Department for
Business, Energy
& Industrial Strategy

ENERGY TRENDS SEPTEMBER 2018

September 2018

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This publication is available for download at www.gov.uk/government/statistics/energy-trends-september-2018.

Contents

Introduction

Energy Trends and Energy Prices are produced by the Department for Business, Energy and Industrial Strategy (BEIS) on a quarterly basis. Both periodicals are published concurrently in June, September, December and March. The September editions cover the second quarter of the current year.

Energy Trends includes information on energy as a whole and by individual fuels. The text and charts provide an analysis of the data in the tables. The tables are mainly in commodity balance format, as used in the annual Digest of UK Energy Statistics. The 2018 edition of the Digest was published on 26 July 2018 and is available on the BEIS section of the GOV.UK website at: www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

The balance format shows the flow of a commodity from its sources of supply, through to its final use. The articles provide in-depth information on current issues within the energy sector.

The text and tables included in this publication represent a snapshot of the information available at the time of publication. However, the data collection systems operated by BEIS, which produce this information, are in constant operation. New data are continually received and revisions to historic data made. To ensure that those who use the statistics have access to the most up-to-date information, revised data will be made available as soon as possible. The tables are available free of charge from the BEIS section of the GOV.UK website. In addition to quarterly tables, the main monthly tables continue to be updated and are also available on the BEIS section of the GOV.UK website. Both sets of tables can be accessed at:
www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics

Energy Trends does not contain information on Foreign Trade, Weather (temperature, wind speed, sun hours and rainfall) and Prices. Foreign Trade and Weather tables are available on the BEIS section of the GOV.UK website at:
www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics
Information on Prices can be found in the Energy Prices publication and on the BEIS section of the GOV.UK website at: www.gov.uk/government/collections/quarterly-energy-prices

Please note that the hyperlinks to tables within this document will open the most recently published version of a table. If you require a previously published version of a table please contact Kevin Harris (see details below).

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The main points for the second quarter of 2018:

- Total energy production was 2.1 per cent lower than in the second quarter of 2017.
- Oil production rose by 0.4 per cent when compared with the second quarter of 2017, with crude oil production up 0.9 per cent, but Natural Gas Liquids (NGLs) production down 5.6 per cent.
- Natural gas production was 6.7 per cent lower than the second quarter of 2017, as a result of robust volumes in 2017. Gas imports fell by 11 per cent, driven by lower LNG imports, whilst exports fell by 49 per cent.
- Coal production in the second quarter of 2018 was 1.9 per cent lower than the second quarter of 2017, due to falling demand. Coal imports were 7.3 per cent lower. Generators' demand for coal fell by 18 per cent to a record low.
- Total primary energy consumption for energy fell by 1.3 per cent. However, when adjusted to take account of weather differences between the second quarter of 2017 and the second quarter of 2018, total primary energy consumption fell by 1.1 per cent to a new record low.
- Temperatures in the quarter were on average 0.2 degrees warmer than a year earlier, with only May being slightly colder than in 2017.
- Final energy consumption (excluding non-energy use) was 0.8 per cent lower than in the second quarter of 2017. Domestic consumption fell by 4.4 per cent and other final users consumption fell by 2.3 per cent, whilst industrial consumption rose by 1.2 per cent and transport consumption rose by 0.6 per cent. On a temperature adjusted basis, final energy consumption rose by 0.3 per cent.
- Gas demand was 2.7 per cent lower than the second quarter of 2017 driven by the warmer weather in the period, whilst electricity consumption was 1.0 per cent lower than in the second quarter of 2017.
- Electricity generated in the second quarter of 2018 fell by 0.7 per cent to 76.5 TWh compared to a year earlier.
- Of electricity generated in the second quarter of 2018, gas accounted for 42.0 per cent, whilst coal accounted for a record low of only 1.6 per cent. Nuclear generation accounted for 21.7 per cent of total electricity generated in the second quarter of 2018.
- Low carbon electricity's share of electricity generation fell slightly to 53.4 per cent in the second quarter of 2018, compared to 53.7 per cent in the second quarter of 2017.
- Renewables' share of electricity generation was a record 31.7 per cent in 2018 Q2, up 1.1 percentage points on the share in 2017 Q2, reflecting increased capacity as well as lower overall electricity generation.
- Renewable electricity generation was 24.3 TWh in 2018 Q2, an increase of 3.0 per cent on the 23.6 TWh in 2017 Q2. Renewable electricity capacity was 42.2 GW at the end of 2018 Q2, a 10 per cent increase (3.9 GW) on a year earlier, with over half of the annual increase coming from offshore wind.

Section 1 - Total Energy

Key results show:

Total energy production was 2.1 per cent lower than in the second quarter of 2017. (**Charts 1.1 & 1.2**)

Total primary energy consumption for energy uses fell by 1.3 per cent. However, when adjusted to take account of weather differences between the second quarter of 2017 and the second quarter of 2018, primary energy consumption fell by 1.1 per cent to a new record low. (**Chart 1.3**)

Final energy consumption (excluding non-energy use) fell by 0.8 per cent compared to the second quarter of 2017. Domestic consumption fell by 4.4 per cent, other final users (mainly from the service sector) consumption fell by 2.3 per cent, whilst industrial consumption rose by 1.2 per cent and transport consumption rose by 0.6 per cent. (**Charts 1.4 & 1.5**)

On a temperature adjusted basis, final energy consumption rose by 0.3 per cent, with a fall in the domestic sector, but rises in the industrial, transport and other final users sectors. (**Chart 1.5**)

Net import dependency was 34.1 per cent, up 3.8 percentage points from the second quarter of 2017. (**Chart 1.6**)

Fossil fuel dependency was 78.4 per cent, in the second quarter of 2018. (**Chart 1.7**)

Relevant tables

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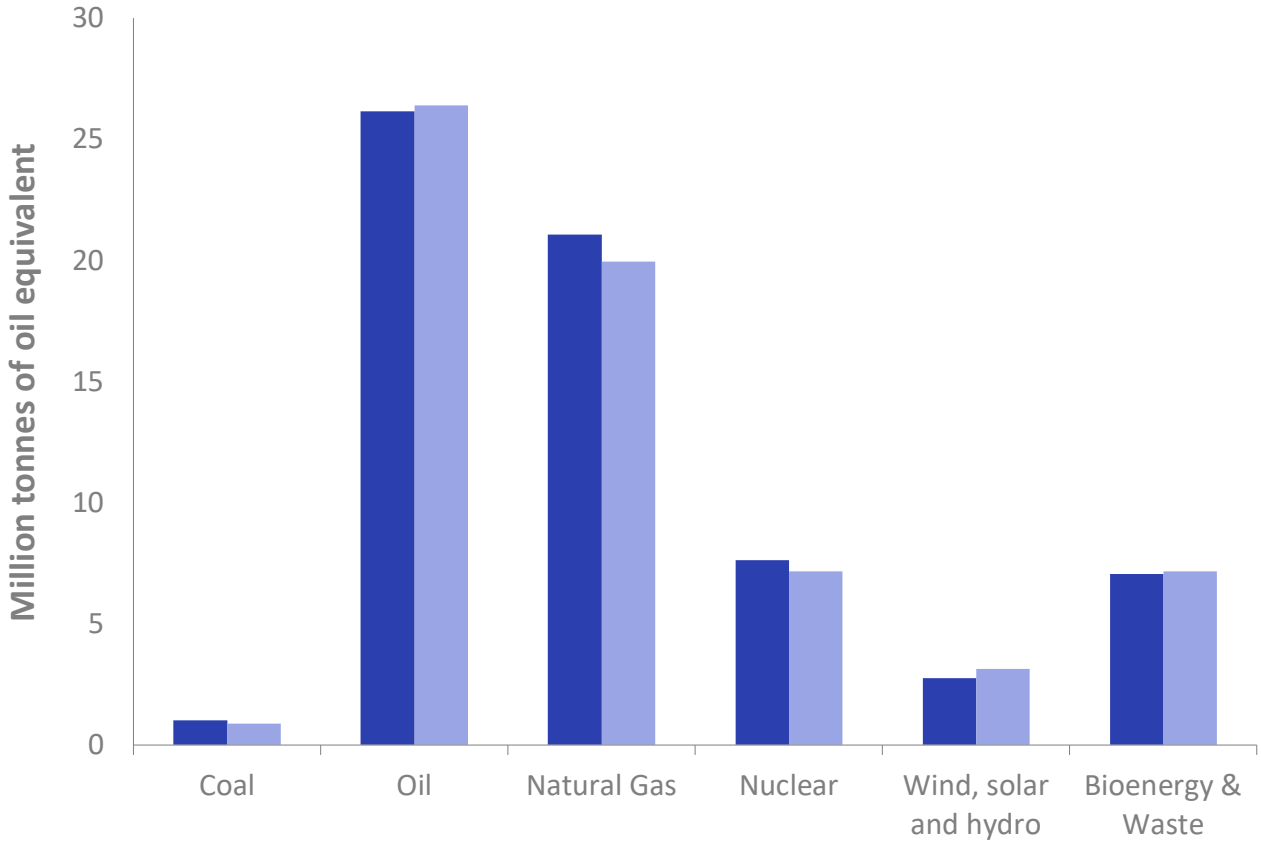
Chart 1.1 Production of indigenous primary fuels (Table 1.1)



Total production in the second quarter of 2018 stood at 31.2 million tonnes of oil equivalent, 2.1 per cent lower than in the second quarter of 2017.

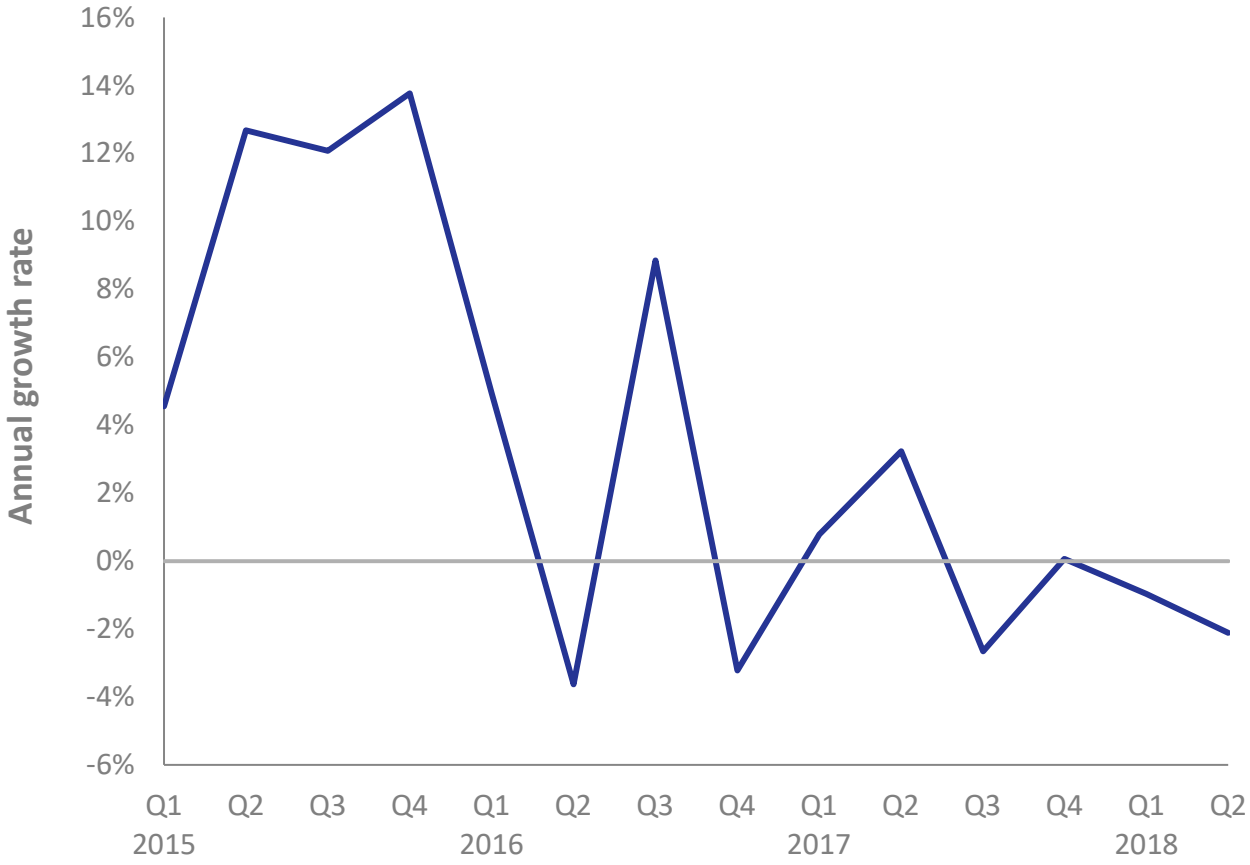
Production of oil rose by 0.4 per cent, whilst production of natural gas fell by 6.7 per cent predominantly due to robust production this time last year.

Primary electricity output in the second quarter of 2018 was 5.0 per cent lower than in the second quarter of 2017. Nuclear electricity output was 6.7 per cent lower due to outages at several large reactors, whilst output from wind, hydro and solar pv was broadly unchanged, with rises in offshore wind and solar (a record quarterly level) offset by falls in onshore wind and hydro output.

Production of bioenergy and waste was 8.0 per cent higher compared to the second quarter in 2017.

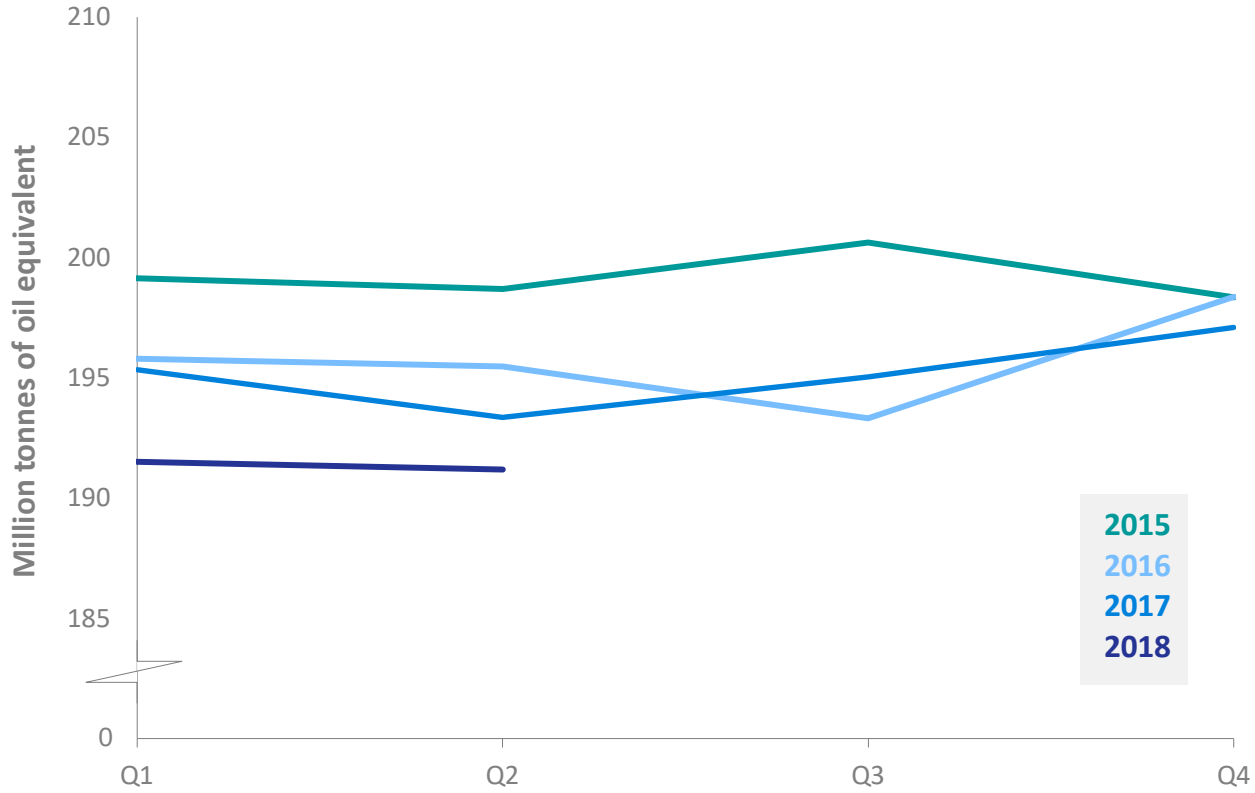
In the second quarter of 2018 production of coal and other solid fuels was 1.1 per cent lower than the corresponding period of 2017, due to low demand from electricity generators.

Chart 1.2 UK production (annual growth rate) (Table 1.1)



In the second quarter of 2018, the annual growth rate of UK quarterly production was -2.1 per cent on the same quarter last year with increases in bioenergy & waste and oil output offset by decreases in coal, gas, nuclear and wind, solar & hydro output.

Chart 1.3 Total inland consumption (primary fuel input basis) [(1)] (Table 1.2)



(1) Seasonally adjusted and temperature corrected annual rates

Total inland consumption on a primary fuel input basis (seasonally adjusted and temperature corrected annualised rate), was 191.2 million tonnes of oil equivalent, a record low, in the second quarter of 2018, 1.1 per cent lower than in the second quarter of 2017. The main driver for the low level is the switch by electricity generators from using fossil fuels to low carbon sources (nuclear and renewables), as well as improvements in energy efficiency.

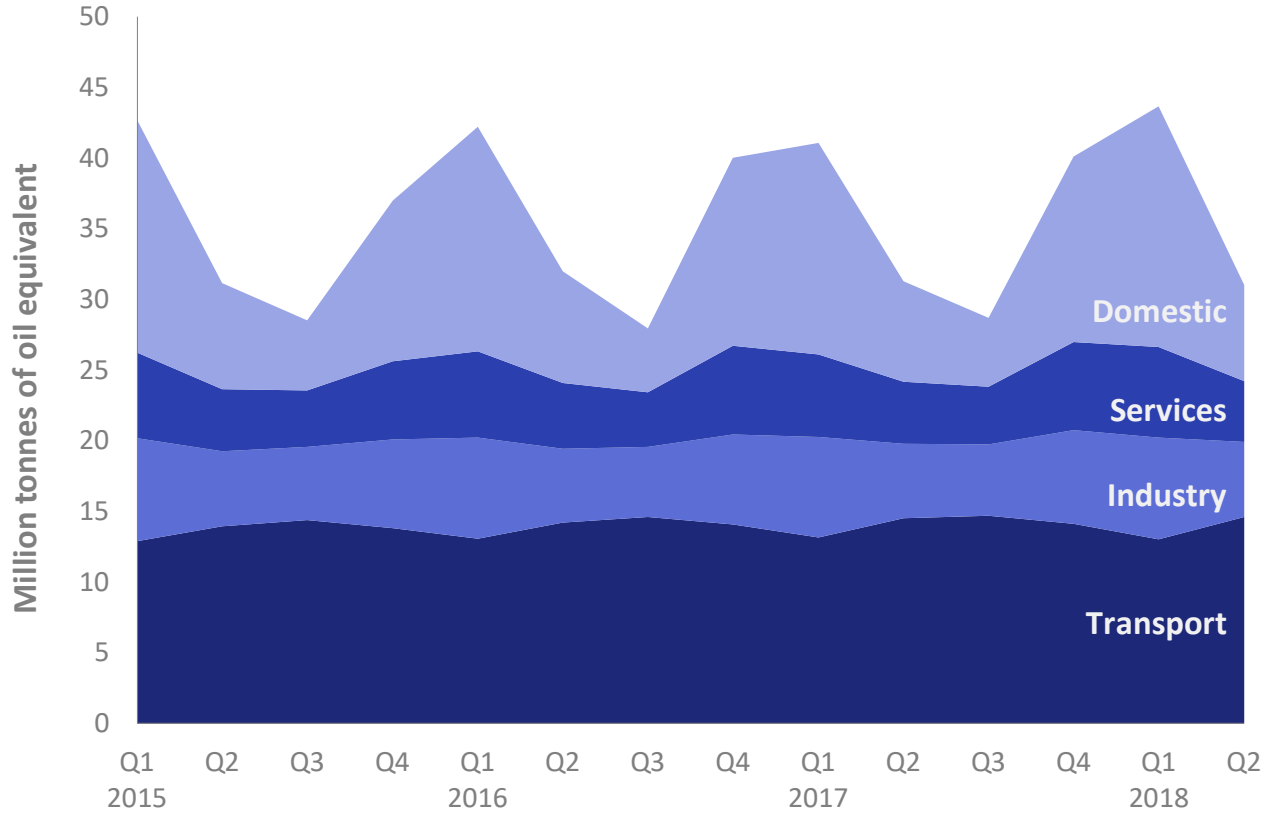
The average temperature in the second quarter of 2018 was 0.2 degree Celsius warmer than the same period a year earlier, with only May being slightly colder than in 2017.

