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 2016 (Table 1 below) uses a simplified version of the annual energy balance and shows the renewables components for supply, demand, transformation, and final consumption.

Table 1: 2016 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	2,633	0	51,952	0	39,789	10,774	19,987	0	0	125,135	14,056	11.2%
Imports	5,747	890	53,380	38,254	45,979	3,743	0	1,694	0	149,687	4,014	2.7%
Exports	-333	-16	-38,180	-26,663	-10,048	-338	0	-185	0	-75,763	-388	0.5%
Marine bunkers	0	0	0	-2,840	0	0	0	0	0	-2,840	0	0%
Stock change	3,658	-89	-135	77	1,397	0	0	0	0	4,907	0	0%
Primary supply	11,705	785	67,016	8,828	77,117	14,180	19,987	1,509	0	201,125	17,682	8.8%
Statistical difference	-58	1	-86	32	127	0	0	17	0	32		
Primary demand	11,763	784	67,102	8,796	76,990	14,180	19,987	1,492	0	201,093	17,680	8.8%
Transfers	0	27	-1,640	1,629	135	-165	-4,573	4,573	0	-14		
TRANSFORMATION	-10,243	231	-65,462	64,560	-27,876	-8,964	-15,414	24,356	1,409	-37,404	-4,589	-
Electricity generation	-7,533	-540	0	-559	-25,630	-8,894	-15,414	24,356	0	-34,214	-4,571	-
Heat generation	-132	-51	0	-62	-2,246	-70	0	0	1,409	-1,152	-17	-
Petroleum refineries	0	0	-65,931	65,776	0	0	0	0	0	-155	0	-
Coke manufacture	-1,384	1,303	0	0	0	0	0	0	0	-81	0	-
Blast furnaces	-1,037	-656	0	0	0	0	0	0	0	-1,692	0	-
Patent fuel manufacture	-157	175	0	-81	0	0	0	0	0	-64	0	-
Other	0	0	469	-515	0	0	0	0	0	-46	0	-
Energy industry use	0	417	0	4,188	4,968	0	0	2,035	273	11,881	553	-
Losses	0	96	0	0	464	0	0	2,263	0	2,823	600	-
FINAL CONSUMPTION	1,520	529	0	70,797	43,818	5,050	0	26,122	1,136	148,971	11,939	8.0%
Industries	1,072	316	0	4,074	8,427	1,337	0	7,894	610	23,730	3,358	14.2%
Transport	11	0	0	54,345	0	1,010	0	401	0	55,767	1,116	2.0%
Domestic	414	168	0	2,525	26,773	2,079	0	9,284	52	41,295	4,592	11.1%
Other Final Users	22	0	0	2,034	8,178	625	0	8,542	474	19,875	2,872	14.5%
Non energy use	0	46	0	7,818	439	0	0	0	0	8,303	0	0.0%

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.

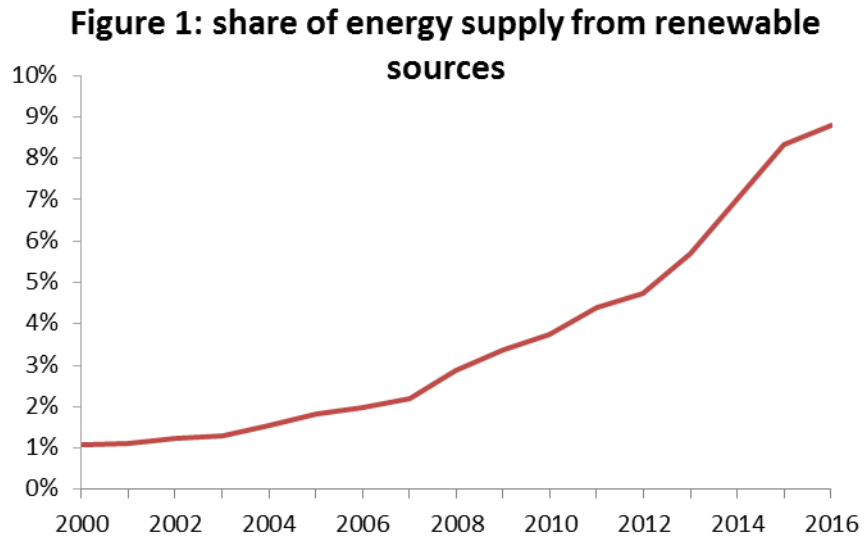
Table 2: Energy balance 2014 to 2016, showing proportion of renewables (ktoe)

