# Aggregated energy balances showing proportion of renewables in supply and demand

## Introduction

In 2016, the Economics and Social Affairs Department of the United Nations published its International Recommendations for Energy Statistics (IRES)[1]. The report recommended countries should include an "of which renewables" column to their energy balances, both absolute values and percentages.

Adding this breakdown provides a fuller picture of renewable energy in the UK. Although DUKES chapter 6 reports progress against the Renewable Energy Directive (RED), it is based on final consumption and is calculated using a methodology specific to the directive[2]. BEIS has considered that publishing this information will provide users with additional insights into renewable energy trends in the UK.

## Summary Table

The summary table for 2019 (Table 1 below) uses a simplified version of the annual energy balance shows the renewables components for supply, demand, transformation, and final consumption.

Table 1: 2019 Energy balance, showing proportion of renewables (ktoe)[3]

| | Hard Coals | Man. Solid Fuels | Crude Oil & NGL | Petroleum Products | Natural Gas | Bioenergy & Waste | Primary Electricity | Electricity | Heat Sold | TOTAL | of which renewables | share of renewables |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SUPPLY** | | | | | | | | | | | | |
| Indigenous production | 1,508 | 0 | 56,762 | 0 | 37,771 | 13,761 | 20,407 | 0 | 0 | 130,209 | 19,166 | 14.7% |
| Imports | 4,426 | 623 | 57,134 | 36,380 | 44,548 | 5,491 | 0 | 2,111 | 0 | 150,712 | 5,851 | 3.9% |
| Exports | -493 | -8 | -49,105 | -22,664 | -7,539 | -385 | 0 | -291 | 0 | -80,485 | -502 | 0.6% |
| Marine bunkers | 0 | 0 | 0 | -2,492 | 0 | 0 | 0 | 0 | 0 | -2,492 | 0 | 0.0% |
| Stock change | 3 | 112 | -97 | -579 | -125 | 0 | 0 | 0 | 0 | -685 | 0 | 0.0% |
| **Primary supply** | 5,445 | 727 | 64,694 | 10,645 | 74,655 | 18,867 | 20,407 | 1,820 | 0 | 197,259 | 24,515 | 12.4% |
| Statistical difference | -25 | 0 | 30 | -34 | -343 | 0 | 0 | 30 | 0 | -342 | | |
| **Primary demand** | 5,469 | 727 | 64,664 | 10,679 | 74,998 | 18,867 | 20,407 | 1,790 | 0 | 197,602 | 24,509 | 12.4% |
| Transfers | 0 | 24 | -379 | 375 | 454 | -497 | -7,154 | 7,154 | 0 | -23 | | 0.0% |
| **TRANSFORMATION** | -4,173 | 262 | -64,285 | 63,401 | -25,614 | -11,420 | -13,253 | 20,619 | 1,563 | -32,899 | -5,876 | 17.9% |
| Electricity generation | -1,839 | -513 | 0 | -332 | -23,271 | -11,180 | -13,253 | 20,619 | 0 | -29,769 | -5,785 | 19.4% |
| Heat generation | -4 | -1 | 0 | -42 | -2,343 | -240 | 0 | 0 | 1,563 | -1,067 | -91 | 8.5% |
| Petroleum refineries | 0 | 0 | -64,689 | 64,264 | 0 | 0 | 0 | 0 | 0 | -425 | 0 | |
| Coke manufacture | -1,375 | 1,292 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -83 | 0 | |
| Blast furnaces | -863 | -646 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1,508 | 0 | |
| Patent fuel manufacture | -92 | 130 | 0 | -46 | 0 | 0 | 0 | 0 | 0 | -9 | 0 | |
| Other | 0 | 0 | 404 | -443 | 0 | 0 | 0 | 0 | 0 | -39 | 0 | |
| Energy industry use | 0 | 428 | 0 | 4,150 | 5,363 | 0 | 0 | 1,907 | 319 | 12,167 | 798 | 6.6% |
| Losses | 0 | 84 | 0 | 0 | 442 | 0 | 0 | 2,268 | 0 | 2,794 | 878 | 31.4% |
| **FINAL CONSUMPTION** | 1,296 | 501 | 0 | 70,306 | 44,034 | 6,950 | 0 | 25,388 | 1,244 | 149,719 | 16,961 | 11.3% |
| Industries | 927 | 309 | 0 | 2,300 | 8,750 | 1,461 | 0 | 7,878 | 673 | 22,298 | 4,485 | 20.1% |
| Transport | 11 | 0 | 0 | 54,448 | 0 | 1,737 | 0 | 469 | 0 | 56,665 | 1,918 | 3.4% |
| Domestic | 337 | 142 | 0 | 2,554 | 26,650 | 2,449 | 0 | 8,927 | 269 | 41,328 | 6,091 | 14.7% |
| Other Final Users | 22 | 0 | 0 | 3,762 | 8,233 | 1,302 | 0 | 8,114 | 302 | 21,734 | 4,467 | 20.6% |
| Non energy use | 0 | 50 | 0 | 7,244 | 401 | 0 | 0 | 0 | 0 | 7,695 | 0 | |

The spreadsheet, available at: www.gov.uk/government/collections/renewables-statistics#energy-trends:-articles also shows this on a year-by-year basis from 2000, alongside a time- series without the individual fuels, as shown in Table 2.