Between the second quarter of 2017 and the second quarter of 2018 (on a seasonally adjusted and temperature corrected basis) coal and other solid fuel consumption fell by 13 per cent, driven by decreased coal use in electricity generation.

On the same basis, natural gas consumption fell by 2.6 per cent between the second quarter of 2017 and the second quarter of 2018, whilst oil consumption in the second quarter of 2018 was 0.5 per cent higher than in the second quarter of 2017.

Also on a seasonally adjusted and temperature corrected basis there was a fall of 6.1 per cent in nuclear consumption, a fall of 1.3 per cent from wind, hydro and solar pv, but a rise of 11 per cent in bioenergy & waste consumption.

Chart 1.4 Final energy consumption by user (Table 1.3a)



Total final energy consumption fell by 0.5 per cent between the second quarter of 2017 and the second quarter of 2018.

Domestic sector energy consumption fell by 4.4 per cent. Average temperatures in the second quarter of 2018 were 0.2 degree Celsius warmer than a year earlier, with only May being slightly colder than in 2017.

Service sector energy consumption fell by 2.3 per cent.

Industrial sector energy consumption rose by 1.2 per cent.

Transport sector energy consumption rose by 0.6 per cent.

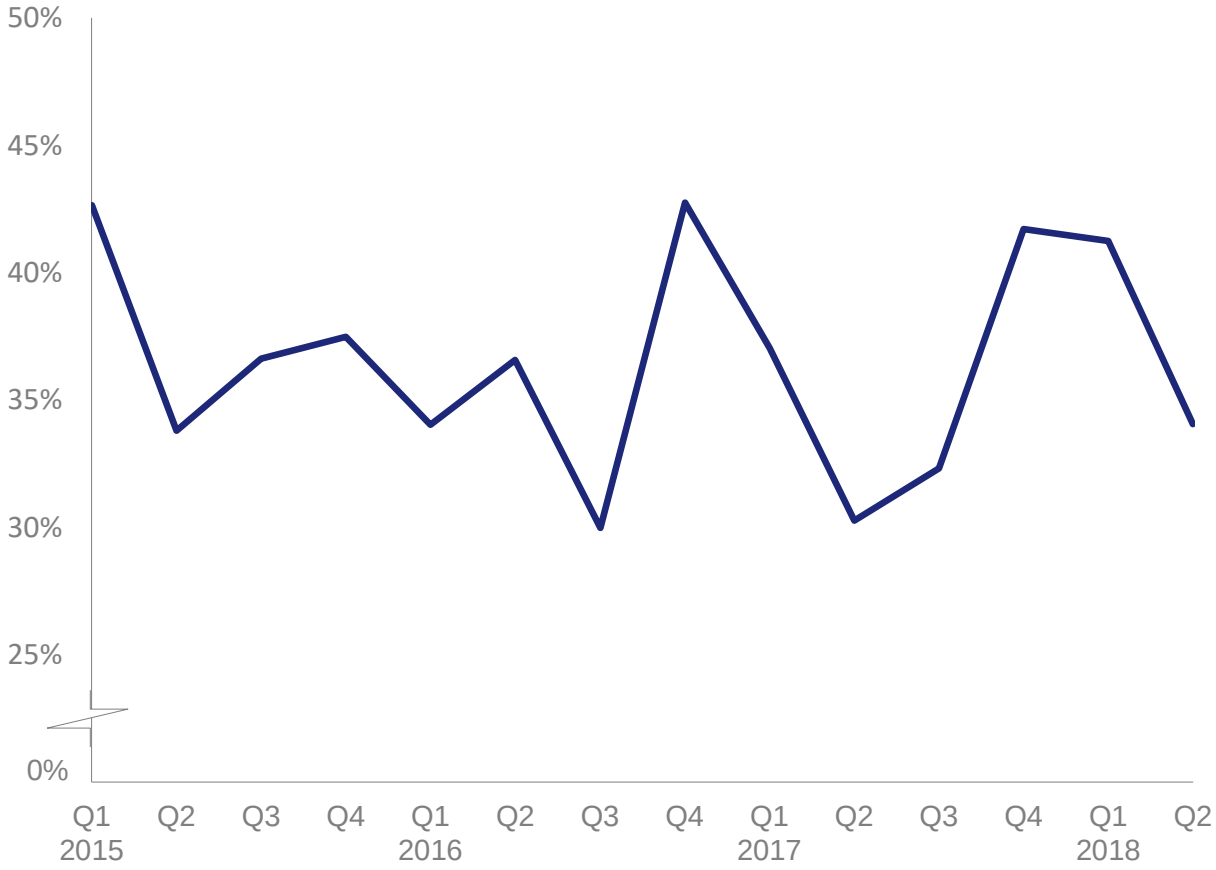
Chart 1.5 Seasonally adjusted and temperature corrected final energy consumption (Table 1.3c)

Total unadjusted final energy consumption (excluding non-energy use) fell by 0.8 per cent between the second quarter of 2017 and the second quarter of 2018.

On a seasonally and temperature adjusted basis final energy consumption (excluding non-energy use) rose by 0.3 per cent between the second quarter of 2017 and the second quarter of 2018.

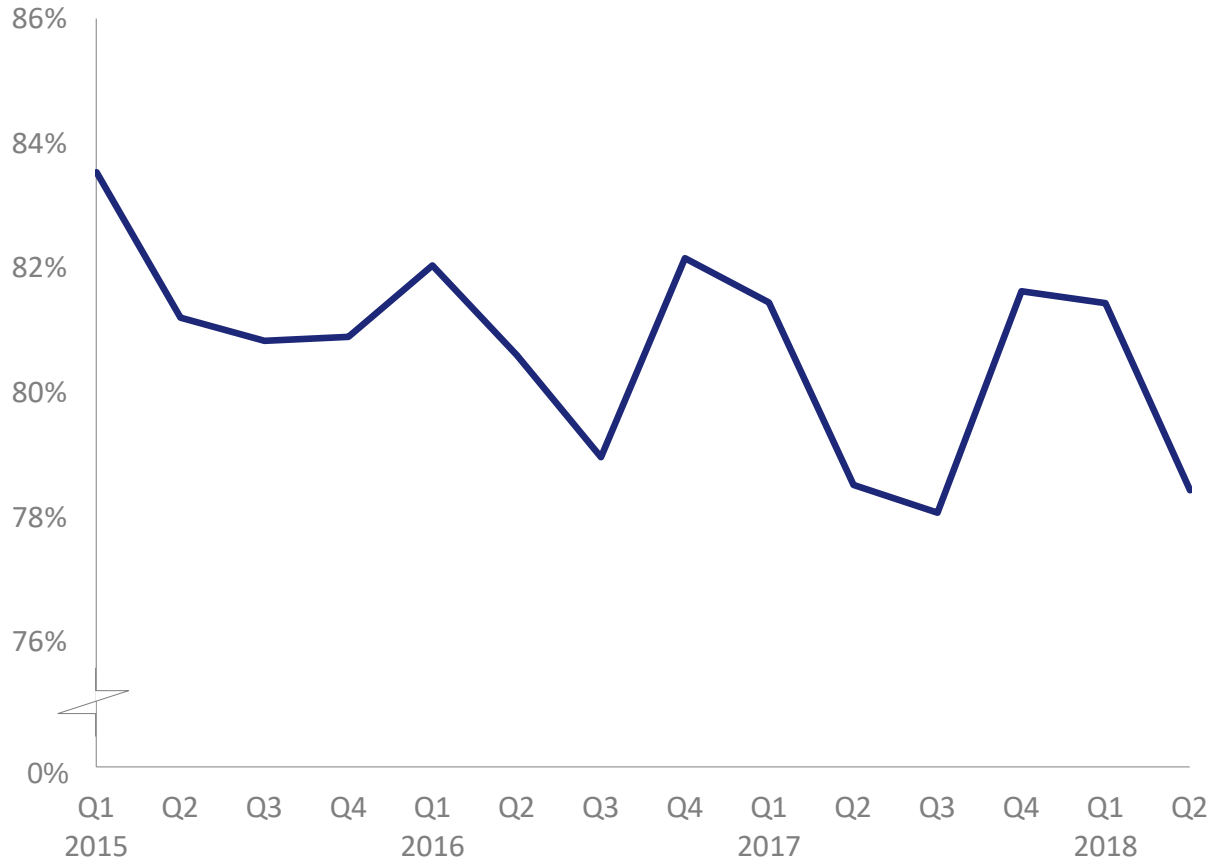
Unadjusted domestic consumption fell by 4.4 per cent over this same period, and was down 0.6 per cent on a seasonally and temperature adjusted basis.

Chart 1.6 Net import dependency (Table 1.3a)



In the second quarter of 2018 net import dependency was 34.1 per cent, down 7.2 percentage points from the first quarter of 2018, but up 3.8 percentage points from the second quarter of 2017, reflecting the falls in both exports and imports.

Chart 1.7 Fossil fuel dependency (Table 1.3a)



In the second quarter of 2018 fossil fuel dependency was 78.4 per cent, down 0.1 percentage points from the second quarter of 2017 and down 3.0 percentage points from the first quarter of 2018.

1 TOTAL ENERGY

TABLE 1.1. Indigenous production of primary fuels

Million tonnes of oil equivalent

							Primary electricity	
		Total	Coal[1]	Petroleum[2]	Natural gas[3]	Bioenergy & waste[4,5]	Nuclear	Wind, solar and hydro[6]
2013		113.9	8.0	44.5	35.3	7.7	15.4	3.02
2014		112.5	7.3	43.7	35.8	8.3	13.9	3.60
2015		124.5	5.4	49.5	38.8	10.6	15.5	4.65
2016		126.3	2.6	52.0	39.9	11.8	15.4	4.56
2017		126.7	1.9	50.9	40.0	12.9	15.1	5.80
Per cent change		*+0.4*	*-26.5*	*-1.9*	*+0.3*	*+9.4*	*-1.9*	*+27.1*
2017	Quarter 2	31.8	0.5	13.0	10.3	2.9	3.8	1.35
	Quarter 3	29.0	0.5	12.3	8.4	2.6	3.9	1.28
	Quarter 4	32.1	0.5	12.5	10.5	3.3	3.6	1.75
2018	Quarter 1	33.5r	0.4	13.4	10.3r	4.1r	3.6	1.79r
	Quarter 2 p	31.2r	0.4	13.0r	9.6r	3.1r	3.6	1.35r
Per cent change[7]		*-2.1*	*-1.1*	*+0.4*	*-6.7*	*+8.0*	*-6.7*	-

1. Includes an estimate of slurry.
2. Crude oil, offshore and land, plus condensates and petroleum gases derived at onshore treatment plants.
3. Includes colliery methane, excludes gas flared or re-injected.
4. Includes solid renewable sources (wood, straw and waste), a small amount of renewable primary heat sources (solar, geothermal etc), liquid biofuels and sewage gas and landfill gas.
5. Bioenergy & waste introduced as a separate category from March 2014 - see special feature article in the March 2014 edition of Energy Trends at: www.gov.uk/government/collections/energy-trends-articles
6. Includes solar PV and natural flow hydro.
7. Percentage change between the most recent quarter and the same quarter a year earlier.

1 TOTAL ENERGY

TABLE 1.2 Inland energy consumption: primary fuel input basis

Million tonnes of oil equivalent

							Primary electricity								Primary electricity	
		Total	Coal[1]	Petroleum[2]	Natural gas[3]	Bioenergy & waste[4, 5]	Nuclear	Wind, solar and hydro[6]	Net imports	Total	Coal	Petroleum	Natural gas	Bioenergy & waste	Nuclear	Wind, solar and hydro	Net imports
		Unadjusted[7]								*Seasonally adjusted and temperature corrected*[8,9] *(annualised rates)*							
2013		206.8	39.0	65.8	72.6	9.6	15.4	3.02	1.24	204.0	38.3	65.8	70.5	9.6	15.4	3.03	1.24
2014		194.0	31.5	66.0	66.1	11.2	13.9	3.60	1.76	199.2	33.0	66.0	69.8	11.2	13.9	3.60	1.76
2015		196.5	25.1	67.4	68.1	13.9	15.5	4.65	1.81	199.2	25.7	67.4	70.2	13.9	15.5	4.65	1.81
2016		194.5	12.4	68.6	76.8	15.2	15.4	4.56	1.53	195.7	12.7	68.6	77.8	15.2	15.4	4.56	1.53
2017		192.1	10.1	68.9	75.0	16.0	15.1	5.80	1.27	195.2	10.5	68.9	77.7	16.0	15.1	5.80	1.27
Per cent change		*-1.2*	*-18.7*	*+0.5*	*-2.4*	*+4.9*	*-1.9*	*+27.1*	*-16.8*	*-0.3*	*-17.3*	*+0.5*	*-0.1*	*+5.0*	*-1.9*	*+27.1*	*-16.8*
2017	Quarter 2	43.0	1.5	17.2	15.0	3.6	3.8	1.35	0.45	193.3	9.3	68.9	75.6	16.0	15.6	6.11	1.81
	Quarter 3	40.3	1.6	17.5	12.3	3.2	3.9	1.28	0.46	195.0	9.4	70.1	76.8	15.4	15.6	5.97	1.82
	Quarter 4	53.4	3.3	17.6	22.7	4.3	3.6	1.75	0.14	197.1	10.8	70.3	79.1	16.0	14.1	6.17	0.55
2018	Quarter 1	57.2r	3.3r	16.4r	26.8r	4.8r	3.6	1.79r	0.46	191.5r	9.9r	65.8r	76.8r	16.5	14.3	6.32r	1.85
	Quarter 2 p	42.4r	1.4r	17.3r	14.6r	3.8r	3.6	1.35r	0.45	191.2r	8.0r	69.3r	73.6r	17.8	14.7	6.03r	1.78
Per cent change[10]		*-1.3*	*-10.0*	*+0.5*	*-2.8*	*+5.0*	*-6.7*	*-*	*-1.3*	*-1.1*	*-13.3*	*+0.5*	*-2.6*	*+11.2*	*-6.1*	*-1.3*	*-1.3*

1. Includes net foreign trade and stock changes in other solid fuels.
2. Inland deliveries for energy use, plus refinery fuel and losses, minus the differences between deliveries and actual consumption at power stations.
3. Includes gas used during production and colliery methane. Excludes gas flared or re-injected and non-energy use of gas.
4. Includes solid renewable sources (wood, straw and waste), a small amount of renewable primary heat sources (solar, geothermal, etc.), liquid biofuels, landfill gas and sewage gas.
5. Bioenergy & waste introduced as a separate category from March 2014 - see special feature article in the March 2014 edition of Energy Trends at:
www.gov.uk/government/collections/energy-trends-articles
6. Includes natural flow hydro, but excludes generation from pumped storage stations.
7. Not seasonally adjusted or temperature corrected.
8. Coal and natural gas are temperature corrected; petroleum, bioenergy and waste, and primary electricity are not temperature corrected.
9. For details of temperature correction see the June and September 2011 editions of Energy Trends; Seasonal and temperature adjustment factors were reassessed in June 2013
www.gov.uk/government/collections/energy-trends
10. Percentage change between the most recent quarter and the same quarter a year earlier.

1 TOTAL ENERGY

Table 1.3a Supply and use of fuels

Thousand tonnes of oil equivalent

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change*[1]
SUPPLY													
Indigenous production	126,256	126,745	*+0.4*	30,847	29,767	32,074	33,841	31,842	28,981	32,081	33,508r	31,170	*-2.1*
Imports	150,078	151,891	*+1.2*	35,370	33,239	41,752	40,006	34,585	35,504	41,796	41,831r	33,357	*-3.5*
Exports	-75,774	-79,323	*+4.7*	-18,178	-20,474	-17,608	-18,520	-20,784	-21,573	-18,446	-17,232r	-17,982	*-13.5*
Marine bunkers	-2,840	-2,596	*-8.6*	-777	-816	-674	-545	-639	-779	-633	-552	-660	*+3.3*
Stock change[2]	+4,837	+3,373	*-30.3*	-1,040	+26	+242	+2,689	-53	+184	+553	+1,537r	-1,400	*(+)*
Primary supply	202,557	200,090	*-1.2*	46,222	41,743	55,785	57,471	44,951	42,317	55,351	59,091r	44,485	*-1.0*
Statistical difference[3]	-127	161		-19	-67	-25	105	-21	-26	104	97r	25	
Primary demand	202,684	199,929	*-1.4*	46,241	41,810	55,811	57,367	44,971	42,343	55,247	58,994r	44,460	*-1.1*
Transfers[4]	-14	4		-1	-2	-7	-9	35	-26	4	-8r	35	
TRANSFORMATION	-37,423	-35,779	*-4.4*	-8,516	-8,203	-10,153	-10,247	-8,086	-7,971	-9,476	-9,524r	-7,878	*-2.6*
Electricity generation	-34,219	-32,645	*-4.6*	-7,737	-7,484	-9,310	-9,335	-7,331	-7,320	-8,659	-8,700r	-7,185	*-2.0*
Heat generation	-1,218	-1,252	*+2.8*	-273	-227	-342	-382	-273	-243	-354	-382	-273	*+0.0*
Petroleum refineries	-103	-104	*+0.7*	-39	-18	-20	-59	-12	-7	-26	-1	-10	*-21.0*
Coke manufacture	-81	-84	*+3.8*	-20	-21	-20	-23	-20	-21	-21	-18	-22	*+8.5*
Blast furnaces	-1,692	-1,585	*-6.3*	-425	-432	-428	-418	-419	-363	-385	-392	-359	*-14.5*
Patent fuel manufacture	-64	-69	*+8.3*	-11	-10	-22	-19	-20	-9	-22	-21	-19	*-2.7*
Other[5]	-46	-40	*-11.9*	-11	-11	-11	-11	-11	-9	-9	-10	-11	*-1.1*
Energy industry use	12,058	12,040	*-0.1*	2,969	2,968	2,971	3,088	3,011	2,947	2,994	2,917r	2,860	*-5.0*
Losses	2,954	2,973	*+0.6*	693	615	733	940	659	644	729	965r	667	*+1.1*
FINAL CONSUMPTION	150,235	149,141	*-0.7*	34,056	30,007	41,953	43,083	33,249	30,754	42,055	45,580r	33,090	*-0.5*
Iron & steel	939	885	*-5.8*	233	230	232	244	222	211	209	222r	210	*-5.7*
Other industries	22,760	23,188	*+1.9*	4,994	4,733	6,152	6,873	5,055	4,846	6,413	6,968r	5,132	*+1.5*
Transport	55,994	56,470	*+0.9*	14,218	14,612	14,078	13,142	14,497	14,691	14,140	13,029r	14,582	*+0.6*
Domestic	41,661	40,116	*-3.7*	7,917	4,510	13,318	14,956	7,117	4,899	13,144	17,005r	6,801	*-4.4*
Other Final Users	20,819	20,518	*-1.5*	4,642	3,845	6,235	5,863	4,386	4,061	6,207	6,421r	4,287	*-2.3*
Non energy use	8,061	7,964	*-1.2*	2,051	2,077	1,939	2,006	1,970	2,046	1,942	1,935r	2,078	*+5.5*
DEPENDENCY[6]													
Net import dependency	36.2%	35.8%		36.6%	30.0%	42.8%	37.0%	30.3%	32.3%	41.7%	41.2%r	34.1%	
Fossil fuel dependency	81.1%	80.1%		80.6%	79.0%	82.2%	81.5%	78.5%	78.1%	81.6%	81.4%r	78.4%	
Low carbon share	17.4%	18.5%		17.6%	19.2%	17.0%	17.5%	19.6%	19.9%	17.5%	17.2%r	19.7%	

1. Percentage change between the most recent quarter and the same quarter a year earlier; (+) represents a positive percentage change greater than 100%.
2. Stock change + = stock draw, - = stock build.
3. Primary supply minus primary demand.
4. Annual transfers should ideally be zero. For manufactured fuels differences occur in the rescreening of coke to breeze.
   For oil and petroleum products differences arise due to small variations in the calorific values used.
5. Back-flows from the petrochemical industry - see article in the June 2016 edition of Energy Trends.
6. See article in the December 2010 edition of Energy Trends.

