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 2018 (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: 2018 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	1,655	0	55,707	0	38,711	13,375	20,532	0	0	129,981	18,247	14.0%
Imports	6,751	714	57,369	38,661	44,529	4,259	0	1,834	0	154,116	4,566	3.0%
Exports	-424	-8	-48,797	-24,387	-7,196	-283	0	-191	0	-81,286	-352	0.4%
Marine bunkers	0	0	0	-2,615	0	0	0	0	0	-2,615	0	0%
Stock change	-126	-47	312	294	-657	-9	0	0	0	-232	-9	4%
Primary supply	7,857	658	64,591	11,953	75,388	17,341	20,532	1,643	0	199,964	22,451	11.2%
Statistical difference	-124	-3	-49	101	-68	0	0	-5	0	-148		
Primary demand	7,981	661	64,640	11,852	75,456	17,341	20,532	1,648	0	200,112	22,452	11.2%
Transfers	0	4	-962	1,133	265	-284	-6,471	6,471	0	155		
TRANSFORMATION	-6,562	356	-63,678	62,965	-26,055	-10,590	-14,061	21,938	1,585	-34,103	-5,398	
Electricity generation	-4,213	-489	0	-435	-23,508	-10,367	-14,061	21,938	0	-31,135	-5,306	
Heat generation	-4	-1	0	-48	-2,547	-223	0	0	1,585	-1,238	-92	
Petroleum refineries	0	0	-64,090	63,953	0	0	0	0	0	-137	0	
Coke manufacture	-1,343	1,259	0	0	0	0	0	0	0	-84	0	
Blast furnaces	-879	-553	0	0	0	0	0	0	0	-1,432	0	
Patent fuel manufacture	-124	140	0	-61	0	0	0	0	0	-45	0	
Other	0	0	412	-443	0	0	0	0	0	-31	0	
Energy industry use	0	446	0	4,283	4,900	0	0	2,000	321	11,950	738	
Losses	0	90	0	0	566	0	0	2,293	0	2,949	799	
FINAL CONSUMPTION	1,418	484	0	71,667	44,200	6,467	0	25,765	1,263	151,265	15,518	10.3%
Industries	1,027	266	0	2,232	9,064	1,452	0	7,998	677	22,716	4,188	18.4%
Transport	11	0	0	55,151	0	1,364	0	429	0	56,954	1,513	2.7%
Domestic	355	171	0	2,477	26,584	2,369	0	9,034	260	41,249	5,629	13.6%
Other Final Users	26	0	0	3,727	8,139	1,283	0	8,304	325	21,805	4,189	19.2%
Non energy use	0	48	0	8,079	413	0	0	0	0	8,541	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.

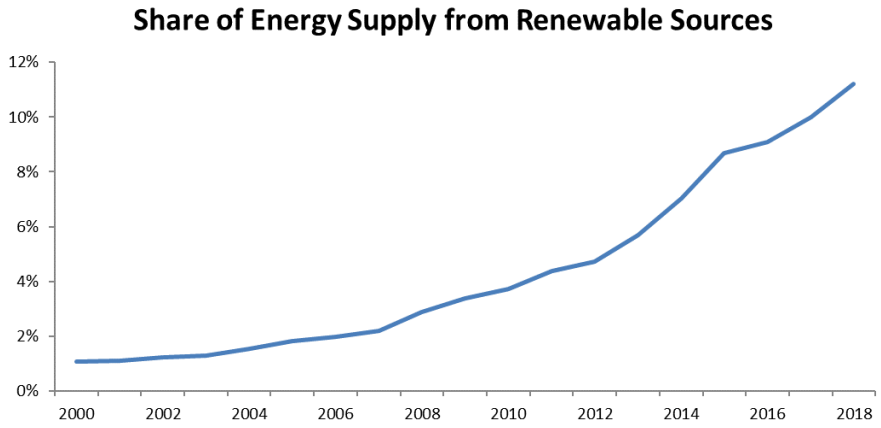
Table 2: Energy balance 2016 to 2018, showing proportion of renewables (ktoe)