	2014			2015			2016		
	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	112,534	11,054	9.8%	123,673	13,349	10.8%	125,135	14,056	11.2%
Imports	166,316	3,497	2.1%	155,134	4,004	2.6%	149,687	4,014	2.7%
Exports	-70,614	-409	0.6%	-76,644	-406	0.5%	-75,763	-391	0.5%
Marine bunkers	-3,004	0	0.0%	-2,684	0	0.0%	-2,840	0	0.0%
Stock change	-4,036	0	0.0%	3,907	0	0.0%	4,907	0	0.0%
Primary supply	201,195	14,142	7.0%	203,386	16,947	8.3%	201,125	17,679	8.8%
Statistical difference	-619			113			32		
Primary demand	201,814	14,150	7.0%	203,273	16,935	8.3%	201,093	17,677	8.8%
Transfers	96			32			-14		
TRANSFORMATION	-44,000	-3,745	-	-41,329	-4,526	-	-37,404	-4,193	-
Electricity generation	-39,564	-3,731	-	-37,544	-4,509	-	-34,214	-4,175	-
Heat generation	-1,108	-14	-	-1,088	-17	-	-1,152	-17	-
Petroleum refineries	-505	0	-	-152	0	-	-155	0	-
Coke manufacture	-334	0	-	-156	0	-	-81	0	-
Blast furnaces	-2,379	0	-	-2,277	0	-	-1,692	0	-
Patent fuel manufacture	-66	0	-	-68	0	-	-64	0	-
Other	-44	0	-	-44	0	-	-46	0	-
Energy industry use	11,889	450	-	12,485	562	-	11,881	579	-
Losses	3,258	498	-	3,133	600	-	2,823	629	-
FINAL CONSUMPTION	142,762	9,457	6.6%	146,359	11,246	7.7%	148,971	12,276	8.2%
Industries	24,302	2,134	8.8%	24,362	3,093	12.7%	23,730	3,460	14.6%
Transport	54,146	1,321	2.4%	54,749	1,097	2.0%	55,767	1,121	2.0%
Domestic	38,680	3,721	9.6%	40,046	4,430	11.1%	41,295	4,713	11.4%
Other Final Users	18,481	2,280	12.3%	19,344	2,626	13.6%	19,875	2,983	15.0%
Non energy use	7,153			7,859			8,303		

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 8.8 per cent in 2016

Figure 1: share of energy supply from renewable sources



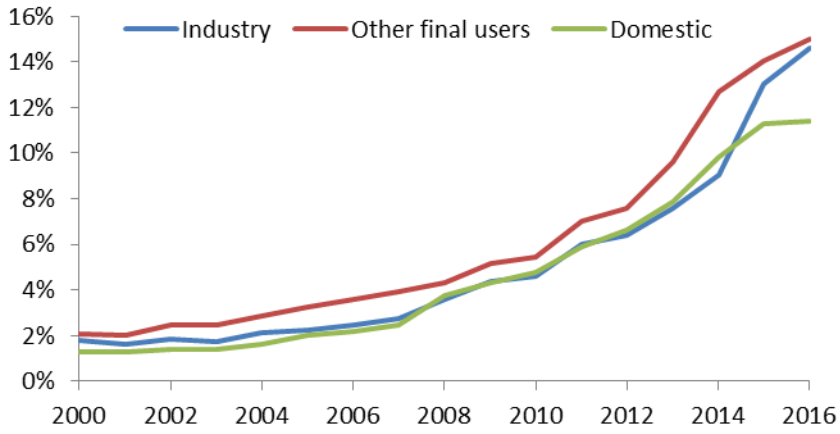
- This is in line with the 8.9 per cent progress against the RED as reported in DUKES 2017. As the two measures are calculated on a different basis, they do not match exactly.

- 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 2 per cent (for transport, mainly from biofuels) to a high of 15 per cent for 'other final users', which is largely the service and commercial sectors that consume relatively large quantities of electricity.

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

Figure 2: Final consuming sectors; proportion of renewables



Over the last two years, the proportion of renewables in the industrial sector has surpassed the domestic sector and is now in line with the "other final user" category at 15 per cent (increasing from 9 per cent in 2014). This trend has been driven by a sharp decrease in industry use of fossil fuels and a corresponding increase in the use of renewables. Table 3 shows how each individual fuel type has impacted the change between the two years.

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

	ktoe			Change (ktoe)	Change (%)
	2014	**2015**	**2016**	**2014-2016**	**2014-2016**
Hard Coals	1,627	1,360	1,072	-555	-34%
Man. Solid Fuels	566	457	316	-250	-44%
Petroleum Products	4,238	4,298	4,074	-164	-4%
Natural Gas	8,653	8,531	8,427	-226	-3%
Renewables	2,196	3,173	3,460	1,265	58%

Development of the statistics

As this is the first time BEIS has published this particular breakdown, comments from users are welcome to contribute to the ongoing improvement and usefulness of the statistics.

For further information, please contact:

Liz Waters
BEIS Energy Statistics Team
Tel: 0300 068 5735
E-mail: elizabeth.waters@beis.gov.uk

Methodological Annex

The following calculations were used to derive the renewable components:

Bioenergy and waste: For bio-energy, 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

Table A.1 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.