1 TOTAL ENERGY

Table 1.3b Supply and use of fuels

Thousand tonnes of oil equivalent

	2017 Quarter 2									2018 Quarter 2 p								
	Coal	Manufactured fuels[4]	Primary oil	Petroleum Products	Natural gas[5]	Bioenergy & waste[6]	Primary electricity	Electricity	Heat sold	Coal	Manufactured fuels[4]	Primary oil	Petroleum Products	Natural gas[5]	Bioenergy & waste[6]	Primary electricity	Electricity	Heat sold
SUPPLY																		
Indigenous production	450	-	12,997	-	10,337	2,870	5,188	-	-	445	-	13,049	-	9,648	3,100	4,928	-	-
Imports	1,185	166	15,048	8,703	8,168	844	-	471	-	1,066	214	13,382	10,196	7,294	733	-	471	-
Exports	-75	0	-10,707	-6,355	-3,506	-122	-	-19	-	-83	-1	-9,852	-6,179	-1,778	-63	-	-26	-
Marine bunkers	-	-	-	-639	-	-	-	-	-	-	-	-	-660	-	-	-	-	-
Stock change[1]	-184	+12	-102	+139	+81	-	-	-	-	-228	-13	-841	+180	-497	-	-	-	-
Primary supply	1,377	177	17,236	1,848	15,080	3,593	5,188	451	-	1,200	200	15,738	3,537	14,667	3,771	4,928	446	-
Statistical difference[2]	-26	+0	-11	-31	+64	+0	-	-17	-	-9	-1	+1	-8	+63	-	-	-22	-
Primary demand	1,403	177	17,248	1,879	15,016	3,593	5,188	468	-	1,209	200	15,737	3,545	14,604	3,771	4,928	468	-
Transfers[3]	-	1	-676	+711	+54	-56	-1,354	+1,354	-	-	+1	-381	+413	64	-63	-1,352	+1,352	-
TRANSFORMATION	-1,068	87	-16,572	16,399	-6,310	-2,349	-3,834	5,214	347	-896	59	-15,356	15,180	-6,282	-2,528	-3,576	5,173	347
Electricity generation	-407	-130	-	-121	-5,742	-2,311	-3,834	5,214	-	-328	-124	-	-127	-5,714	-2,489	-3,576	5,173	-
Heat generation	-1	0	-	-13	-568	-39	-	-	347	-1	0	-	-13	-568	-39	-	-	347
Petroleum refineries	-	-	-16,685	16,673	-	-	-	-	-	-	-	-15,468	15,458	-	-	-	-	-
Coke manufacture	-357	337	-	-	-	-	-	-	-	-314	292	-	-	-	-	-	-	-
Blast furnaces	-269	-150	-	-	-	-	-	-	-	-221	-137	-	-	-	-	-	-	-
Patent fuel manufacture	-34	30	-	-16	-	-	-	-	-	-32	28	-	-15	-	-	-	-	-
Other[7]	-	-	113	-124	-	-	-	-	-	-	-	112	-122	-	-	-	-	-
Energy industry use	-	116	-	1,087	1,237	-	-	490	81	-	107	-	1,013	1,163	-	-	496	81
Losses	-	26	-	-	126	-	-	508	-	-	35	-	-	114	-	-	517	-
FINAL CONSUMPTION	335	124	-	17,901	7,397	1,187	-	6,038	266	313	118	-	18,125	7,109	1,180	-	5,979	266
Iron & steel	6	72	-	2	85	-	-	58	-	5	68	-	0	80	-	-	57	-
Other industries	237	-	-	984	1,592	225	-	1,845	173	230	-	-	1,017	1,612	227	-	1,874	173
Transport	3	-	-	14,110	-	282	-	103	-	3	-	-	14,149	-	328	-	103	-
Domestic	83	40	-	452	4,095	396	-	2,011	42	70	37	-	498	3,820	382	-	1,952	42
Other final users	6	-	-	503	1,519	285	-	2,022	51	6	-	-	502	1,491	244	-	1,994	51
Non energy use	-	13	-	1,851	107	-	-	-	-	-	12	-	1,959	107	-	-	-	-

1. Stock fall +, stock rise -.
2. Primary supply minus primary demand.
3. Annual transfers should ideally be zero. For manufactured fuels differences occur in the rescreening of coke to breeze. For oil and petroleum products differences arise due to small variations in the calorific values used.
4. Includes all manufactured solid fuels, benzole, tars, coke oven gas and blast furnace gas.
5. Inludes colliery methane.
6. Includes geothermal, solar heat and biofuels for transport; wind and wave electricity included in primary electricity figures.
7. Back-flows from the petrochemical industry - see article in the June 2016 edition of Energy Trends.

1 Total Energy

Table 1.3c Seasonally adjusted and temperature corrected final energy consumption data[1]

Thousand tonnes of oil equivalent

	2016	2017	per cent change	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	per cent change[2]
By consuming sector													
Final Consumption (unadjusted)													
Industry	23,700	24,071	+1.6	5,227	4,963	6,383	7,116	5,277	5,057	6,621	7,189r	5,342	+1.2
Transport	55,994	56,470	+0.9	14,218	14,612	14,078	13,142	14,497	14,691	14,140	13,029r	14,582	+0.6
Domestic	41,661	40,116	-3.7	7,917	4,510	13,318	14,956	7,117	4,899	13,144	17,005r	6,801	-4.4
Other final users	20,819	20,518	-1.5	4,642	3,845	6,235	5,859	4,386	4,061	6,211	6,421r	4,287	-2.3
Total	142,174	141,175	-0.7	32,005	27,930	40,014	41,073	31,278	28,707	40,117	43,645r	31,012	-0.8
Final Consumption (Seasonally and temperature adjusted) [3]													
Industry	23,865	24,374r	+2.1	5,944	5,884	5,942	6,102r	6,072r	6,010r	6,189r	6,037r	6,171	+1.6
Transport	55,895	56,296r	+0.7	13,930	13,961	14,083	13,893r	14,184r	14,097r	14,122r	14,178r	14,240	+0.4
Domestic	43,202	43,335r	+0.3	10,925	10,570	10,730	10,756r	10,794r	10,970r	10,814r	10,663r	10,733	-0.6
Other final users	21,365	21,448r	+0.4	5,321	5,360	5,364	5,302r	5,278r	5,485r	5,382r	5,289r	5,284	+0.1
Total	144,327	145,453r	+0.8	36,120	35,775	36,120	36,053r	36,329r	36,563r	36,508r	36,167r	36,428	+0.3
By fuel													
Final Consumption (unadjusted)													
Gas	43,402	42,173	-2.8	8,172	4,438	14,041	15,827	7,291	5,071	13,985	17,981r	7,002	-4.0
Electricity	26,122	25,852	-1.0	6,112	5,970	6,944	6,941	6,038	5,958	6,915	7,090r	5,979	-1.0
Other	72,651	73,150	+0.7	17,721	17,521	19,029	18,306	17,949	17,679	19,217	18,574r	18,030	+0.5
Total	142,174	141,175	-0.7	32,005	27,930	40,014	41,073	31,278	28,707	40,117	43,645r	31,012	-0.8
Final Consumption (Seasonally and temperature adjusted) [3]													
Gas	45,107	45,639r	+1.2	11,379	11,004	11,256	11,262r	11,272r	11,684r	11,421r	11,254r	11,311	+0.3
Electricity	26,315	26,165r	-0.6	6,574	6,605	6,533	6,533r	6,550r	6,521r	6,561r	6,482r	6,508	-0.6
Other	72,905	73,649r	+1.0	18,167	18,166	18,331	18,259r	18,506r	18,358r	18,526r	18,432r	18,609	+0.6
Total	144,327	145,453r	+0.8	36,120	35,775	36,120	36,053r	36,329r	36,563r	36,508r	36,167r	36,428	+0.3

1. For methodology see articles in Energy Trends (June 2011 and September 2011 editions)
2. Percentage change between the most recent quarter and the same quarter a year earlier.
3. Seasonally and temperature adjusted series revised back to 2017 Q1 in September 2018.

Section 2 – Solid Fuels and Derived Gases

Key results show:

Overall coal production in the second quarter of 2018 fell to 0.7 million tonnes, down 1.9 per cent compared with the second quarter of 2017. Surface mining production fell to 690 thousand tonnes as less coal was used for electricity generation. Some mines are not producing as they are restoring or under care and maintenance which also contributed to lower production. **(Chart 2.1)**

Coal imports fell 7.3 per cent on levels shown in the second quarter of 2017 **(Charts 2.1 and 2.2)**

The demand for coal by electricity generators in the second quarter of 2018 fell to a new record low of 0.5 million tonnes and was 18 per cent lower than demand in the second quarter of 2017. The decline was mainly due to lower demand for electricity as temperatures were higher. There was also an increase in the use of both gas and renewables for electricity generation. In June 2018 coal-fired generation was at a record low. **(Chart 2.3)**

Total stock levels were down 31 per cent (-2.0 million tonnes) to 4.5 million tonnes compared to a year earlier. This was mainly due to closing power stations using up their stocks. **(Chart 2.4)**

Relevant tables

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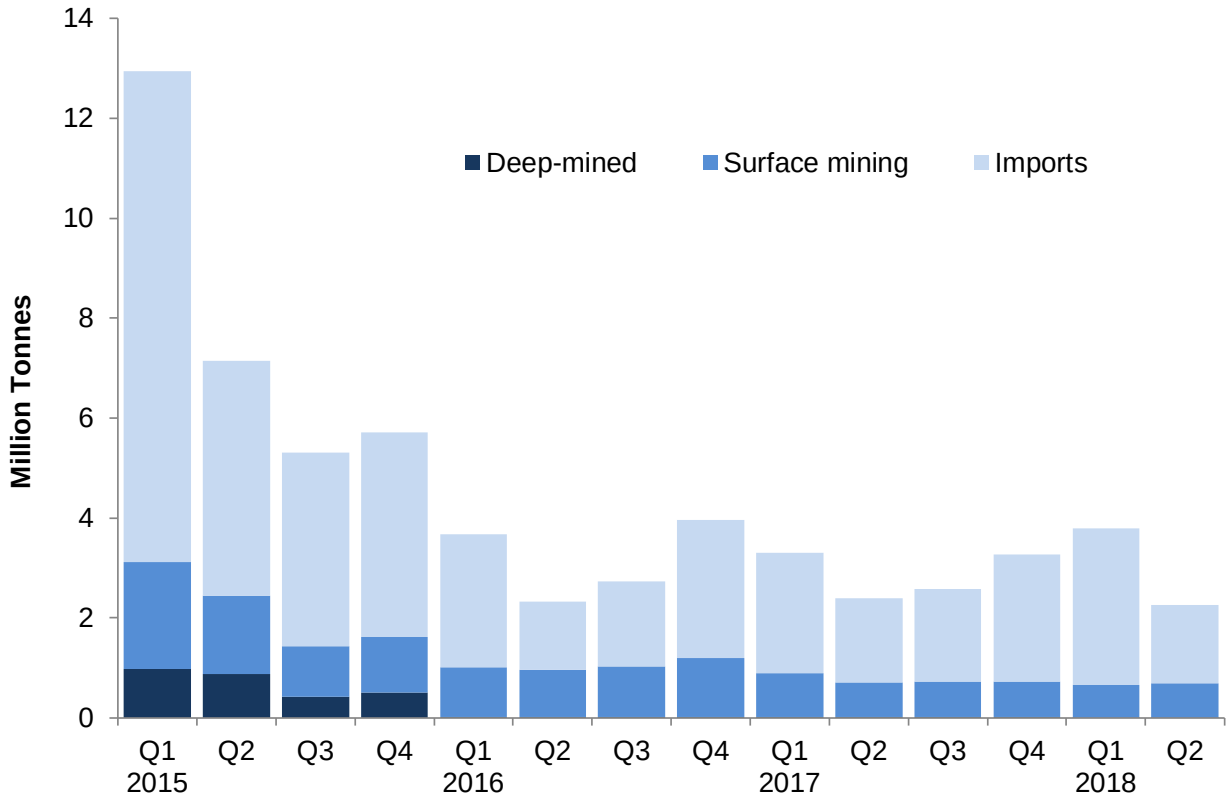
Chart 2.1 Coal supply (Table 2.1)



Coal production in the second quarter of 2018 fell to 0.7 million tonnes, 1.9 per cent down compared to the second quarter of 2017. The bulk of this decrease came from the contraction in surface mine output as deep mine production is now under 1 per cent of production with only seven small deep mines remaining. The falls were due to decreased demand, particularly for electricity generation, as well as some mines not producing as they are restoring or under care and maintenance which also contributed to lower production.

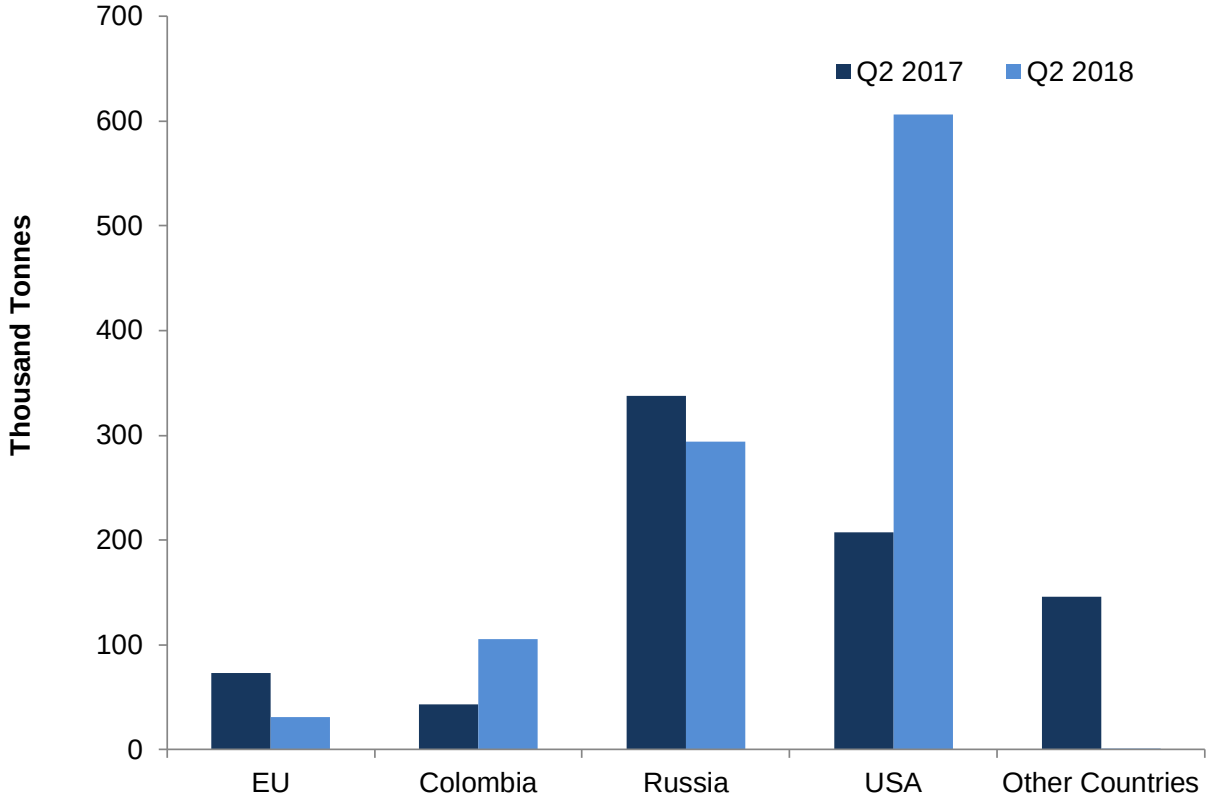
Table 2A Coal imports by origin

Thousand Tonnes

	2016	2017	2017 Q2	2018 Q2p
European Union	439	356	88	40
Russia	2,292	3,883	669	567
Colombia	2,667	731	44	105
USA	1,420	2,352	482	730
Australia	778	749	203	98
Other Countries	898	427	196	19
Total Imports	**8,494**	**8,498**	**1,681**	**1,559**

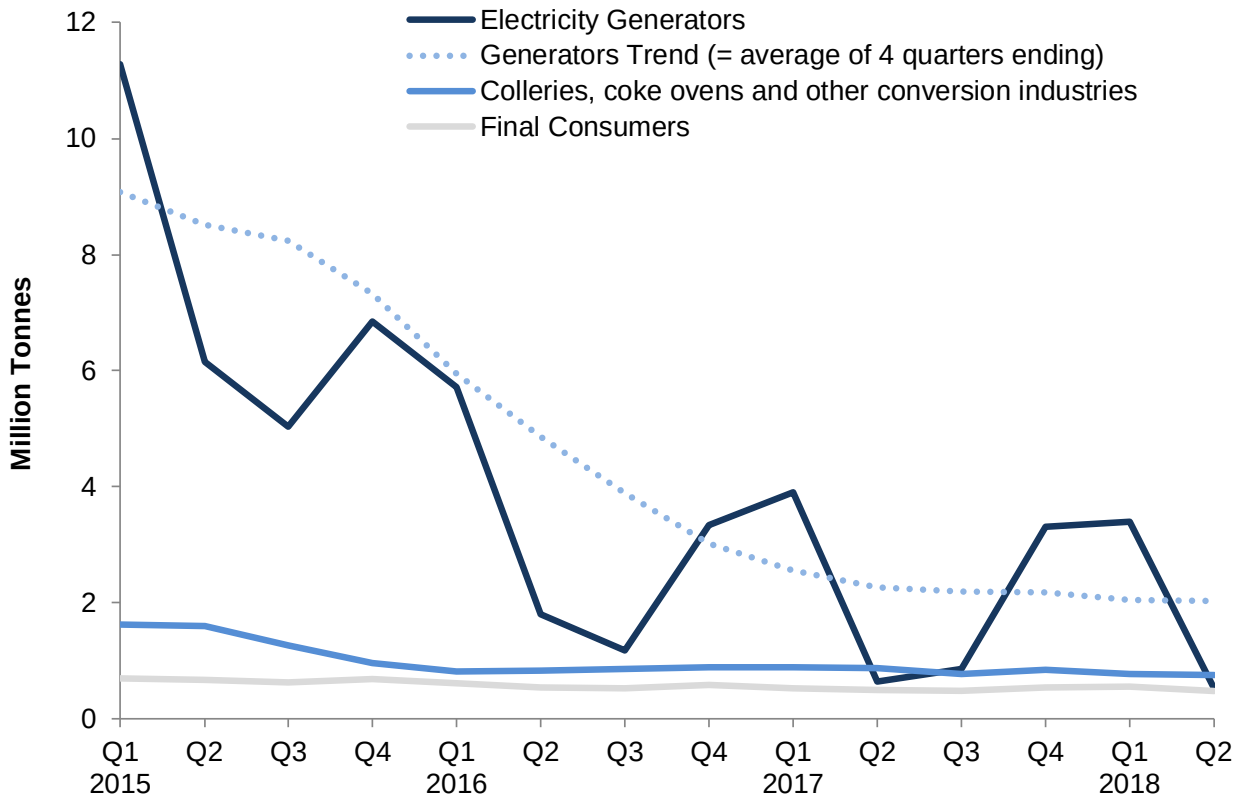
Imports of coal in the second quarter of 2018 were 7.3 per cent lower than in the second quarter of 2017 at 1.6 million tonnes.

Chart 2.2 Steam coal imports (Table 2.4)



In the second quarter of 2018, total coal imports decreased by 7.3 per cent to 1.6 million tonnes. The USA (47 per cent), Russia (36 per cent) and Colombia (7 per cent) accounted for 90 per cent of total coal imports. Steam coal imports in the second quarter of 2018 rose by 28 per cent to 1.0 million tonnes. Steam coal imports accounted for 66 per cent of total coal imports. Coking coal imports in the second quarter of 2018 fell by 40 per cent to 0.5 million tonnes and accounted for 32 per cent of total coal imports.