[1] https://unstats.un.org/unsd/energy/ires/IRES_edited2.pdf

[2] The key differences are that the RED basis uses net calorific values and a normalisation process to smooth out the effects of extreme weather years for hydro and wind generation.

[3] Note that for a number of rows, the tables do not show the proportion of biofuels. For transformation for instance, the total in the energy balance is the net loss of the transformation process. A renewable component of this can be calculated but it is in itself fairly meaningless.

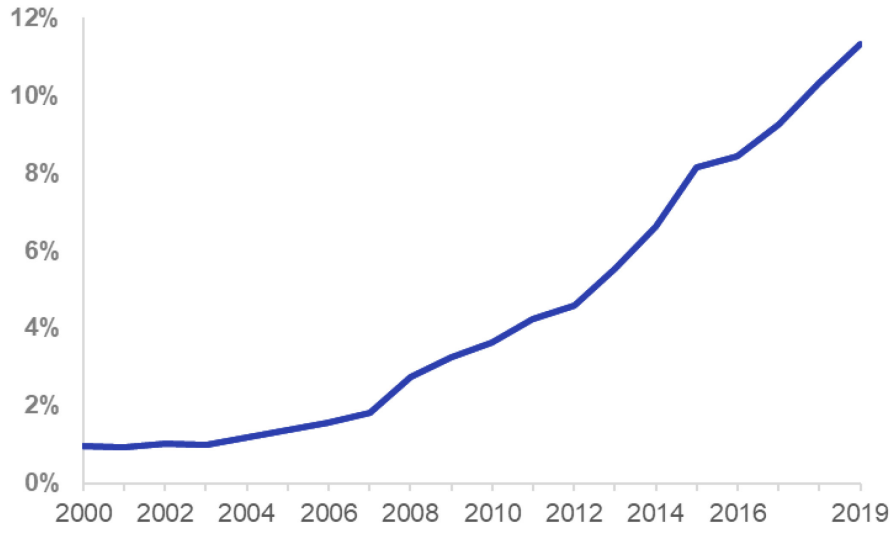
Table 2: Energy balance 2017 to 2019 showing proportion of renewables (ktoe)

