   |
| Energy UK                                    | <a href="http://www.energy-uk.org.uk">www.energy-uk.org.uk</a>   |
| Interconnector                               | <a href="http://www.interconnector.com">www.interconnector.com</a>   |
| International Energy Agency (IEA)            | <a href="http://www.iea.org">www.iea.org</a>   |
| International Steel Statistics Bureau (ISSB) | <a href="http://www.issb.co.uk">www.issb.co.uk</a>   |
| National Grid                                | <a href="http://www.nationalgrid.com">www.nationalgrid.com</a>   |
| Oil & Gas UK                                 | <a href="https://oeuk.org.uk/">https://oeuk.org.uk/</a>  |
| Renewable UK                                 | <a href="http://www.renewableuk.com">www.renewableuk.com</a>   |
| Ricardo Energy & Environment                 | <a href="https://ee.ricardo.com">https://ee.ricardo.com</a>  |
| UK-AIR: Air Information Resource             | <a href="https://uk-air.defra.gov.uk">https://uk-air.defra.gov.uk</a>  |
| UK Petroleum Industry Association (UKPIA)    | <a href="https://www.ukpia.com">https://www.ukpia.com</a>  |
| United Nations Statistics Division           | <a href="https://unstats.un.org/home">https://unstats.un.org/home</a>  |
| US Department of Energy                      | <a href="http://www.energy.gov">www.energy.gov</a>   |
| US Energy Information Administration         | <a href="http://www.eia.gov">www.eia.gov</a>   |



# Annex D

## Major events in the Energy Industry

**2022**

### **Energy Security**

In May 2022 as part of the Queen's Speech, the Government announced the Energy Security Bill. The purpose of the Bill is to help the UK transition to a cleaner, more affordable and more secure energy system.

In April 2022 the Government published the British energy security strategy. The strategy details plans for the growth in the deployment of wind, new nuclear, solar and hydrogen, whilst supporting the production of domestic oil and gas in the nearer term, which could see 95% of electricity generated by 2030 being low carbon.

### **Energy Prices**

In March 2022 the Chancellor announced in his Spring Statement that fuel duty on petrol and diesel will be reduced by 5p per litre for 12 months.

In February 2022 the energy price cap was increased by £693 from £1,277 to £1,971 per year, from 1 April for the six-month "summer" price cap period.

### **Coal**

In April 2022 the Government announced alongside the publication of the British energy security strategy that the UK will phase out imports of Russian coal by the end of 2022.

### **Gas**

In May 2022 the Boiler Upgrade Scheme opened for applications. Property owners will now be able to apply for grants of £5,000 to replace fossil fuel boilers with low-carbon heat pumps. The £450 million 3-year scheme helps make heat pumps the affordable and obvious alternative for replacing expensive gas and oil domestic heating.

In April 2022 the Government announced alongside the publication of the British energy security strategy that the UK will phase out imports of Russian liquefied natural gas as soon as possible after the end of 2022.

### **Oil**

In March 2022 the Government announced that the UK will phase out imports of Russian oil and oil products by the end of 2022 in response to Russia's illegal invasion of Ukraine.

**2021**

**Climate Change**

In April 2021 the Government set into law a new climate change target to reduce emissions by 78% by 2035 compared to 1990 levels. In addition, the UK's sixth Carbon Budget will incorporate the UK's share of international aviation and shipping emissions for the first time.

**Coal**

In June 2021 the Government announced that the deadline to phase out coal from the UK energy system has been brought forward. From 1 October 2024 the UK will no longer use coal to generate electricity, a year earlier than planned.

**Energy Prices**

In August 2021 the energy price cap was increased by £139 from £1,138 to £1,277 per year, from 1 October for the six-month "winter" price cap period.

In February 2021 the energy price cap was increased by £96 from £1,042 to £1,138 per year, from 1 April for the six-month "summer" price cap period.

**Oil**

In May 2021 as part of the Queen's Speech, the Government announced the Downstream Oil Resilience Bill. The purpose of the Bill is to provide tools to build resilience in the downstream oil sector and address threats to security of fuel supply.

**2020**

### **Energy Policy**

In December 2020 the Government published an Energy White Paper which set out plans to build back greener by cleaning up the UK energy system, in addition to keeping energy bills affordable, and levelling up the country by creating greener and more sustainable jobs.

The Energy White Paper outlines policies which will support up to 220,000 green jobs across the UK with an aim to fully decarbonise electricity generation and reach net zero emissions by 2050. To achieve this the government will invest in offshore wind, clean hydrogen, carbon capture and storage, and advanced nuclear. In addition, there are also plans for a smarter energy system that will reduce carbon emissions across industry, transport and buildings by up to 230 million metric tonnes (MtCo2e) by 2032.

In November 2020 the Prime Minister set out an ambitious ten-point plan for a green industrial revolution which will create and support up to 250,000 British jobs. Key energy elements of the plan include:

- produce enough offshore wind to power every home, quadrupling how much we currently produce to 40GW by 2030, supporting up to 60,000 jobs;
- work with industry by aiming to generate 5GW of low carbon hydrogen production capacity by 2030 for industry, transport, power and homes, and to develop the first town heated entirely by hydrogen by the end of the decade;
- advance nuclear as a clean energy source, across large scale nuclear and developing the next generation of small and advanced reactors, which could support 10,000 jobs;
- make our homes, schools and hospitals greener, warmer and more energy efficient, whilst creating 50,000 jobs by 2030, alongside a target to install 600,000 heat pumps every year by 2028.

### **Climate Change**

In December 2020 the Prime Minister announced an ambitious new emissions target thus setting the UK on the path to net zero by 2050. The new target aims for at least 68% reduction in greenhouse gas emissions by the end of the decade, compared to 1990 levels.

### **Electricity**

In July 2020 construction work commenced on what is set to be the world's longest electricity interconnector, linking the UK's power system with Denmark. Due for completion in 2023, the 765-kilometre 'Viking Link' cable will stretch from Lincolnshire to South Jutland in Denmark.

In May 2020 approval was granted for Britain's largest ever solar farm at Cleve Hill, near Whitstable in Kent. The 350MW facility, comprising of 800,000 solar panels, will begin operation in 2022 and will provide power to around 91,000 homes.

### **Energy Prices**

In August 2020 the energy price cap was reduced by £84 from £1,126 (revised) to £1,042 per year, from 1 October for the six-month "winter" price cap period.

In February 2020 the energy price cap was reduced by £17 to £1,162 per year, from 1 April for the six-month "summer" price cap period.

*BEIS news stories including press releases, speeches and statements are available [here](#).*