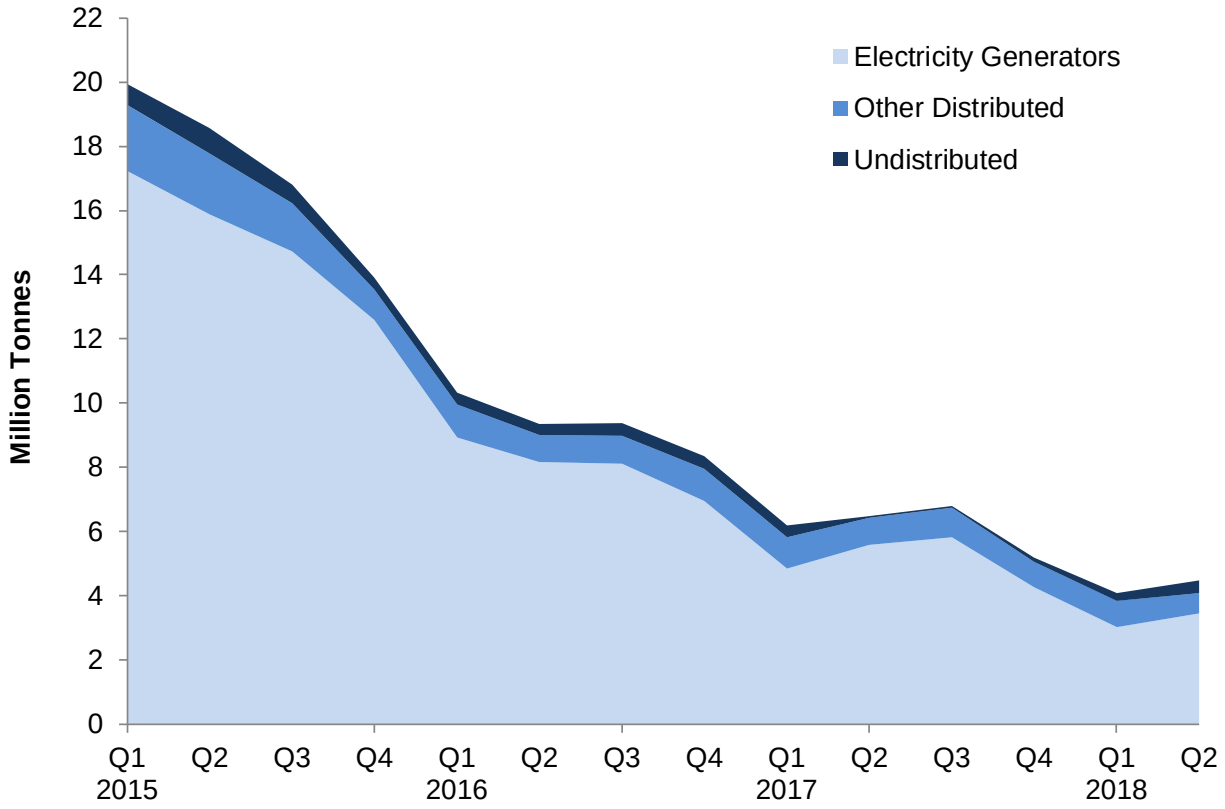
Chart 2.3 Coal consumption (Table 2.1)



Total demand for coal in the second quarter of 2018, at 1.7 million tonnes, was 13 per cent lower than in the second quarter of 2017. Consumption by electricity generators was down by 18 per cent to a record low of 0.5 million tonnes. Electricity generators accounted for 30 per cent of total coal use in the second quarter of 2018 compared with 32 per cent a year earlier. The decline was mainly due to lower demand for electricity as temperatures were higher. There was also an increase in the use of both renewables and gas for electricity generation.

In the second quarter of 2018, sales to industrial users fell by 0.8 per cent to 0.4 million tonnes whilst sales to other final consumers (including domestic) decreased by 9.0 per cent to 0.1 million tonnes. Coal used in blast furnaces was down 18 per cent compared to the second quarter of 2017, to 0.3 million tonnes.

Chart 2.4 Coal stocks (Table 2.1)



Coal stocks rose seasonally by 0.4 million tonnes from the first quarter of 2018 and at the end of June stood at 4.5 million tonnes. This was 2.0 million tonnes lower than at the end of June 2017.

The level of coal stocks at power stations at the end of the second quarter of 2018 was 3.5 million tonnes, 2.1 million tonnes lower than at the end of June 2017. This was mainly due to closing power stations using up their stocks.

Stocks held by coke ovens were 0.4 million tonnes at the end of the second quarter of 2018, this was 120 thousand tonnes lower than stock levels at the end of June 2017.

Stocks held by producers (undistributed stocks) at the end of the second quarter of 2018 were 0.4 million tonnes.

2 SOLID FUEL AND DERIVED GASES

Table 2.1 Supply and consumption of coal

Thousand tonnes

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change* [1]
SUPPLY													
Indigenous production	4,178	3,041	*-27.2*	962	1,027	1,188	888	708	721	724	649	694	*-1.9*
Deep mined	22	20	*-7.8*	6	5	5	5	5	5	5	4	4	*-18.2*
Surface mining[2]	4,156	3,021	*-27.3*	957	1,022	1,183	883	702	716	720	645	690	*-1.8*
Imports[4]	8,494	8,498	-	1,356	1,694	2,768	2,412	1,681	1,862	2,542	3,146r	1,559	*-7.3*
Exports[5]	443	495	*+11.6*	76	137	128	120	100	142	133	144	111	*+10.9*
Stock change[6]	+5,547	+3,159	*-43.1*	+952	-7	+1,012	+2,170	-281	-315	+1,585	+1,088r	-381	*+35.6*
Total supply	17,775	14,203	*-20.1*	3,194	2,578	4,839	5,350	2,008	2,126	4,718	4,739r	1,761	*-12.3*
Statistical difference	+30	+19		+4	+1	+11	+14	+4	+0	+1	+1r	+7	
Total demand	17,745	14,183	*-20.1*	3,190	2,577	4,828	5,336	2,004	2,126	4,717	4,738r	1,754	*-12.5*
TRANSFORMATION	15,468	12,126	*-21.6*	2,643	2,052	4,237	4,802	1,512	1,645	4,168	4,182r	1,275	*-15.6*
Electricity generation	12,056	8,724	*-27.6*	1,808	1,186	3,341	3,907	638	864	3,315	3,402r	525	*-17.7*
Heat generation[7]	6	6	-	1	1	2	2	1	1	2	2	1	-
Coke manufacture	1,821	1,888	*+3.7*	438	464	475	482	469	474	462	430	413	*-12.0*
Blast furnaces	1,364	1,301	*-4.6*	345	346	357	350	354	270	326	284	291	*-17.9*
Patent fuel manufacture	223	207	*-7.1*	51	55	62	59	48	36	63	65	45	*-7.9*
Energy industry use	-	-		-	-	-	-	-	-	-	-	-	
FINAL CONSUMPTION	2,277	2,057	*-9.6*	547	525	592	535	493	481	549	556r	478	*-2.9*
Iron & steel	35	33	*-5.7*	10	7	7	9	9	8	7	6r	7	*-24.4*
Other industries	1,632	1,436	*-12.0*	400	404	397	356	359	357	364	370r	358	*-0.2*
Domestic	550	535	*-2.6*	123	101	171	156	113	103	164	165r	101	*-10.3*
Other final users	60	53	*-10.9*	14	13	18	14	12	13	14	15r	13	*+2.7*
Stocks at end of period													
Distributed stocks	7,953	5,067	*-36.3*	9,018	8,976	7,953	5,834	6,431	6,755	5,067	3,836r	4,073	*-36.7*
Of which:													
Major power producers[8]	6,962	4,257	*-38.8*	8,163	8,125	6,962	4,838	5,589	5,834	4,257	3,029r	3,464	*-38.0*
Coke ovens	611	331	*-45.9*	494	328	611	451	470	460	331	525r	350	*-25.5*
Undistributed stocks	406	134	*-67.1*	345	395	406	355	39	31	134	258r	403	*(+)*
Total stocks[9]	8,359	5,200	*-37.8*	9,364	9,370	8,359	6,189	6,470	6,785	5,200	4,095r	4,476	*-30.8*

1. Percentage change between the most recent quarter and the same quarter a year earlier.

2. The term 'surface mining' has now replaced opencast production. Opencast production is a surface mining technique.

3. Not produced since 2013 as the only mine producing slurry has ceased trading

4. For a detailed breakdown of UK Imports by country and grade of coal refer to Table 2.4 Coal imports (internet table only).

5. Trade is counted as an export under three conditions, when it is recorded as an import and is subsequently exported; it enters the UK port with the intention of being imported but due to a change of ownership at the port it is exported without having cleared the port; and when items leave the warehouse and are exported. Trade is not classified as exports when it is resting at a UK port and the UK is not the intended final destination.

6. Stock change + = stock draw, - = stock build.

7. Heat generation is based on an annual figure and is then split over a quarterly period. The 2018 heat generation figures currently shown are the 2017 figures carried forward - these will be updated in June 2019.

8. This includes stocks held at ports.

9. For some quarters, closing stocks may not be consistent with stock changes, due to additional stock adjustments

2 SOLID FUEL AND DERIVED GASES

Table 2.2 Supply and consumption of coke oven coke, coke breeze and other manufactured solid fuels

Thousand tonnes

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change*[3]
SUPPLY													
Indigenous production	1,593	1,580	*-0.8*	385	409	424	408	384	395	393	377	324	*-15.5*
Coke Oven Coke	1,332	1,361	*+2.2*	319	344	348	346	337	343	334	313	280	*-16.8*
Coke Breeze	16	18	*+11.8*	4	4	4	4	4	5	4	4	5	*+17.4*
Other MSF	245	201	*-17.9*	61	61	71	57	42	47	55	60	39	*-8.3*
Imports	1,251	1,000	*-20.0*	284	284	397	187	233	264	316	278	301	*+29.3*
Exports	22	20	*-12.3*	4	6	6	7	1	4	8	2	2	*(+)*
Stock change[1]	-126	-3	*-97.7*	+21	-15	-130	+65	+17	-25	-60	+19	-19	
Transfers	-4	-4		-1	-0	-2	-1	-1	-1	-1	-1	-2	
Total supply	2,691	2,554	*-5.1*	685	671	682	652	632	628	642	671	603	*-4.6*
Statistical difference	0	-1		-	0	-0	-0	-	-0	-0	-0	-	
Total demand	2,691	2,554	*-5.1*	685	671	682	652	632	628	642	671	603	*-4.6*
TRANSFORMATION	2,140	2,017	*-5.8*	548	533	535	508	507	502	499	537	482	*-4.8*
Coke manufacture	-	-		-	-	-	-	-	-	-	-	-	
Blast furnaces	2,140	2,017	*-5.8*	548	533	535	508	507	502	499	537	482	*-4.8*
Energy industry use	-	-		-	-	-	-	-	-	-	-	-	
FINAL CONSUMPTION	551	538	*-2.5*	137	138	146	144	126	125	143	134r	121	*-3.7*
Iron & steel	316	296	*-6.5*	79	84	78	76	70	74	76	61	69	*-1.9*
Other industries	-	-		-	-	-	0	0	0	-0	0	0	
Domestic	236	242	*+2.9*	58	55	68	68	56	51	67	73r	52	*-5.9*
Stocks at end of period[2]	1,249	1,252	*+0.2*	1,108	1,142	1,249	1,185	1,167	1,197	1,252	1,233	1,316	*+12.8*

1. Stock change + = stock draw, - = stock build.
2. For some quarters, closing stocks may not be consistent with stock changes, due to additional stock adjustments
3. Percentage change between the most recent quarter and the same quarter a year earlier; (+) represents a positive percentage change greater than 100%.

2 SOLID FUEL AND DERIVED GASES

Table 2.3 Supply and consumption of coke oven gas, blast furnace gas, benzole and tars

GWh

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change* [1]
SUPPLY													
Indigenous production	14,089	14,064	*-0.2*	3,603	3,424	3,656	3,541	3,543	3,403	3,577	3,370	3,429	*-3.2*
Coke oven gas	3,468	3,745	*+8.0*	836	855	907	960	946	949	891	838	893	*-5.6*
Blast furnace gas	10,090	9,763	*-3.2*	2,645	2,439	2,603	2,444	2,451	2,332	2,536	2,396	2,394	*-2.3*
Benzole & tars	531	556	*+4.7*	123	129	145	138	146	122	150	136	142	*-2.6*
Transfers	344	148	*-56.9*	106	64	47	56	24	29	39	66	28	*+13.1*
Total supply	14,433	14,213	*-1.5*	3,709	3,487	3,703	3,597	3,568	3,431	3,616	3,436	3,457	*-3.1*
Statistical difference	+8	+21		+12	+7	-8	+5	+0	+8	+7	-9	-6	
Total demand	14,425	14,192	*-1.6*	3,697	3,480	3,711	3,592	3,567	3,423	3,609	3,445	3,463	*-2.9*
TRANSFORMATION	6,291	6,043	*-3.9*	1,536	1,507	1,725	1,586	1,519	1,427	1,511	1,704	1,441	*-5.1*
Electricity generation	6,278	6,029	*-4.0*	1,533	1,504	1,721	1,582	1,516	1,424	1,507	1,701	1,437	*-5.2*
Heat generation[2]	13	13	-	3	3	3	3	3	3	3	3	3	-
Energy industry use	5,446	5,324	*-2.2*	1,415	1,270	1,386	1,350	1,345	1,293	1,337	1,148	1,248	*-7.2*
Losses	1,116	1,272	*+14.0*	337	318	213	272	301	332	367	213	406	*+34.6*
FINAL CONSUMPTION	1,572	1,552	*-1.3*	409	385	388	384	402	370	395	379	369	*-8.4*
Iron & steel	1,041	996	-4	286	256	242	247	256	249	245	243	226	*-11.6*
Other industries[3]	-	-		-	-	-	-	-	-	-	-	-	
Non-Energy Use[4]	531	556	*+4.7*	123	129	145	138	146	122	150	136	142	*-2.6*

1. Percentage change between the most recent quarter and the same quarter a year earlier; (+) represents a positive percentage change greater than 100%.

2. Heat generation is based on an annual figure and is then split over a quarterly period. The 2018 heat generation figures currently shown are the 2017 figures carried forward - these will be updated in June 201

3. The main industrial consumer of derived gases Monckton coke-works (also a producer of them) closed in December 2014.

4. From 2009, unclassified final consumption for benzole and tars has been recorded under non energy use

Section 3 – Oil and Oil Products

Key results show:

Total indigenous UK production of crude oil and Natural Gas Liquids (NGL) in Q2 2018 was relatively stable on last year (up 0.4 per cent), with a 0.9 per cent increase in crude oil production and a 5.6 per cent decrease in NGLs. **(Chart 3.1)**

Net imports of primary oils (crude oil, NGLs and process oils) in Q2 2018 decreased to 3.2 million tonnes, down by nearly a fifth on last year. These met about 23 per cent of UK's refinery demand, which was relatively low in the early part of 2018 because of extensive planned maintenance. **(Chart 3.3)**

Indigenous production of petroleum products was down 7.3 per cent on last year because of the refinery maintenance during this period. Imports increased by 17 per cent to meet demand, particularly for transport fuels. Exports remained relatively stable on last year, down 2.8 per cent. (**Chart 3.2**)

The UK was a net importer of petroleum products in Q2 2018 by 3.7 million tonnes, following last quarter's record level of 3.8 million tonnes. These are new quarterly highs since the UK became a net importer in 2013. **(Chart 3.2)**

In Q2 2018 total deliveries of hydrocarbon transport fuels were stable, up 0.3 per cent compared with Q2 2017. Excluding the bio component, demand for petrol was down 0.1 per cent while demand for road diesel increased by just 0.4 per cent. Deliveries of jet fuel increased by 0.3 per cent. (**Chart 3.5)**

Overall stocks of crude oil and petroleum products were up by 5.4 per cent at end of Q2 2018. **(Chart 3.6)**

Relevant tables

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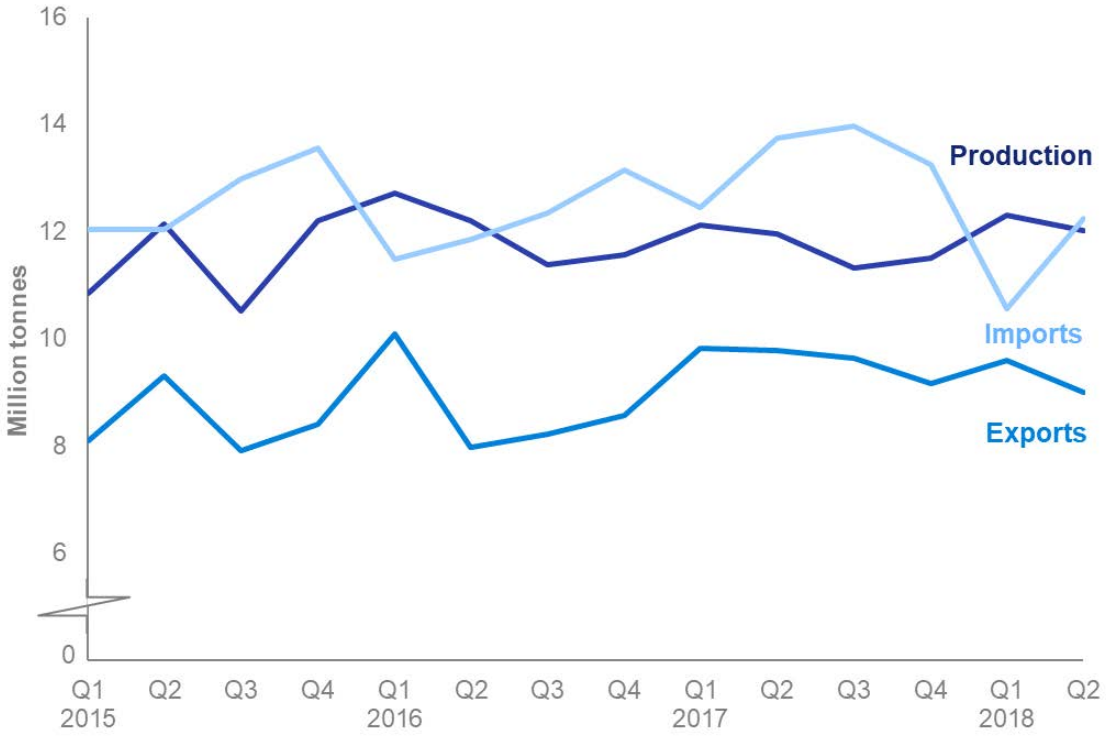
Chart 3.1 Production and trade of crude oil and NGLs (Table 3.1)



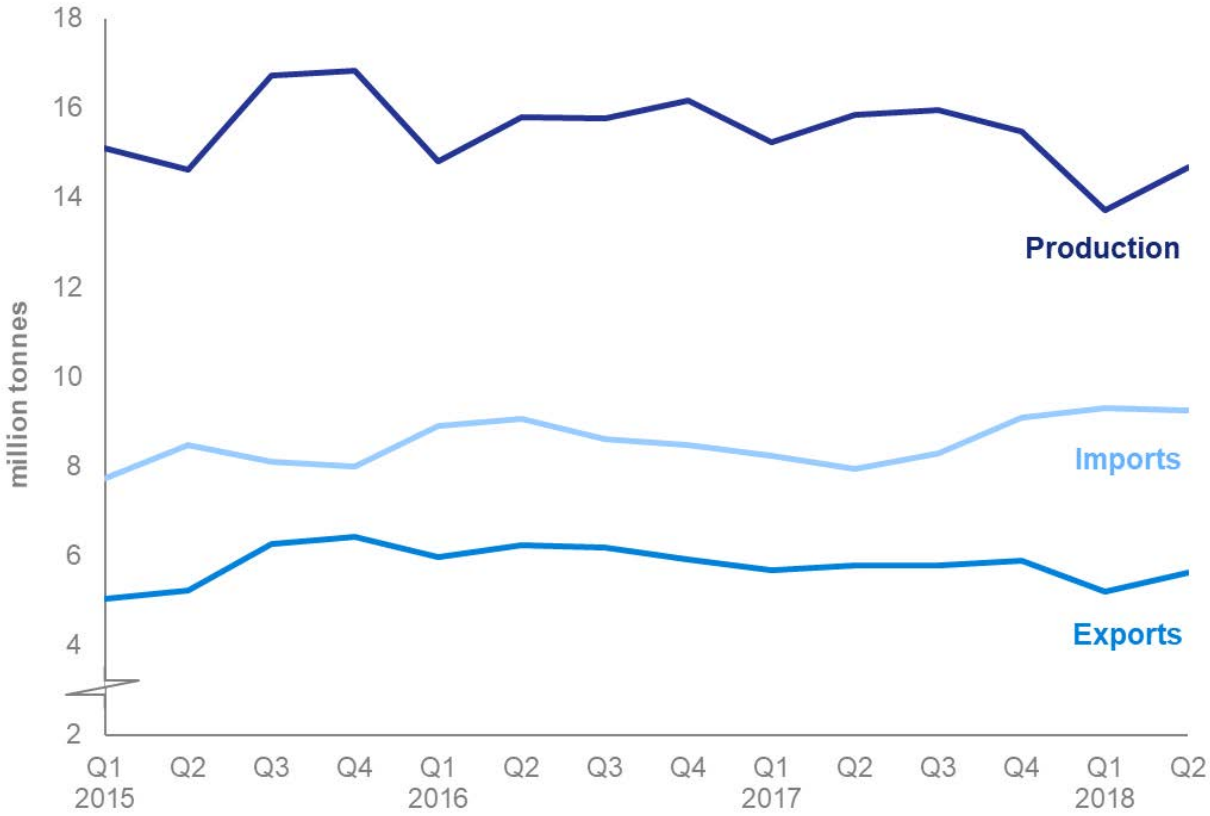
Indigenous crude oil production in Q2 2018 was relatively stable on last year, up just 0.9 per cent whilst production of Natural Gas Liquids (NGLs) was down 5.6 per cent. As a result, indigenous production of crude and NGLs was 0.4 per cent higher on last year.