| | 2017 | | | 2018 | | | 2019 | | |
|---|---|---|---|---|---|---|---|---|---|
| | TOTAL (ktoe) | of which renewables (ktoe) | share of renewables (%) | TOTAL (ktoe) | of which renewables (ktoe) | share of renewables (%) | TOTAL (ktoe) | of which renewables (ktoe) | share of renewables (%) |
| **SUPPLY** | | | | | | | | | |
| Indigenous production | 126,601 | 16,908 | 13.4% | 130,433 | 18,417 | 14.1% | 130,209 | 19,166 | 14.7% |
| Imports | 152,464 | 3,818 | 2.5% | 154,363 | 4,620 | 3.0% | 150,712 | 5,851 | 3.9% |
| Exports | -79,245 | -539 | 0.7% | -81,456 | -386 | 0.5% | -80,485 | -502 | 0.6% |
| Marine bunkers | -2,619 | 0 | 0.0% | -2,615 | 0 | 0.0% | -2,492 | 0 | 0.0% |
| Stock change | 3,441 | 0 | 0.0% | -143 | -9 | 6.4% | -685 | 0 | 0.0% |
| **Primary supply** | 200,644 | 20,187 | 10.1% | 200,582 | 22,642 | 11.3% | 197,259 | 24,515 | 12.4% |
| Statistical difference | 168 | 0 | 0.0% | -49 | 0 | 0.0% | -342 | 0 | 0.0% |
| **Primary demand** | 200,476 | 20,183 | 10.1% | 200,631 | 22,656 | 11.3% | 197,602 | 24,509 | 12.4% |
| Transfers | -133 | 0 | 0.0% | -62 | 0 | 0.0% | -23 | 0 | 0.0% |
| **TRANSFORMATION** | -35,595 | -4,958 | 13.9% | -34,102 | -5,466 | 16.0% | -32,899 | -5,876 | 17.9% |
| Electricity generation | -32,623 | -4,886 | 15.0% | -31,295 | -5,379 | 17.2% | -29,769 | -5,785 | 19.4% |
| Heat generation | -1,065 | -73 | 6.8% | -1,059 | -87 | 8.2% | -1,067 | -91 | 8.5% |
| Petroleum refineries | -149 | 0 | 0.0% | -152 | 0 | 0.0% | -425 | 0 | 0.0% |
| Coke manufacture | -84 | 0 | 0.0% | -84 | 0 | 0.0% | -83 | 0 | 0.0% |
| Blast furnaces | -1,585 | 0 | 0.0% | -1,432 | 0 | 0.0% | -1,508 | 0 | 0.0% |
| Patent fuel manufacture | -54 | 0 | 0.0% | -45 | 0 | 0.0% | -9 | 0 | 0.0% |
| Other | -34 | 0 | 0.0% | -34 | 0 | 0.0% | -39 | 0 | 0.0% |
| Energy industry use | 12,069 | 679 | 5.6% | 12,032 | 751 | 6.2% | 12,167 | 798 | 6.6% |
| Losses | 2,863 | 713 | 24.9% | 2,863 | 801 | 28.0% | 2,794 | 878 | 31.4% |
| **FINAL CONSUMPTION** | 149,817 | 13,834 | 9.2% | 151,573 | 15,640 | 10.3% | 149,719 | 16,961 | 11.3% |
| Industries | 22,808 | 3,690 | 16.2% | 22,933 | 4,224 | 18.4% | 22,298 | 4,485 | 20.1% |
| Transport | 57,003 | 1,127 | 2.0% | 56,884 | 1,514 | 2.7% | 56,665 | 1,918 | 3.4% |
| Domestic | 39,837 | 5,145 | 12.9% | 41,633 | 5,694 | 13.7% | 41,328 | 6,091 | 14.7% |
| Other Final Users | 21,522 | 3,872 | 18.0% | 21,902 | 4,208 | 19.2% | 21,734 | 4,467 | 20.6% |
| Non energy use | 8,647 | 0 | 0 | 8,221 | 0 | 0 | 7,695 | 0 | 0 |

## Trends

- Over time, the proportion of renewables in energy supply has been steadily increasing over the years, rising from 1.1 per cent in 2000 to 11.3 per cent in 2019

Figure 1: share of energy supply from renewable sources



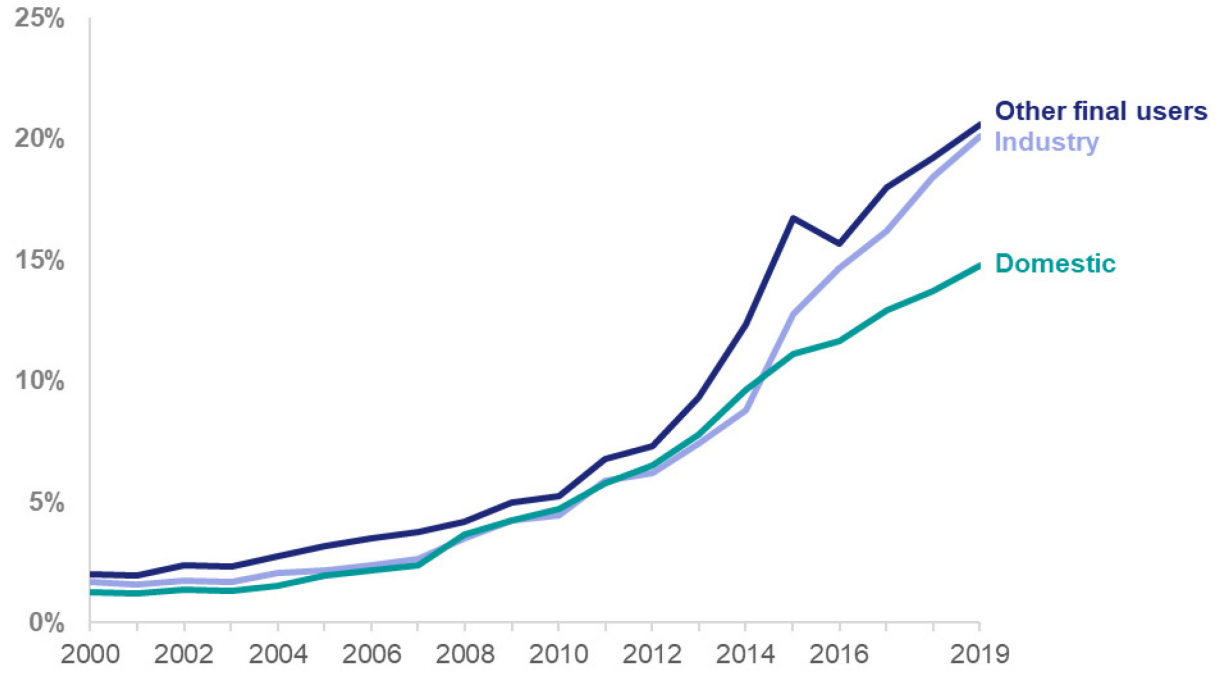

- The trajectory is in line with progress against the RED as reported in DUKES 2020. As the two measures are calculated on a different basis, they do not match exactly.