	2016			2017			2018		
	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	125,927	14,739	11.7%	126,364	16,798	13.3%	129,981	18,247	14.0%
Imports	149,848	4,021	2.7%	152,193	3,736	2.5%	154,116	4,566	3.0%
Exports	-75,803	-425	0.6%	-79,254	-549	0.7%	-81,286	-352	0.4%
Marine bunkers	-2,840	0	0.0%	-2,619	0	0.0%	-2,615	0	0.0%
Stock change	4,795	0	0.0%	3,481	0	0.0%	-232	-9	3.9%
Primary supply	201,927	18,335	9.1%	200,166	19,985	10.0%	199,964	22,451	11.2%
Statistical difference	-192			-8			-148		
Primary demand	202,119	18,332	9.1%	200,174	19,981	10.0%	200,112	22,452	11.2%
Transfers	18			105			155		
TRANSFORMATION	-37,536	-4,661	-	-35,733	-4,916	-	-34,103	-5,398	-
Electricity generation	-34,318	-4,585	-	-32,580	-4,830	-	-31,135	-5,306	-
Heat generation	-1,211	-76	-	-1,269	-85	-	-1,238	-92	-
Petroleum refineries	-125	0	-	-127	0	-	-137	0	-
Coke manufacture	-81	0	-	-84	0	-	-84	0	-
Blast furnaces	-1,692	0	-	-1,585	0	-	-1,432	0	-
Patent fuel manufacture	-64	0	-	-54	0	-	-45	0	-
Other	-46	0	-	-34	0	-	-31	0	-
Energy industry use	12,052	566	-	11,974	668	-	11,950	738	-
Losses	2,804	593	-	2,850	710	-	2,949	799	-
FINAL CONSUMPTION	149,744	12,512	8.4%	149,721	13,688	9.1%	151,265	15,518	10.3%
Industries	22,417	3,314	14.8%	22,656	3,698	16.3%	22,716	4,188	18.4%
Transport	56,001	1,116	2.0%	57,002	1,126	2.0%	56,954	1,513	2.7%
Domestic	41,113	4,707	11.4%	39,874	5,086	12.8%	41,249	5,629	13.6%
Other Final Users	21,779	3,376	15.5%	21,571	3,778	17.5%	21,805	4,189	19.2%
Non energy use	8,434			8,619			8,541		

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 11.2 per cent in 2018

Figure 1



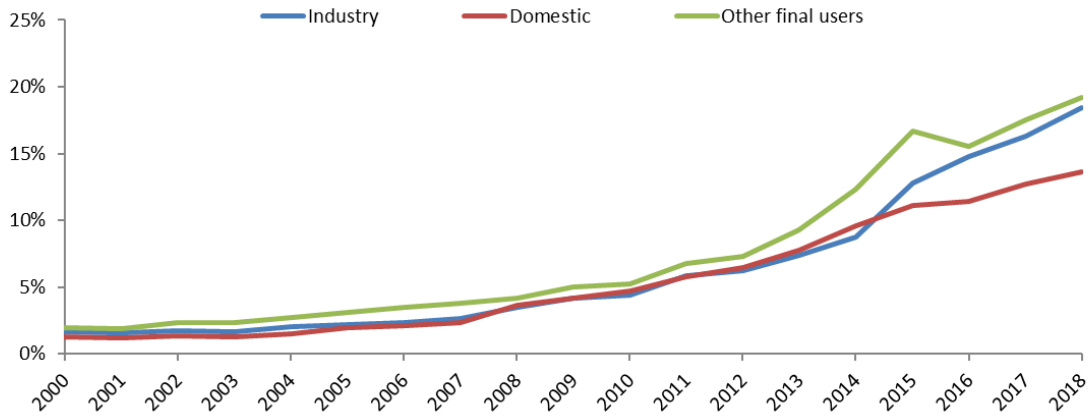
- This is in line with the 11.0 per cent progress against the RED as reported in DUKES 2019. As the two measures are calculated on a different basis, they do not match exactly.

- 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 2.7 per cent (for transport, mainly from biofuels) to a high of 19.2 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



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 industry 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 (19 per cent for the former and 18 per cent for the latter). This compares with 14 per cent renewables in the domestic sector reflecting the high proportion of gas consumption for heating purposes.

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[4] See www.gov.uk/government/publications/energy-trends-june-2019-special-feature-article-change-to-method-of-estimating-sector-demand-for-oil-products

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 renewable components with reference to domestic consumption in 2018.

Table A.1. worked example (ktoe)

Fuel Source	Fossil	Renewable	Total
Coal	355	0	355
Manufactured Fuel	171	0	171
Petroleum	2,477	0	2,477
Natural Gas	26,484	100	26,584
Bioenergy	0	2,369	2,369
Electricity	5,893	3,141	9,034
Heat	241	19	260
Total	35,621	5,629	41,250
Proportion, of which renewables			**13.6%**

Notes for renewable data

Natural gas: BEIS estimate that 284 ktoe of biomethane was injected into the gas grid. If this biogas was consumed equally by all gas consumers, then 100 ktoe were consumed by the domestic sector.

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

Electricity: BEIS estimate 33.0 per cent of electricity supply was produced from renewables.

Heat: BEIS estimate that 8.0 per cent of heat sold was generated from renewables.