The key story this quarter is around low refinery demand, following the record low seen in Q1 this year, which has in turn affected trade figures. Extensive planned refinery maintenance in the early part of 2018 resulted in a 7.3 per cent decrease in demand during Q2 and an 11 per cent fall in imports of crude and process oils. Exports were also down, by 7.9 per cent, compared to strong exports this time last year.

Trade volumes were also affected by the 44 per cent increase in refinery use of indigenous crude compared to 2017, when this reached record lows during a period of high exports of UKCS crude.

Lower imports resulted in net imports of primary oils (crude, NGLs and feedstocks) of 3.2 million tonnes, down nearly one-fifth on Q2 2017.

Chart 3.2 Production and trade of petroleum products (Table 3.2)

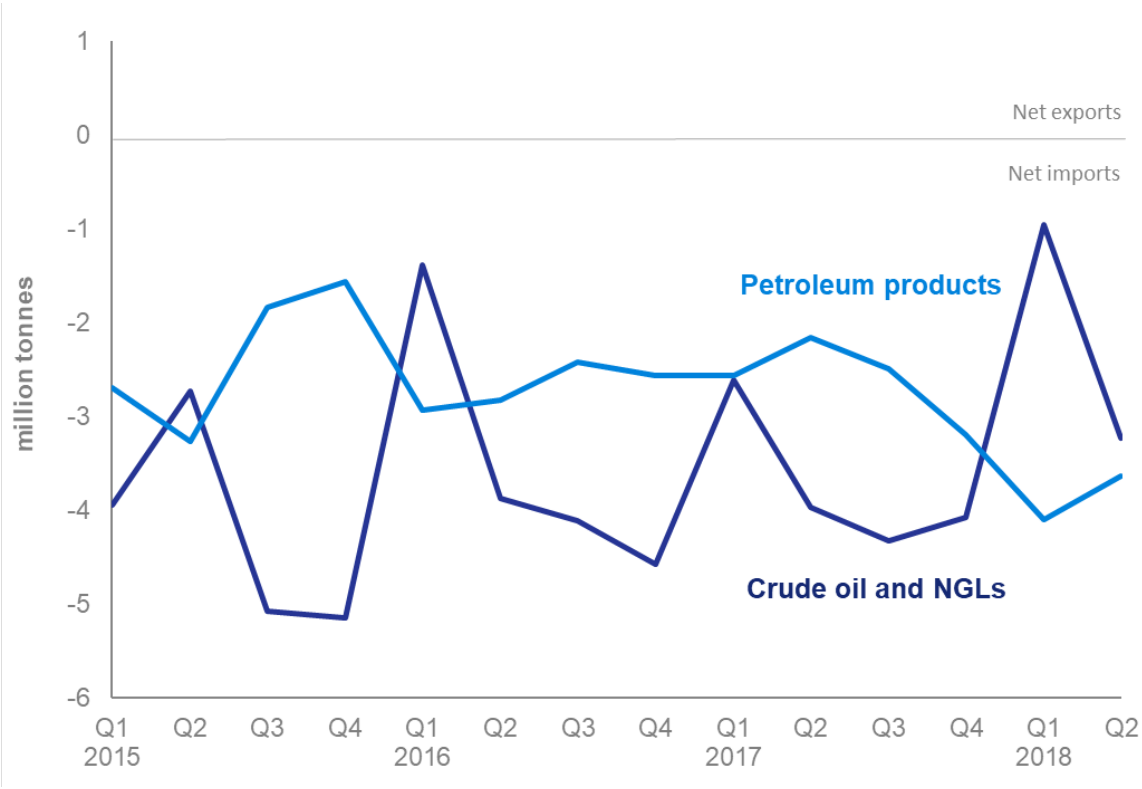


Indigenous production of petroleum products in Q2 2018 was down 7.3 per cent on last year, a result of planned maintenance in the early part of 2018. This maintenance can also be seen earlier in the year in the reduced production and exports of products in Q1 2018 in Chart 3.2, and reduced primary oil imports (as a result of lower refinery demand) in Chart 3.1.

Imports of petroleum products increased by 17 per cent (1.4 million tonnes) to make up the shortfall in supply to meet demand, particularly for transport fuels and burning oil. Exports were relatively stable, down just 2.8 per cent.

Net imports remained high at 3.7 million tonnes in Q2 2018, the second highest quarterly level after reaching 3.8 million tonnes in Q1 this year.

Chart 3.3 Overall trade in primary oils and petroleum products (Table 3.1)

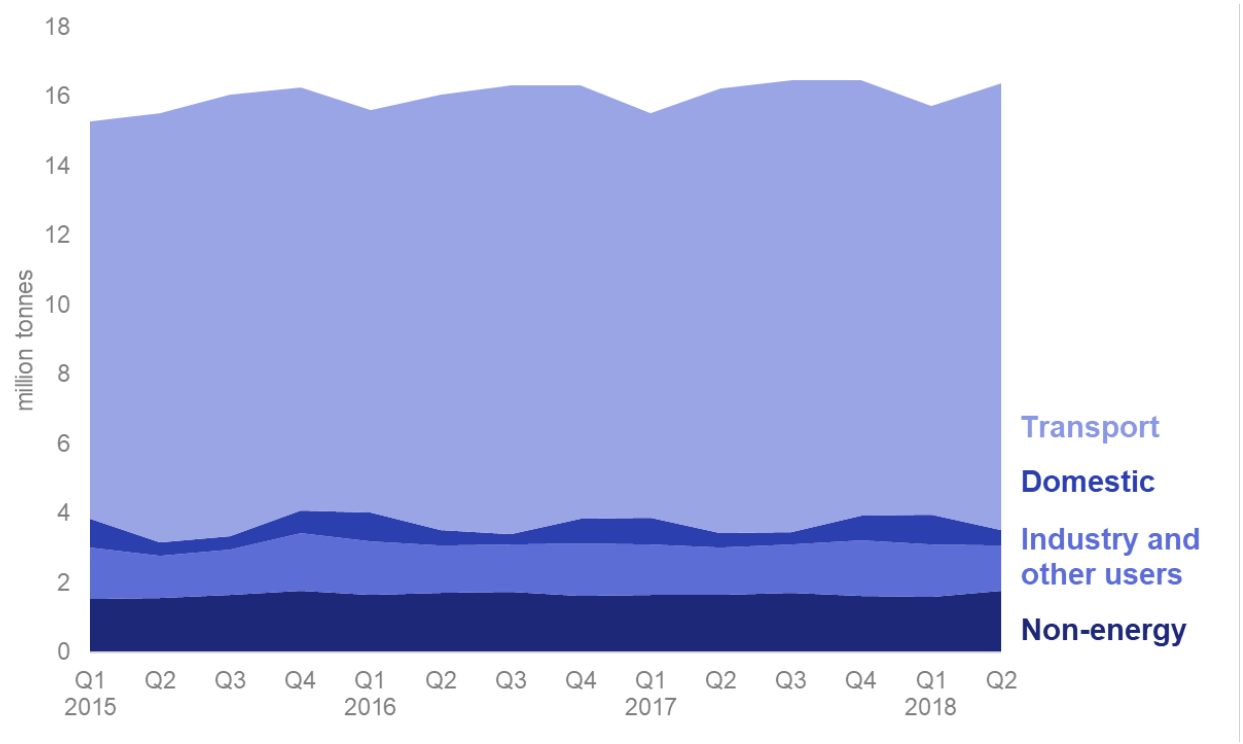


In Q2 2018 net imports of primary oils (crude, NGLs and feedstocks) decreased by nearly a fifth to 3.2 million tonnes compared with 4.0 million tonnes in Q2 2017, following record low levels of net imports in Q1 this year as a result of the low imports stemming from low refinery demand.

The UK's overall net import dependence for primary oils was 12 per cent in Q2 2018, compared to 14 per cent last year.

In Q2 2018 the UK was a net importer of petroleum products by 3.7 million tonnes, up from 2.2 million tonnes in the second quarter of 2017, but down slightly on the record 3.8 million tonnes in Q1 2018.

Chart 3.4 Final consumption of oil (Table 3.4)

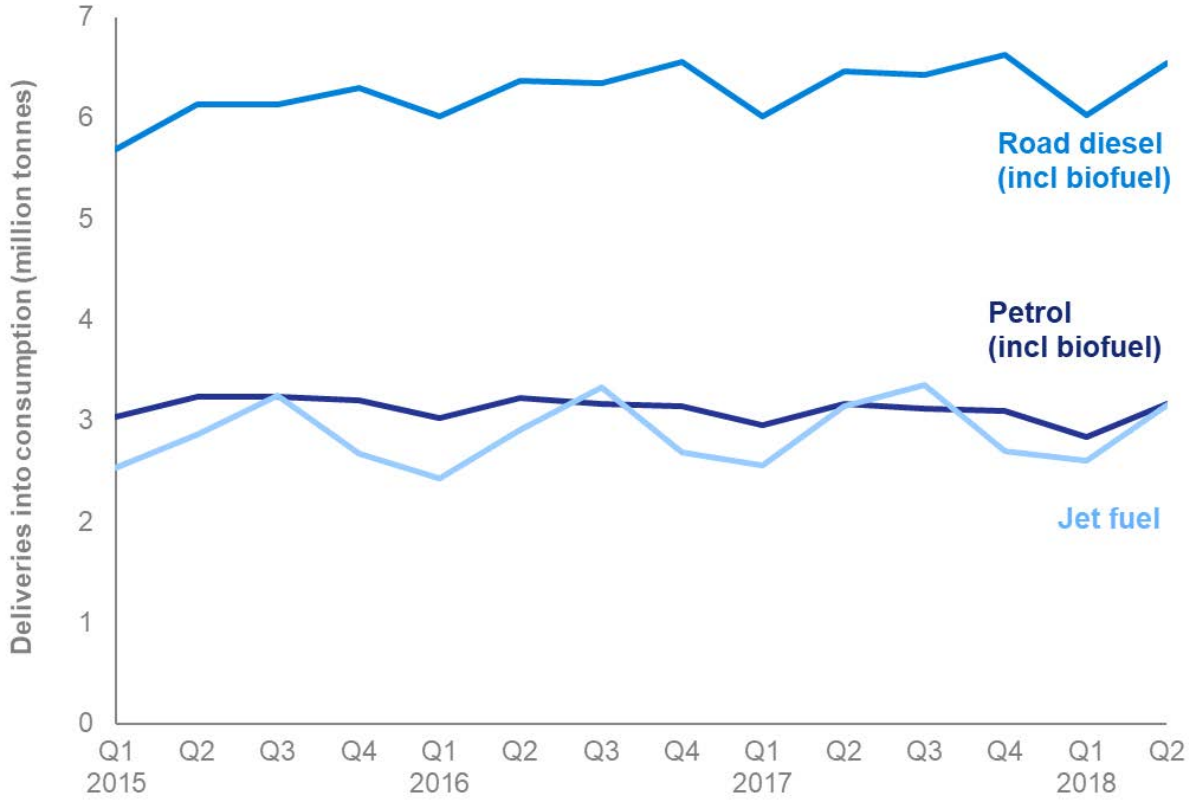


In Q2 2018 final consumption of petroleum products was relatively stable on last year, up 1.3 per cent.

Transport, which accounts for over three-quarters of UK final consumption, was also comparatively stable, higher by just 0.3 per cent. Consumption of road diesel (including biofuels) was up just 0.4 per cent while petrol was down just 0.1 per cent. (See Chart 3.5 for more detail).

Demand for products for non-energy use was higher by 5.8 per cent in the latest quarter.

Chart 3.5 Demand for key transport fuels (Table 3.4 and Table 3.5)

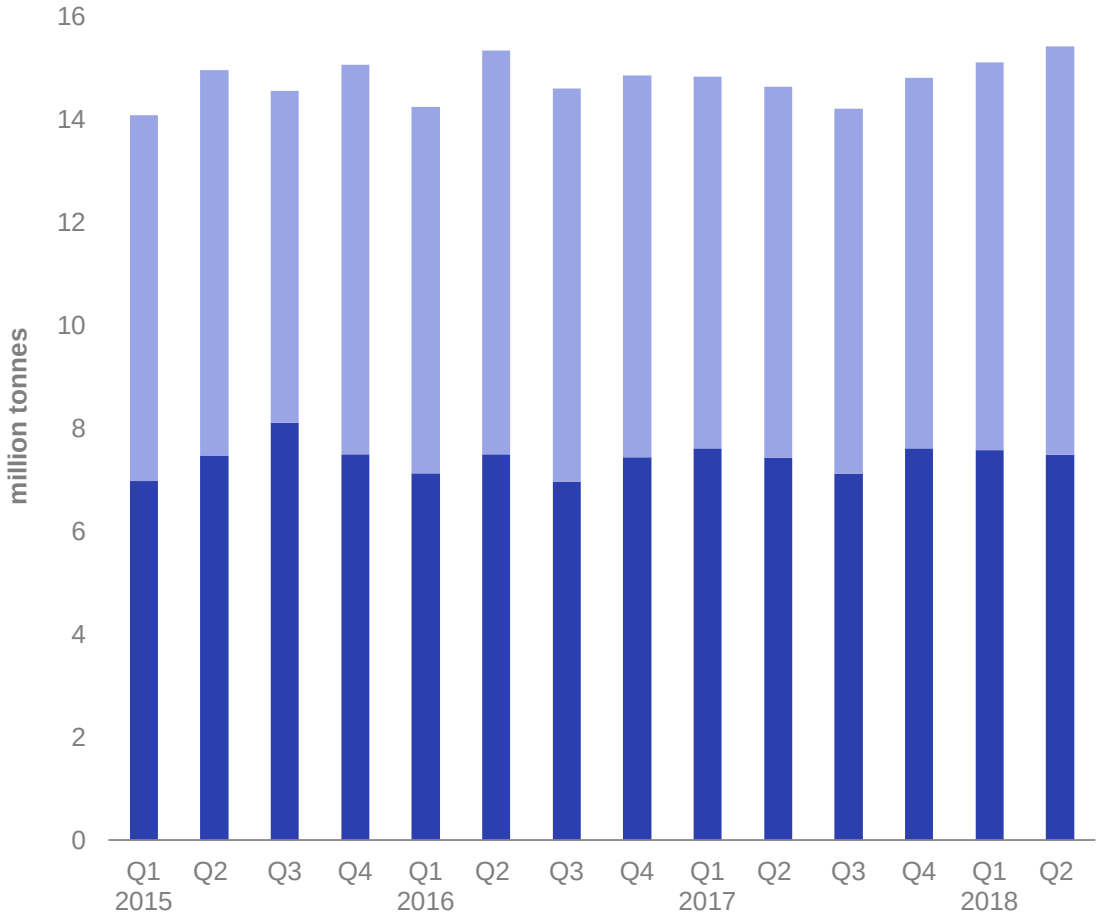


Excluding the bio component, motor spirit (petrol) deliveries were down by 0.1 per cent on the second quarter of 2017.

Diesel (DERV) demand increased by 0.4 per cent compared to Q2 2017. Total DERV consumption, including biodiesel, increased by 1.2 per cent due to a jump of more than a quarter in biodiesel sales. Please note that these figures are derived from a new HMRC data system and should be seen as provisional.

Demand for aviation turbine fuel increased by 0.3 per cent compared to Q2 2017. Consumption increased sharply on the first quarter of this year because demand is seasonal with more people flying during summer months.

Chart 3.6 UK oil stocks (Table 3.6)



At the end of Q2 2018 total stocks for all oil were up by 5.4 per cent (0.8 million tonnes) compared to the same point in 2017.

Stocks of primary oils were up by 10 per cent, primarily because of an increase in stocks held at refineries.

Product stocks remained fairly stable (up 0.8 per cent), with an increase in volumes held under bilateral agreements offsetting a fall in physical stocks of kerosene.

Chart 3.6 combines stocks of products with the product equivalent of stocks of crude oil to give an overall level of UK stocks of key products.

At the end of the Q2 2018, the UK had stocks equal to around 60 days of demand.

Further information on how the UK meets its oil stocking obligations are set out at:
www.gov.uk/government/publications/uk-emergency-oil-stocking-international-obligations

3 OIL AND OIL PRODUCTS

Table 3.1 Supply and use of crude oil, natural gas liquids and feedstocks[1]

Thousand tonnes

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change*[8]
SUPPLY													
Indigenous production[2]	47,872	46,916	*-2.0*	12,210	11,377	11,570	12,127	11,962	11,325	11,502	12,297	12,010	*+0.4*
Crude oil	44,306	43,050	*-2.8*	11,347	10,560	10,583	11,101	10,918	10,460	10,572	11,288	11,021	*+0.9*
NGLs[3]	3,139	3,446	*+9.8*	757	717	881	911	940	765	830	906	888	*-5.6*
Feedstocks	428	420	*-1.9*	105	100	106	116	103	100	100	104	102	*-1.5*
Imports[4]	48,798	53,384	*+9.4*	11,845	12,335	13,138	12,439	13,736	13,965	13,244	10,557r	12,228	*-11.0*
Crude oil & NGLs	42,415	46,837	*+10.4*	10,171	10,681	11,721	10,990	11,796	12,385	11,666	8,926r	10,702	*-9.3*
Feedstocks	6,383	6,547	*+2.6*	1,674	1,654	1,417	1,449	1,939	1,580	1,578	1,631	1,526	*-21.3*
Exports[4]	34,856	38,397	*+10.2*	7,976	8,225	8,565	9,824	9,771	9,636	9,167	9,601r	9,000	*-7.9*
Crude Oil & NGLs	33,247	36,941	*+11.1*	7,544	7,931	8,312	9,470	9,445	9,195	8,831	9,368r	8,524	*-9.7*
Feedstocks	1,609	1,456	*-9.5*	433	294	253	353	325	441	336	234	476	*+46.2*
Stock change[5]	-125	330	*(-)*	-492	95	-83	414	-94	191	-182	224r	-773	*(+)*
Transfers[6]	-1,282	-2,035	*+58.7*	-368	-209	-481	-574	-560	-440	-461	-256r	-296	*-47.2*
Total supply	60,407	60,198	*-0.3*	15,219	15,373	15,579	14,583	15,273	15,406	14,936	13,220r	14,170	*-7.2*
Statistical difference[7]	15	-47		-21	4	17	-4	-5	0	-38	8r	4	
Total demand	60,392	60,245	*-0.2*	15,240	15,369	15,562	14,587	15,279	15,406	14,973	13,212	14,165	*-7.3*
TRANSFORMATION	60,392	60,245	*-0.2*	15,240	15,369	15,562	14,587	15,279	15,406	14,973	13,212	14,165	*-7.3*
Petroleum refineries	60,392	60,245	*-0.2*	15,240	15,369	15,562	14,587	15,279	15,406	14,973	13,212	14,165	*-7.3*

1. As there is no use made of primary oils and feedstocks by industries other than the oil and gas extraction and petroleum refining industries, other industry headings have not been included in this table. As such, this table is a summary of the activity of what is known as the Upstream oil industry.
2. Includes offshore and onshore production.
3. Natural Gas Liquids (NGLs) are condensate and petroleum gases derived at onshore treatment plants.
4. Foreign trade as recorded by the Petroleum Industry which may differ from the figures published by HM Revenue and Customs in the Overseas Trade Statistics. Data are subject to further revision as revised information on imports and exports becomes available.
5. Stock fall (+), stock rise (-). Stocks include stocks held at refineries, at oil terminals and also those held in tanks and partially loaded vessels at offshore facilities.
6. Mostly direct disposals to petrochemical plants.
7. Total supply minus total demand.
8. Percentage change between the most recent quarter and the same quarter a year earlier.