- For demand, the proportion met through renewables depends on the fuel mix supplied into the sector. The greater the demand met through electricity, in general the greater the proportion of renewables given the relatively high level of renewables within the electricity generation mix.

- Accordingly, the proportion of demand met from renewables varies from a low of 3.4 per cent (for transport, mainly from biofuels) to highs of over 20 per cent for ‘other final users’, which is largely the service and commercial sectors that consume relatively large quantities of electricity, and industry.

Figure 2 below shows a comparison of the final energy consuming sectors (excluding transport) and the changing renewable component since 2000.

Figure 2: share of final energy consumption from renewable sources




Since 2016, the proportion of renewables has been steadily increasing though Figure 2 above shows a fall between the years 2015 and 2016 for 'other final users'. This represents an increase in the denominator, i.e. total demand which resulted in a fall in the renewables proportion. This is due to a re-allocation of oil consumption from unclassified to other sectors including agriculture, public administration, and commerce for 2016 and 2017[4]. This brings the proportion in renewables demand for other users in line with that for the industry sector (21 per cent for the former and 20 per cent for the latter). This compares with 15 per cent renewables in the domestic sector reflecting the high proportion of gas consumption for heating purposes. Table 3 below shows the changes how each individual fuel type has impacted the change between the two years.

Table 3: Fossil fuel consumption in the industrial sector by fuel:

| | 2016 | 2017 | 2018 | 2019 | 2016-2019 | 2016-2019 |
|---|---|---|---|---|---|---|
| **Hard Coals** | 1304 | 1125 | 1027 | 927 | -377 | -29% |
| **Man. Solid Fuels** | 314 | 296 | 266 | 309 | -5 | -2% |
| **Petroleum Products** | 2331 | 2645 | 2588 | 2300 | -31 | -1% |
| **Natural Gas** | 8647 | 8862 | 8853 | 8750 | 104 | 1% |
| **Renewables** | 3297 | 3690 | 4224 | 4485 | 1188 | 36% |

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[4] See paragraph 1.65 in The Digest of UK Energy Statistics 2019;
www.gov.uk/government/statistics/energy-chapter-1-digest-of-united-kingdom-energy-statistics-dukes

**Methodological Annex**

The following calculations were used to derive the renewable components:

Bioenergy and waste: For bioenergy, the non-biodegradable part of waste which is included in the balances is excluded.

Renewable electricity imports: The renewable mix for those countries exporting electricity to the UK grid (France, Ireland, and The Netherlands) was calculated for each year using data from the International Energy Agency (IEA).

Renewable electricity exports: BEIS assumed that electricity exported from the UK contained renewables in proportion to the overall supply.

Biogas: The ratio of biogas injected into the gas grid to natural gas, is used to calculate the renewable component.

**Worked example – domestic renewables consumption**

This table illustrates the calculation of the renewables components with reference to domestic consumption in 2016.

Table A.1. worked example (ktoe)

| Fuel Source | Fossil | Renewable | Total |
|---|---|---|---|
| **Coal** | 414 | 0 | 414 |
| **Manufactured Fuel** | 168 | 0 | 168 |
| **Petroleum** | 2525 | 0 | 2,525 |
| **Natural Gas** | 26,716 | 57 | 26,773 |
| **Bioenergy** | 0 | 2,079 | 2,079 |
| **Electricity** | 6,828 | 2,456 | 9,284 |
| **Heat** | 51 | 1 | 52 |
| **Total** | 36,702 | 4,593 | 41,295 |
| Proportion, of which renewables | | | **11.1%** |

Notes for renewable data

Natural gas: BEIS estimate that 165 ktoe of biomethane was injected into the gas grid. If this biogas was consumed equally by all gas consumers, then 57 ktoe were consumed by the domestic sector.

Bioenergy: Sum of domestic consumption of wood, solar thermal and heat pumps.

Electricity: BEIS estimate 26.5 per cent of electricity supply was produced from renewables.

Heat: BEIS estimate that 1.5 per cent of heat sold was generated from renewables.