3 OIL AND OIL PRODUCTS

Table 3.2 Supply and use of petroleum products

Thousand tonnes

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change* [1]
SUPPLY													
Indigenous production[2]	62,536	62,494	*-0.1*	15,790	15,771	16,156	15,223	15,845	15,943	15,483	13,724	14,681	*-7.3*
Imports[3]	35,047	33,521	*-4.4*	9,068	8,599	8,485	8,229	7,938	8,279	9,076	9,030r	9,317	*17.4*
Exports[3]	24,312	23,110	*-4.9*	6,245	6,179	5,923	5,664	5,776	5,790	5,880	5,204	5,612	*-2.8*
Marine bunkers	2,659	2,430	*-8.6*	727	763	632	511	597	729	593	517	618	*3.5*
Stock change[4]	89	-122		-278	460	-241	-301	124	253	-197	-61	154	
Transfers[5]	-1,268	-612		-300	-281	-212	-189	-75	-210	-138	-329r	-293	
Total supply	69,433	69,742	*0.4*	17,307	17,607	17,633	16,787	17,459	17,746	17,750	16,642r	17,629	*1.0*
Statistical difference[6]	20	-11		-16	-5	38	8	-27	-4	12	2r	-4	
Total demand	69,413	69,753	*0.5*	17,323	17,612	17,596	16,779	17,486	17,750	17,738	16,640r	17,634	*0.8*
TRANSFORMATION	1,078	1,029	*-4.6*	250	246	284	275	244	245	266	270	247	*1.2*
Electricity generation	501	475	*-5.3*	110	115	130	124	107	111	133	130	113	*5.4*
Heat generation	42	48	*13.4*	11	10	11	12	12	12	12	12	12	*0.0*
Other Transformation	535	506	*-5.4*	130	121	143	139	125	122	120	127	123	*-1.6*
Energy industry use	4,040	4,069	*0.7*	1,019	1,042	990	988	1,024	1,035	1,023	917	956	*-6.6*
Petroleum Refineries	3,377	3,407	*0.9*	854	876	824	823	859	869	857	752	791	*-7.9*
Blast Furnaces	0	0		0	0	0	0	0	0	0	0	0	
Others	662	662	*0.0*	166	166	166	166	166	166	166	166	166	*0.0*
FINAL CONSUMPTION	64,295	64,654	*0.6*	16,053	16,324	16,322	15,516	16,218	16,471	16,450	15,453r	16,430	*1.3*
Iron & steel	4	4	*-0.5*	1	0	0	3	2	0	0	4	0	*(-)*
Other industries	3,951	3,979	*0.7*	877	881	1,059	1,028	909	913	1,128	1,068r	951	*4.6*
Transport	49,501	49,957	*0.9*	12,539	12,917	12,469	11,637	12,802	13,011	12,507	11,475r	12,838	*0.3*
Domestic	2,303	2,230	*-3.2*	450	315	718	762	407	346	714	877r	448	*10.1*
Other final users	1,814	1,840	*1.5*	471	468	464	419	457	483	482	423r	456	*-0.2*
Non energy use	6,721	6,644	*-1.1*	1,715	1,742	1,612	1,667	1,641	1,718	1,618	1,606	1,737	*5.8*

1. Percentage change between the most recent quarter and the same quarter a year earlier; (+) represents a positive percentage change greater than 100%.
2. Includes refinery production and petroleum gases extracted as products during the production of oil and gas.
3. Foreign trade as recorded by the Petroleum Industry which may differ from the figures published by HM Revenue and Customs in the Overseas Trade Statistics. Data are subject for further revision as revised information on imports and exports becomes available.
4. Stock fall (+), stock rise (-).
5. Mainly transfers from product to feedstock.
6. Total supply minus total demand.

3 OIL AND OIL PRODUCTS

Table 3.4 Supply and use of petroleum products - latest quarter

Thousand tonnes

	2017 2nd quarter									2018 2nd quarter p								
	Total Petroleum Products	Motor spirit [10]	DERV [9,10]	Gas oil [1,10]	Aviation turbine fuel	Fuel oils	Petroleum gases [2]	Burning oil	Other products [3]	Total Petroleum Products	Motor spirit [10]	DERV [9,10]	Gas oil [1,10]	Aviation turbine fuel	Fuel oils	Petroleum gases [2]	Burning oil	Other products [3]
SUPPLY																		
Indigenous Production [4]	15,845	4,313	3,424	1,733	1,459	904	1,843	401	1,768	14,681	4,018	2,795	1,962	1,357	814	1,667	401	1,667
Imports [5]	7,938	891	3,326	512	1,988	255	203	38	726	9,317	1,126	3,863	492	2,243	183	301	155	953
Exports [5]	5,776	2,778	317	545	290	709	340	10	787	5,612	2,729	211	687	378	640	265	8	695
Marine bunkers	597	-	-	427	-	170	-	-	-	618	-	-	414	-	204	-	-	-
Stock change [6]	+124	+101	-82	-31	+140	+12	-27	+5	+7	+154	+163	+79	-65	+28	+7	-11	-45	-2
Transfers [7]	-75	+476	-110	+102	-140	-119	-12	+130	-402	-293	+430	-219	+61	-91	-16	-4	+86	-540
Total supply	17,459	3,002	6,240	1,344	3,157	173	1,667	564	1,313	17,629	3,008	6,307	1,349	3,159	145	1,689	588	1,384
Statistical difference [8]	-27	-14	-40	+8	+12	+4	-19	+11	+11	-4	-3	+3	-1	+5	-0	-22	-3	+18
Total demand	17,486	3,015	6,280	1,336	3,145	169	1,686	553	1,302	17,634	3,012	6,304	1,350	3,154	145	1,711	591	1,366
TRANSFORMATION	244	-	-	22	-	27	170	-	25	247	-	-	22	-	34	169	-	23
Electricity generation	107	-	-	21	-	20	66	-	-	113	-	-	21	-	26	66	-	-
Heat generation	12	-	-	1	-	8	4	-	-	12	-	-	1	-	8	4	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	18	-	-	-	-	-	0	-	18	18	-	-	-	-	-	0	-	18
Other transformation [9]	106	-	-	-	-	-	100	-	6	105	-	-	-	-	-	99	-	6
Energy industry use	1,024	-	-	150	-	57	518	-	299	956	-	-	150	-	53	471	-	282
FINAL CONSUMPTION	**16,218**	**3,015**	**6,280**	**1,164**	**3,145**	**85**	**998**	**553**	**979**	**16,430**	**3,012**	**6,304**	**1,179**	**3,154**	**58**	**1,072**	**591**	**1,060**
Iron & steel	2	-	-	-	-	1	-	-	-	0	-	-	-	-	0	-	-	-
Other industries	909	-	-	451	-	53	96	225	84	951	-	-	455	-	25	97	241	134
Transport	12,802	3,015	6,280	342	3,145	0	16	-	4	12,838	3,012	6,304	349	3,154	0	16	-	3
Domestic	407	-	-	37	-	-	42	327	-	448	-	-	39	-	-	57	351	-
Other final users	457	-	-	328	-	30	98	-	-	456	-	-	332	-	32	92	-	-
Non energy use	1,641	-	-	4	-	-	745	-	892	1,737	-	-	4	-	-	810	-	923

1. Includes middle distillate feedstock destined for use in the petrochemical industry and marine diesel
2. Includes ethane, propane, butane and other petroleum gases.
3. Includes naphtha, industrial and white spirits, lubricants, bitumen, petroleum waxes, petroleum coke and other oil products.
4. Includes refinery production and petroleum gases extracted as products during the production of oil and gas.
5. Foreign trade as recorded by the Petroleum Industry which may differ from the figures published by HM Revenue and Customs in the Overseas Trade Statistics. Data are subject to further revision as revised information on imports and exports becomes available.
6. Stock fall (+), stock rise (-).
7. Mainly transfers from product to feedstock.
8. Total supply minus total demand.
9. Backflows from petrochemical companies have been placed on a separate row for the first time June 2016. Please see article in Energy Trend June 2016 for more information.
10. Please note that these figures are derived from a new HMRC data system and should be seen as provisional. The Hydrocarbons Bulletin can be found at:

https://www.uktradeinfo.com/Statistics/Pages/TaxAndDutybulletins.aspx

3 OIL AND OIL PRODUCTS

Table 3.5 Biofuel sales and sales through supermarkets[1]

Thousand tonnes

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change* [2]
MOTOR SPIRIT[6]													
of which, Hydrocarbon [3]	11,951	11,746	*-1.7%*	3,072	3,014	2,988	2,815	3,015	2,972	2,943	2,705r	3,012	*-0.1%*
of which, Bio-ethanol [4]	603	598	*-0.8%*	154	150	152	146	153	145	154	141r	152	*-0.5%*
Total Motor Spirit including Bio-ethanol	**12,554**	**12,344**	*-1.7%*	**3,226**	**3,164**	**3,140**	**2,961**	**3,169**	**3,117**	**3,097**	**2,845r**	**3,164**	*-0.1%*
of which, sold through Supermarkets [5]	5,885	5,794	*-1.6%*	1,479	1,453	1,473	1,388	1,445	1,443	1,518	1,428	1,476	*2.2%*
DIESEL ROAD FUEL[6]													
of which, Hydrocarbon [3]	24,648	24,911	*1.1%*	6,173	6,167	6,419	5,903	6,280	6,265	6,462	5,835r	6,304	*0.4%*
of which, Bio-diesel [4]	630	620	*-1.6%*	195	174	133	118	188	156	158	193r	239	*27.0%*
Total Diesel Road Fuel including Bio-diesel	**25,279**	**25,531**	*1.0%*	**6,368**	**6,342**	**6,552**	**6,022**	**6,467**	**6,421**	**6,621**	**6,028r**	**6,543**	*1.2%*
of which, sold through Supermarkets 5	7,267	7,383	*1.6%*	1,802	1,814	1,858	1,761	1,811	1,863	1,948	1,878	1,898	*4.8%*

1. Monthly data for inland deliveries of oil products are available - See BEIS website: https://www.gov.uk/government/collections/oil-statistics
2. Percentage change between the most recent quarter and the same quarter a year earlier.
3. Demand excluding bioethanol. Based on HMRC data.
4. Bioethanol based on HMRC data and excludes other renewables
5. Data for sales by supermarkets collected by a monthly reporting system. Includes Asda, Morrisons, Sainsburys and Tesco only.
6. Please note that these figures are derived from a new HMRC data system and should be seen as provisional. The Hydrocarbons Bulletin can be found at: https://www.uktradeinfo.com/Statistics/Pages/TaxAndDutybulletins.aspx

3 OIL AND OIL PRODUCTS

Table 3.6 Stocks of petroleum[1] at end of period

Thousand tonnes

		Crude oil and refinery process oil					Petroleum products							Total stocks		
		Refineries[2]	Terminals[3]	Offshore[4]	Net bilaterals of Crude and Process oil [5]	Total[5]	Motor Spirit[6]	Kerosene[7]	Gas/Diesel Oil[8]	Fuel oils	Other products[9]	Net bilaterals of products [5]	Total products	Total Net bilaterals [5]	Total Stocks in UK[10]	Total stocks
2013		3,592	1,102	513	1,469	6,677	1,041	1,419	1,539	404	693	2,432	7,528	3,901	10,304	14,205
2014		3,876	1,147	460	1,728	7,211	947	1,178	1,656	253	773	2,064	6,871	3,792	10,290	14,082
2015		3,156	1,629	499	2,289	7,574	1,084	1,425	1,858	314	792	2,022	7,497	4,312	10,759	15,070
2016		3,088	1,795	526	2,006	7,415	1,079	1,342	2,033	218	687	2,082	7,442	4,089	10,769	14,857
2017		3,244	1,235	600	2,121	7,200	1,129	1,298	2,028	239	794	2,126	7,614	4,246	10,568	14,814
2016	2nd quarter	3,201	1,586	635	2,427	7,849	1,158	1,398	1,990	270	780	1,899	7,495	4,326	11,018	15,344
	3rd quarter	3,238	1,473	615	2,323	7,650	1,107	1,241	1,809	261	718	1,826	6,964	4,150	10,464	14,614
	4th quarter	3,088	1,795	526	2,006	7,415	1,079	1,342	2,033	218	687	2,082	7,442	4,089	10,769	14,857
2017	1st quarter	3,131	1,307	557	2,229	7,224	1,212	1,575	1,970	236	678	1,949	7,620	4,178	10,666	14,844
	2nd quarter	3,003	1,549	542	2,129	7,222	1,112	1,430	2,083	226	698	1,876	7,425	4,005	10,642	14,647
	3rd quarter	2,970	1,318	610	2,197	7,094	1,093	1,276	1,954	229	742	1,826	7,120	4,023	10,191	14,214
	4th quarter	3,244	1,235	600	2,121	7,200	1,129	1,298	2,028	239	794	2,126	7,614	4,246	10,568	14,814
2018	1st quarter	3,388	1,009	459r	2,674	7,529r	1,282	1,153	1,965	264	885	2,034	7,582	4,708	10,404r	15,111r
	2nd quarter p	3,454	1,594	580	2,317	7,945	1,119	1,170	1,952	257	898	2,093	7,488	4,410	11,023	15,433
Per cent change[11]		*+15.0*	*+3.0*	*+6.9*	*+8.8*	*+10.0*	*+0.7*	*-18.2*	*-6.3*	*+13.8*	*+28.6*	*+11.6*	*+0.8*	*+10.1*	*+3.6*	*+5.4*

1. Stocks held at refineries, terminals and power stations. Stocks in the wholesale distribution system and certain stocks at offshore fields (UK Continental Shelf [UKCS]), and others held underare approved bilateral agreements also included.
2. Stocks of crude oil, NGLs and process oil at UK refineries.
3. Stocks of crude oil and NGLs at UKCS pipeline terminals.
4. Stocks of crude oil in tanks and partially loaded tankers at offshore fields (UKCS).
5. The difference between stocks held abroad for UK use under approved bilateral agreements and the equivalent stocks held in the UK for foreign use. From 2013 onwards, EU Directive 2009/119/EC came into effect and this has lead to changes in how UK companies manage their stock-holding. The increase in crude stocks held abroad was at the expense of a decrease in product stocks held under similar agreements.
6.Motor spirit and aviation spirit.
7. Aviation turbine fuel and burning oil.
8. Gas oil, DERV fuel, middle distillate feedstock (mdf) and marine diesel oil.
9. Ethane, propane, butane, other petroleum gases, naphtha (ldf), industrial and white spirits, bitumen, petroleum wax, lubricating oil, petroleum coke, and miscellaneous products.
10. Stocks held in the national territory or elsewhere on the UKCS
11. Percentage change between the most recent quarter and the same quarter a year earlier.

Section 4 - Gas

Key results show:

The most notable development this quarter relates to trade. Following near record pipeline imports at the start of the year due to the cold weather, imports have fallen 11 per cent on last year in Q2. Exports remained low in Q2 following low levels in Q1, and were down by one-half on 2017 at the lowest volume for Q2 in the last 20 years. **(Chart 4.4)**. The quarter also saw the continued contraction of Liquefied Natural Gas (LNG) imports on last year's volumes, down 41 per cent **(Chart 4.5)**.

UK production of natural gas in Q2 2018 was 6.7 per cent lower in comparison to the same quarter last year, as a result of robust volumes last year. Within this, production of associated gas was 14 per cent lower whilst dry gas production was 38 per cent higher **(Charts 4.1 & 4.2)**.

Demand for natural gas in Q2 2018 fell by 2.7 per cent compared to last year, to 170 TWh **(Chart 4.6)**.

Demand for gas for electricity generation fell by 0.5 per cent in comparison to the same quarter last year, in line with a reduction in electricity demand (see Chapter 5 for more details). **(Chart 4.6)**.

Similarly final consumption was down 3.9 per cent, with domestic use and other final users down 6.7 and 1.9 per cent respectively, driven by warmer weather in Q2 2018 when compared with the same period last year **(Chart 4.6)**.

Relevant table

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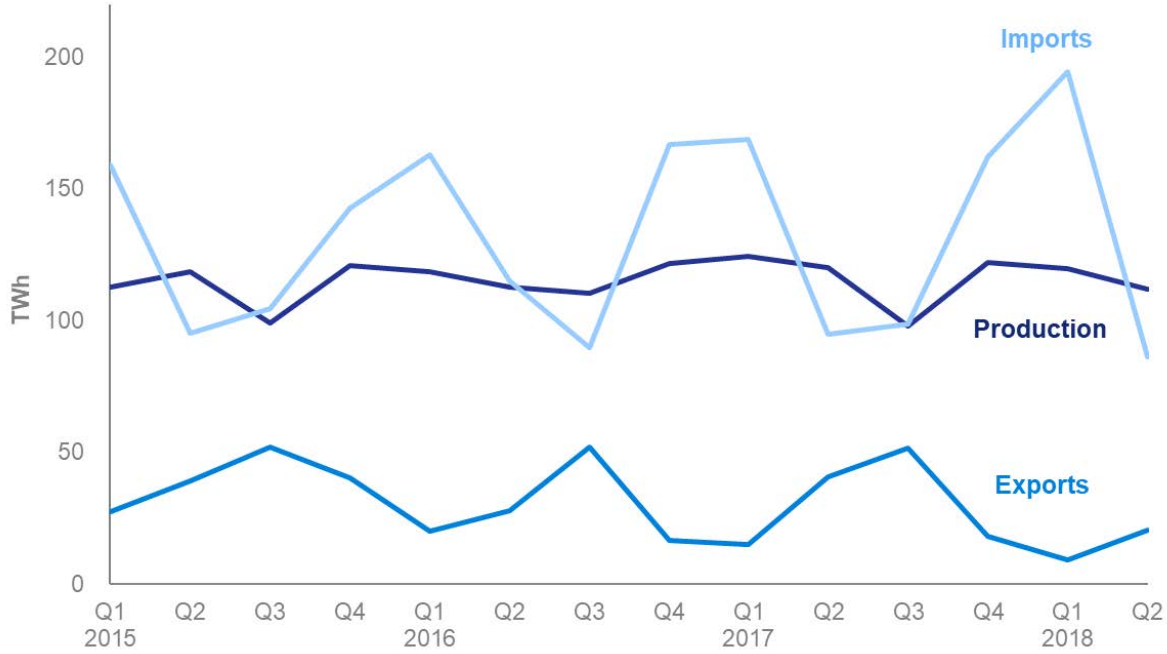
Chart 4.1 Production and imports and exports of natural gas (Table 4.1)



Following near record pipeline imports at the start of the year due to the cold weather, imports in Q2 2018 were down 11 per cent on the same quarter in 2017 and were driven by a 41 per cent decrease in LNG imports, particularly a fall of nearly two-third in imports of LNG from Qatar.

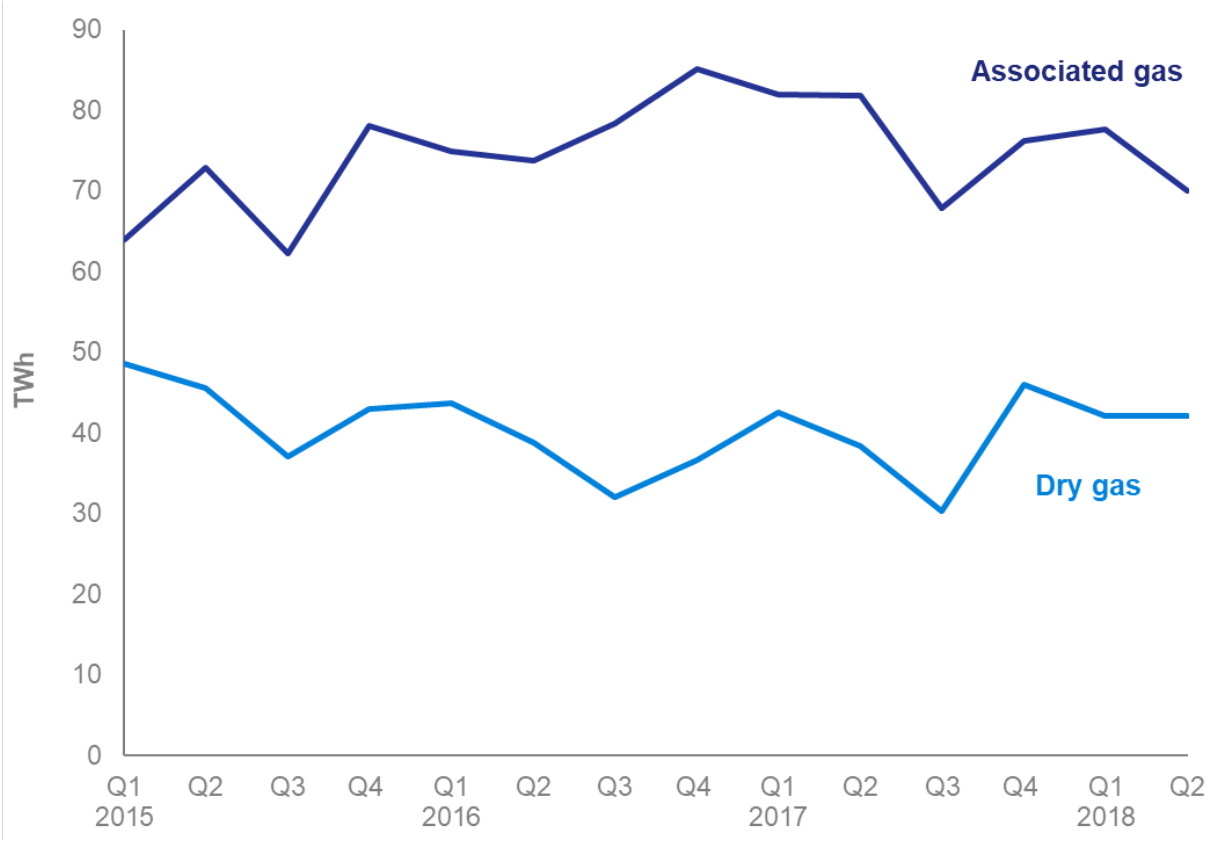
The UK imports natural gas primarily from Norway (predominantly via the Langeled, Tampen Link and Gjoa/Vega pipelines). Smaller volumes are imported from Belgium (via the UK-Belgium Interconnector) and the Netherlands (via the Balgzand to Bacton line). See Map 4.1 for an illustration of trade flows.

The UK exports natural gas primarily to Belgium (over 70 per cent of total exports in 2017) and Ireland (15 per cent of total exports in 2017). Following record low exports in Q1 2018 during a period of high demand due to the cold weather, exports in Q2 were roughly half of last year and the lowest Q2 figure since 1999.

Within the overall decrease, exports to Belgium were down more than 60 per cent, and to the Netherlands by nearly a half. Conversely, exports to Ireland were up by around three-quarters following depressed exports this time last year. Figures have been affected by closures at some facilities.

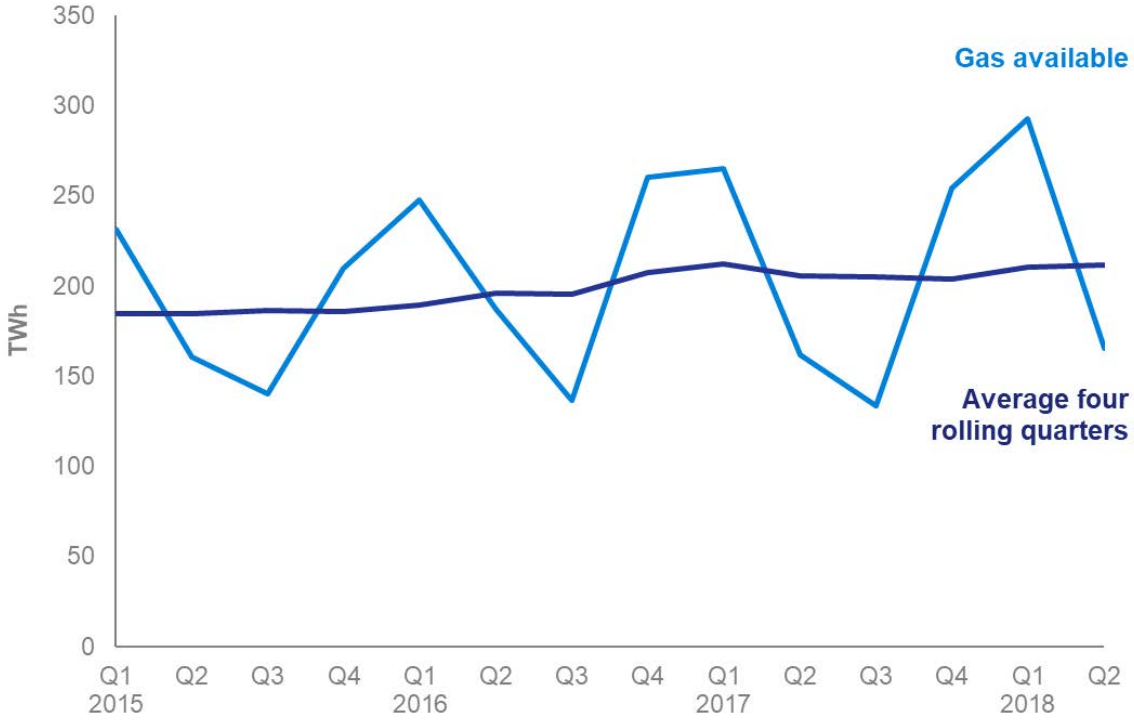
Gross production of natural gas was down by 6.7 per cent in Q2 2018, predominantly due to robust production this time last year. Current volumes are less than 40 per cent of the average quarterly production in 2000 when gas production peaked. The extraction of cushion gas from the Rough storage facility continues to feed into production figures.

Chart 4.2 Production of dry gas and associated gas (not shown in published tables)



Production of associated gas (natural gas produced from oil fields) in Q2 2018 was down 14 per cent compared to the same quarter last year, from 82 to 70 TWh. In comparison dry gas production (natural gas composed mainly of methane) increased by 38 per cent in Q2 2018 on last year, partly because extraction of the cushion gas from Rough had not yet started this time last year.

Chart 4.3 Gas availability (Table 4.2)

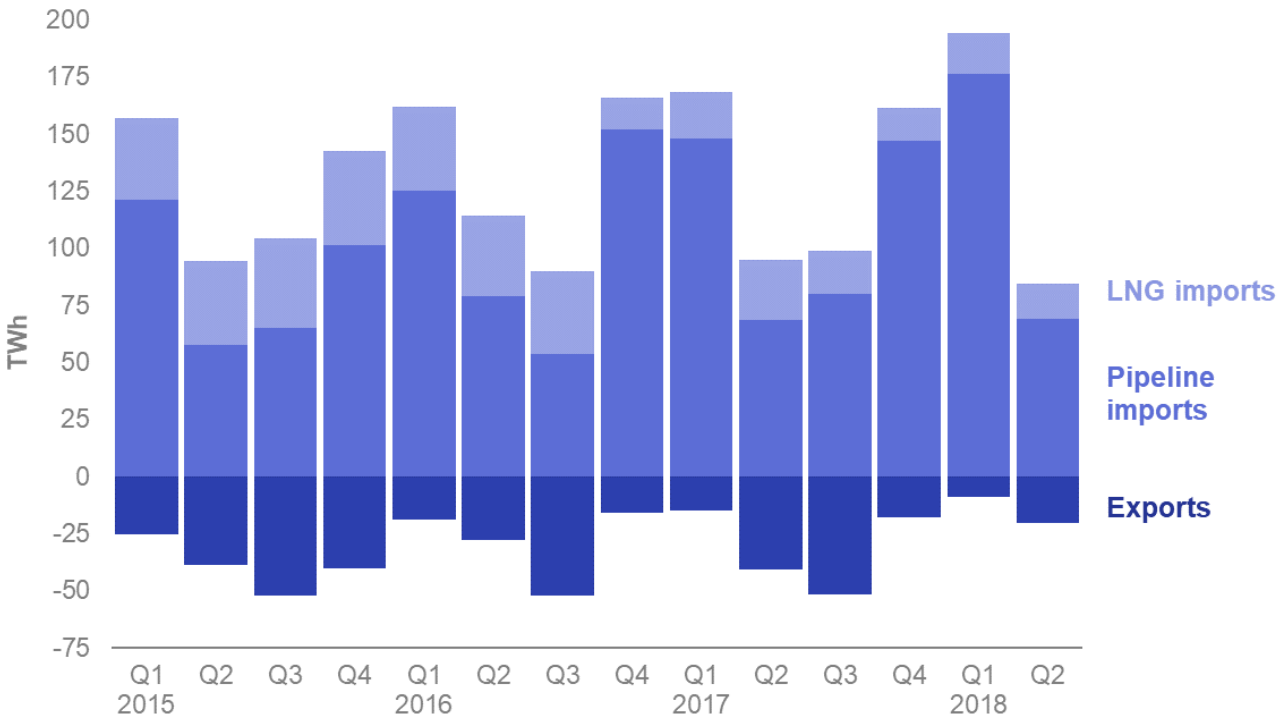


Gas available at terminals is roughly equal to gross gas production minus producers' own use, plus net imports.

Gas availability is seasonal, and peaks during Q1 and Q4 each year. Gas availability in Q2 2018 increased by 1.3 per cent compared to Q2 2017 to 164 TWh and was driven by the large decrease in exports.

The long-term picture shows that the average availability over four rolling quarters had remained fairly constant since the start of 2012 before increasing slightly since the start of 2015.

Chart 4.4 Import and exports (Table 4.3 and Table 4.4)



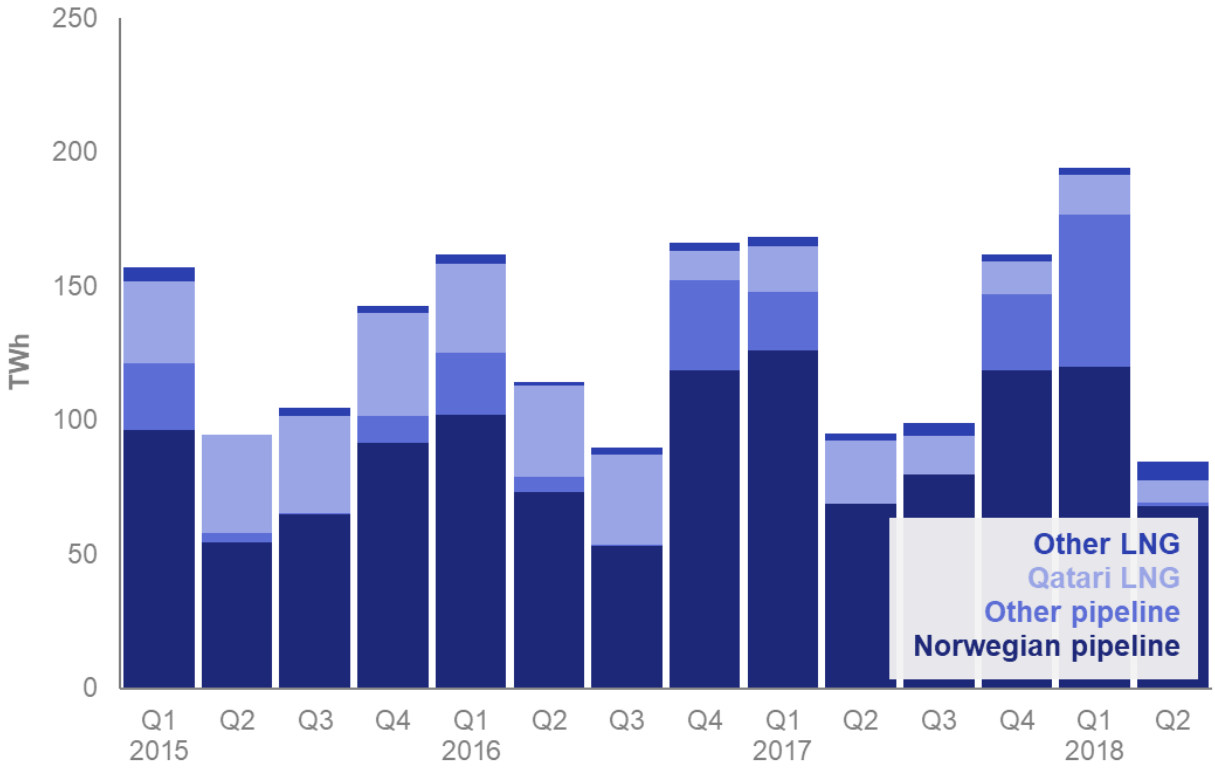
Net Imports during Q2 2018 were up by 18 per cent in comparison to the same quarter in 2017, driven by the lower export figure. Lower exports were partially a result of lower production and the closure of the Belgian interconnector for three weeks during Q2 2018.

As noted in Chart 4.1, the UK imports natural gas primarily from Norway (predominantly via the Langeled, Tampen Link and Gjoa/Vega pipelines). Smaller volumes are imported from Belgium (via the UK-Belgium Interconnector) and the Netherlands (via the Balgzand to Bacton line).

Pipeline imports were stable, up just 0.4 per cent, with overall imports from Norway down 1.4 per cent and increases in imports from Belgium and the Netherlands (around 500 GWh and 700 GWh respectively). Conversely, imports of LNG decreased by 41 per cent, meaning LNG only accounted for 18 per cent of total imports compared to 27 per cent in the same quarter last year.

Exports decreased by just under 50 per cent over the same timeframe, driven by exports to Belgium and the Netherlands falling by 62 per cent and 45 per cent respectively as the flow of the pipelines was reversed to supply imports to the UK, and due to closure of the Belgian interconnector.

Chart 4.5 Imports by origin (Table 4.4)

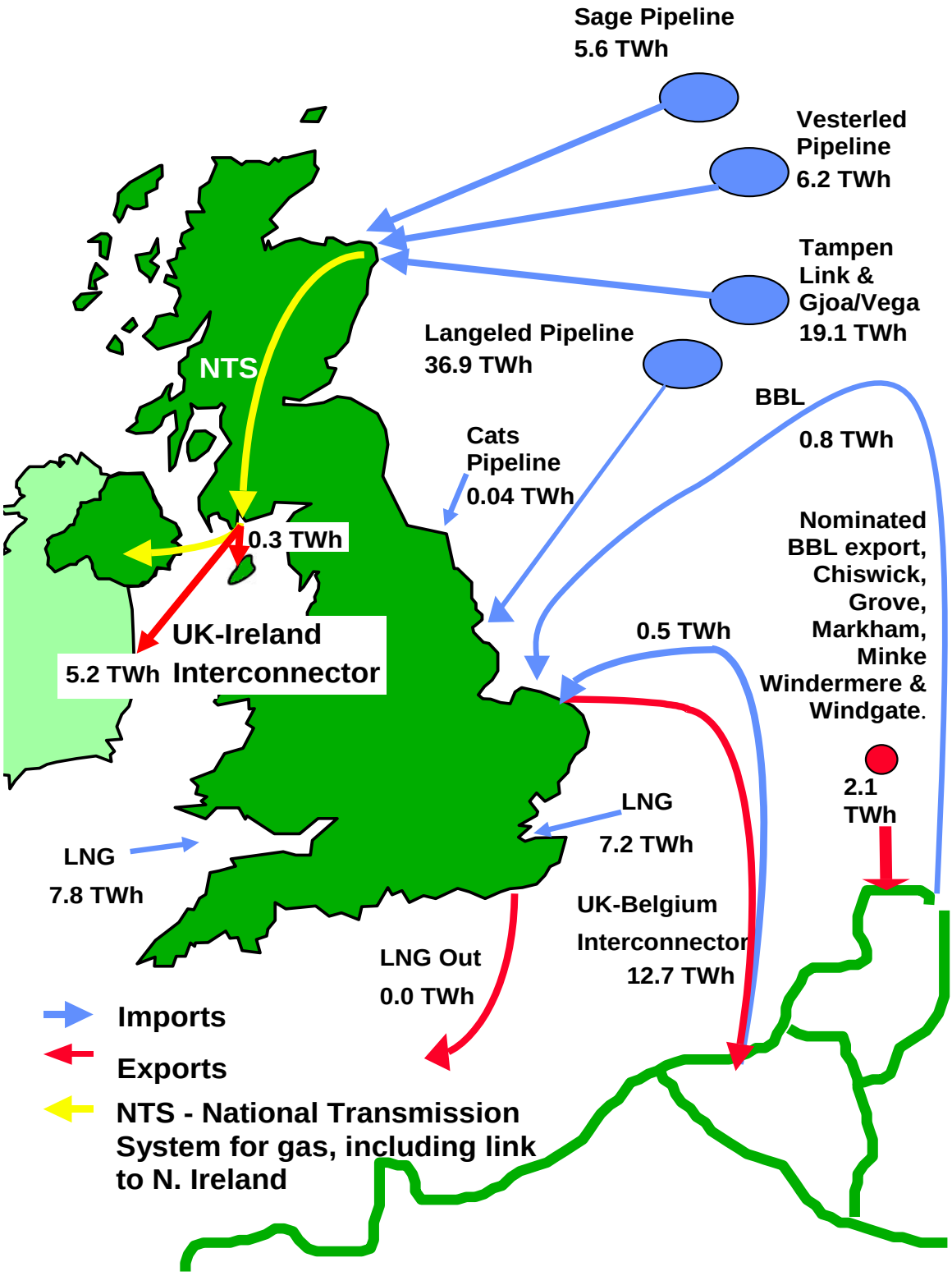


Overall imports in Q2 2018 fell by 11 per cent compared to last year, driven by a fall in imports of LNG. Imports of LNG decreased by 41 per cent, meaning LNG only accounted for 18 per cent of total imports compared to 27 per cent in the same quarter last year. The majority of LNG imports are sourced from Qatar and these fell by nearly two-thirds meaning that Qatari LNG accounted for only 57 per cent of LNG imports in Q2 2018 compared to over 90 per cent in Q2 2017. Imports from Trinidad and Tobago were up by more than a third, and shipments were also received from the US and Russia. Imports of LNG from Russia accounted for 3.2 per cent of total imports, and 1.7 per cent of total supply to the UK in Q2 2018.

Pipeline imports were stable, up just 0.4 per cent on last year, with imports from Norway down 1.4 per cent with small additional volumes from Belgium and the Netherlands mitigating this.

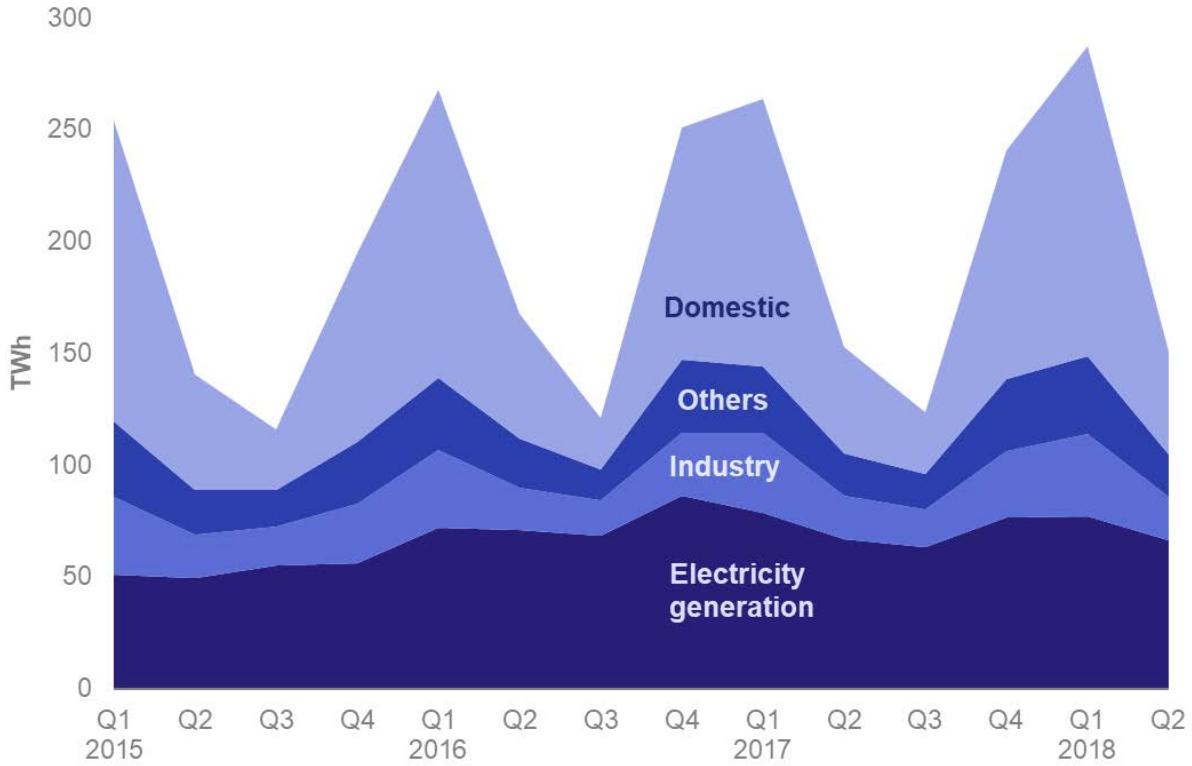
A complete country breakdown for physical pipeline and LNG imports is provided in Energy Trends Table 4.4 - *Supplementary* information *on the origin of UK gas imports*.

Map 4.1: UK imports and exports of gas Q2 2018



Gas

Chart 4.6 UK demand for natural gas (Table 4.1)



UK demand for natural gas in Q2 2018 was down 2.7 per cent in comparison to Q2 2017 (to 170 TWh).

Demand for gas for electricity generation was stable, down just 0.5 per cent in line with a fall in electricity generation and robust production from renewables (see Chapter 5 for more details).

Similarly final consumption was down 3.9 per cent, with domestic use and other final users down 6.7 and 1.9 per cent respectively, driven by warmer weather in Q2 2018 when compared with the same period last year.

4 GAS

Table 4.1. Natural gas supply and consumption

GWh

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change* [1]
SUPPLY													
Indigenous production	463,364	464,929	*+0.3*	112,599	110,387	121,740	124,552	120,091	98,110	122,175	119,707r	112,083	*-6.7*
Imports	534,740	524,890	*-1.8*	114,908	89,950	166,923	168,861	94,995	98,857	162,177	194,527	84,832	*-10.7*
of which LNG	*122,310*	*80,144*	*-34.5*	*35,591*	*36,351*	*13,863*	*20,477*	*26,008*	*18,876*	*14,783*	*17,618r*	*15,240*	*-41.4*
Exports	116,862	125,629	*+7.5*	27,979	51,985	16,735	15,062	40,777	51,590	18,200	9,056	20,681	*-49.3*
Stock change [2]	16,242	11,955		-9,551	-6,797	901	12,725	947	-1,004	-713	*7,586r*	-5,778	*(-)*
Transfers [3]	1,575	2,603		345	457	535	562	631	681	729	708r	750	*+18.8*
Total supply	899,058	878,747	*-2.3*	190,322	142,013	273,363	291,638	175,888	145,054	266,167	313,471r	171,206	*-2.7*
Statistical difference	-2,576	3,917		397	-498	-1,189	1,458	745	374	1,341	590r	738	
Total demand	901,635	874,829	*-3.0*	189,925	142,511	274,552	290,180	175,143	144,680	264,827	312,880r	170,467	*-2.7*
TRANSFORMATION	327,047	315,640	*-3.5*	77,801	73,850	94,526	87,760	73,262	69,394	85,225	86,249r	72,936	*-0.4*
Electricity generation	297,643	285,550	*-4.1*	71,180	68,295	86,314	78,642	66,659	63,487	76,761	77,132r	66,333	*-0.5*
Heat generation [4]	29,404	30,090	*+2.3*	6,621	5,556	8,212	9,117	6,603	5,907	8,463	9,117	6,603	-
Energy industry use	57,589	57,024	*-1.0*	14,051	13,867	13,703	15,183	14,390	13,526	13,925	14,304r	13,531	*-6.0*
Losses	7,139	6,744	*-5.5*	1,760	1,901	1,750	1,934	1,464	1,552	1,794	1,968r	1,329	*-9.2*
FINAL CONSUMPTION	509,860	495,422	*-2.8*	96,313	52,892	164,574	185,304	86,027	60,207	163,883	210,359r	82,671	*-3.9*
Iron & steel	4,084	3,854	*-5.6*	972	955	1,014	1,174	989	866	826	1,063r	925	*-6.4*
Other industries	93,661	97,055	*+3.6*	17,919	14,928	26,922	34,450	18,508	15,632	28,465	35,529r	18,746	*+1.3*
Domestic	311,375	297,035	*-4.6*	55,589	23,098	103,797	119,678	47,624	27,599	102,135	139,074r	44,425	*-6.7*
Other final users	95,631	92,522	*-3.3*	20,555	12,634	31,564	28,763	17,668	14,872	31,219	33,455r	17,337	*-1.9*
Non energy use [4]	5,109	4,956	*-3.0*	1,277	1,277	1,277	1,239	1,239	1,239	1,239	1,239	1,239	-

1. Percentage change between the most recent quarter and the same quarter a year earlier.

2. Stock change + = stock draw, - = stock build.

3. Natural gas used in the manufacture of synthetic coke oven gas and biomethane injections into the grid from installations certified under the Renewable Heat Incentive (RHI).

4. For heat generation and non energy use, the 2018 figures currently shown are the 2017 figures carried forward - these will be updated in June 2019.

Section 5 - Electricity

Key results show:

In 2018 Q2, total electricity generated decreased by 0.7 per cent as total demand fell to 82.0 TWh compared to a year earlier. The demand decrease was largely driven by reduced domestic consumption. (**Chart 5.1**)

Renewables' share of electricity generation increased from 30.6 per cent in 2017 Q2 to a record 31.7 per cent in 2018 Q2, due to increased capacity and a 10.9 per cent increase in average daily sun hours. **(Chart 5.2)**

Nuclear's share of generation decreased from 23.1 per cent in the second quarter of 2017 to 21.7 per cent in the second quarter of 2018. This was due to outages at a number of large reactors, reducing available nuclear capacity. **(Chart 5.2)**

Generation from low carbon sources (renewables plus nuclear) provided more than half of generation, dropping 0.3 percentage points to 53.4 per cent compared to the same period last year. The small decrease in low carbon's share of generation was a result of reduced nuclear generation being balanced by increased renewables generation. **(Chart 5.3)**

Coal's share of generation decreased from 2.0 per cent in 2017 Q2 to a record low of 1.6 per cent in 2018 Q2. Gas remained the dominant fuel type with its share of generation increasing to 42.0 per cent. Since 2015 there has been a large-scale switch in generation from coal to gas. **(Chart 5.2)**

The UK remains a net importer with 6.8 per cent of electricity supplied from net imports in the second quarter of 2018. (**Chart 5.4)**

Relevant tables

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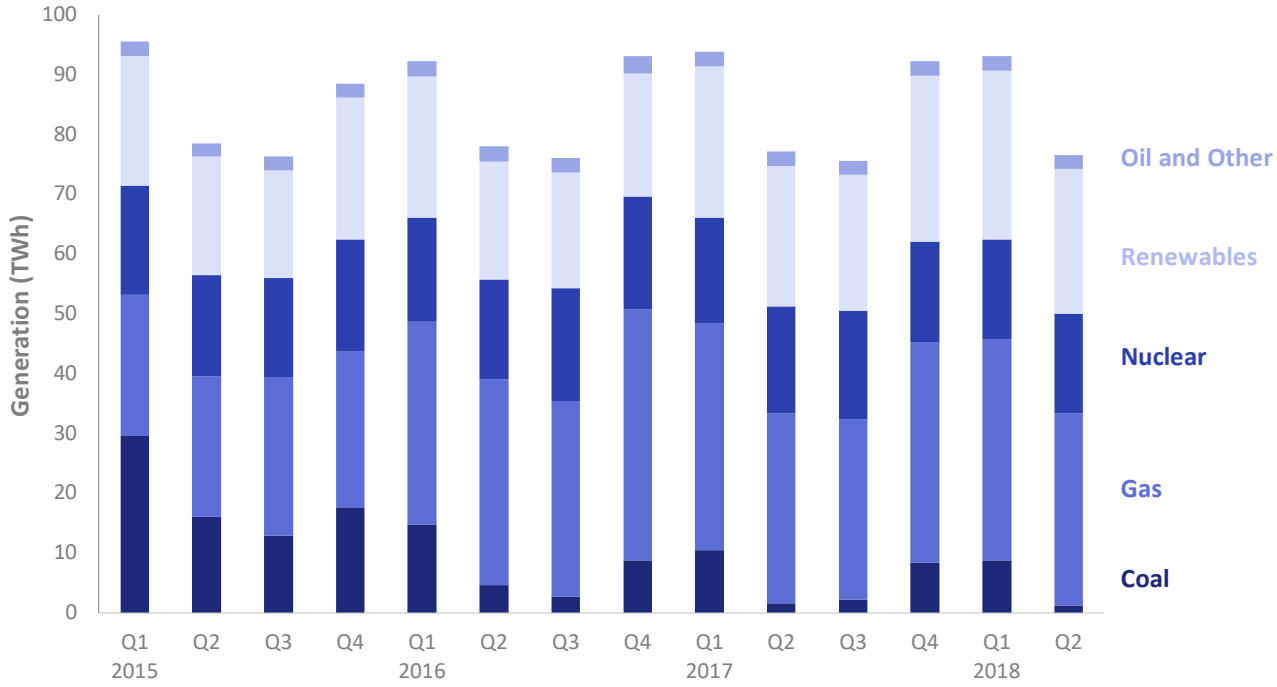
Chart 5.1 Electricity generated by fuel type (Table 5.1)



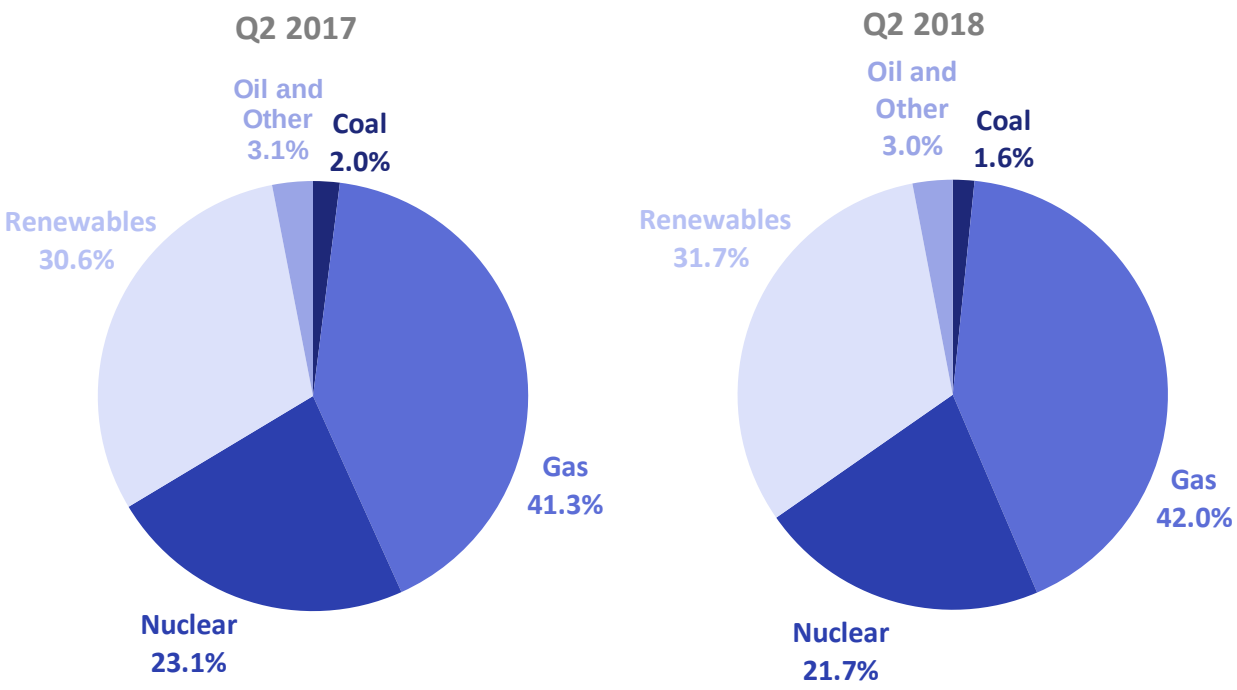
Generation by Major Power Producers (MPPs) decreased by 0.5 per cent compared to 2017 Q2, while generation from other sources decreased by 1.4 per cent. This led to an overall drop of 0.7 per cent in generation, reflecting the reduction in demand. Fossil fuel generation dropped to its lowest level for any previous Q2 (33.7 TWh), while renewable generation increased by 3.0 per cent to 24.3 TWh, a record high for Q2.

Coal fired generation fell by nearly 20 per cent from 1.5 TWh in 2017 Q2 to a new record low of 1.2 TWh in 2018 Q2, as gas generation was favoured over coal. While fuel costs for coal fired generation are lower than for gas, emissions from coal are higher, so generators must pay a greater carbon price per GWh produced. The fall follows the general downward trend in coal fired generation over the last three years.

Nuclear generation decreased by 6.7 per cent from 17.8 TWh in 2017 Q2 to 16.6 TWh in 2018 Q2, due to outages at several large nuclear reactors in Q2 2018. This was offset by rises in gas and bioenergy generation, which increased by 1.0 and 8.8 per cent respectively compared to Q2 2017. The significant increase in bioenergy generation reflects a reduction in the number of outages that affected generation in 2017 Q2.

In 2018 Q2, wind and solar PV generation remained steady at 14.9 TWh (+0.3 per cent on 2017 Q2). However, solar electricity generation reached a record high; MPPs generated 1.3 TWh, an increase of 10.6 per cent on 2017 Q2, due to a 10.9 per cent increase in average daily sun hours for the period - the highest level since Q2 2011. Wind generation remained largely similar compared to Q2 2017 (+0.1 per cent; see Energy Trends table 6.1), as very low wind speeds offset a 15.8 per cent increase in capacity. Hydro generation decreased by 4.5 per cent as rainfall fell 14.6 per cent to its lowest level since Q2 2010.

Chart 5.2 Shares of electricity generation (Table 5.1)



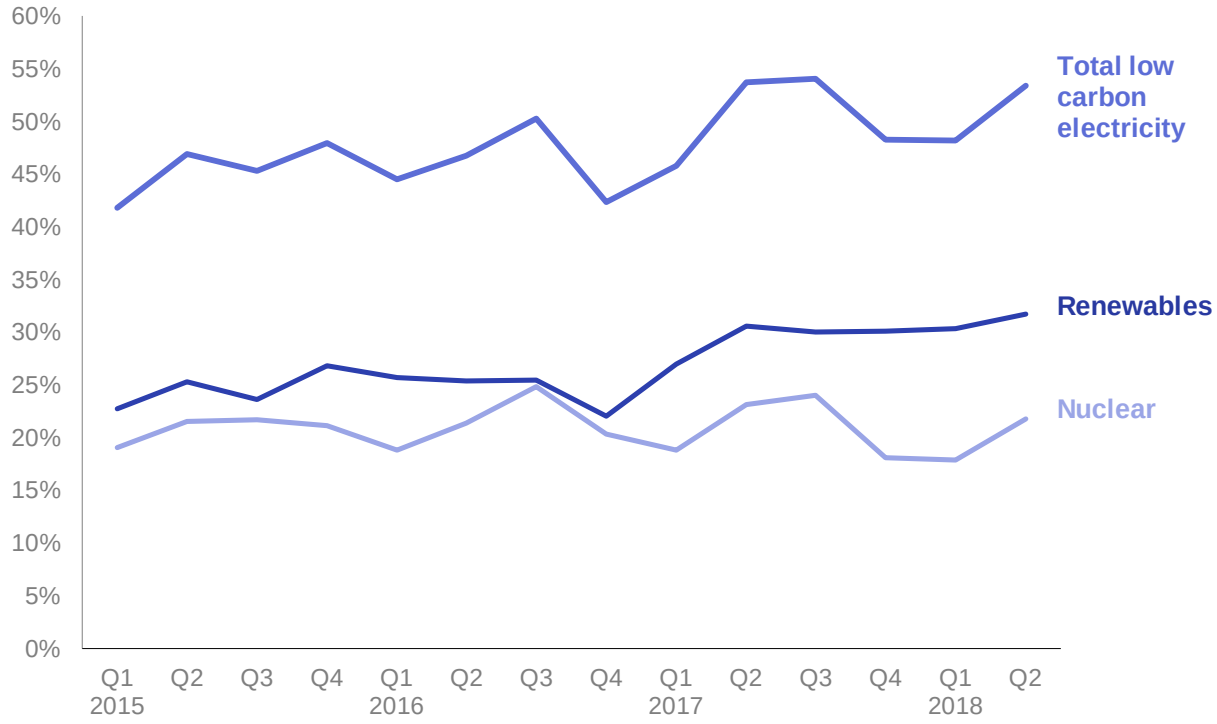
Nuclear's share of generation decreased from 23.1 per cent in the second quarter of 2017 to 21.7 per cent in the second quarter of 2018 following outages at several large reactors, reducing available nuclear capacity. This decrease has caused share increases in all other fuels except coal.

The share of electricity generated from renewables (hydro, wind, bioenergy, solar and other renewables) grew from 30.6 per cent in 2017 Q2 to a record high of 31.7 per cent in 2018 Q2. This was partly due to a 10.9 per cent rise in average daily sun hours to 6.9 hours, the highest level since Q2 2011. Significant increases in capacity also contributed to this, as wind and solar capacity rose by 15.8 and 5.2 per cent, respectively, compared to Q2 2017.

The share of generation from coal decreased from 2.0 per cent in 2017 Q2 to a record low of 1.6 per cent in 2018 Q2. This continues the downward trend in coal generation observed over the past three years.

Gas remains by far the dominant fuel type as its share of generation increased from 41.3 per cent in 2017 Q2 to 42.0 per cent in 2018 Q2, due to the drops in nuclear and coal generation.

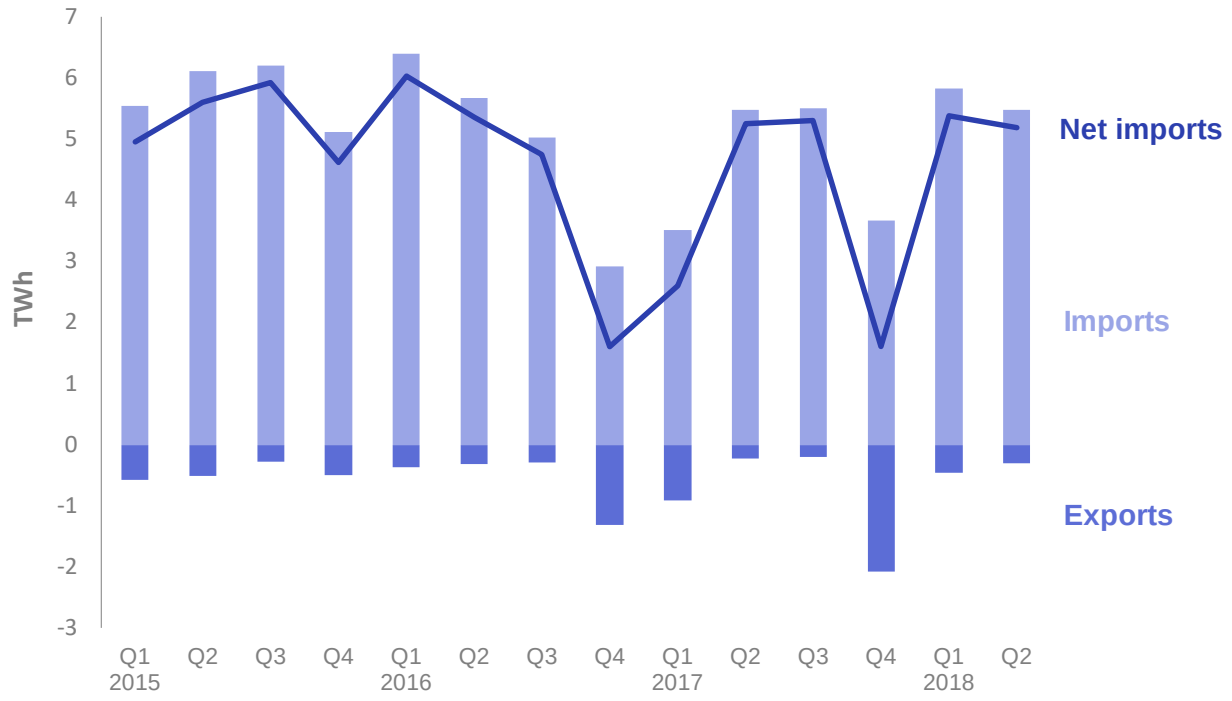
Chart 5.3 Low carbon electricity's share of generation (Table 5.1)



Low carbon electricity's share of generation was steady compared to Q2 2017, decreasing by 0.3 percentage points to 53.4 per cent in Q2 2018, due to an increase in renewable generation and a drop in nuclear generation.

The share of renewable generation reached a record high at 31.7 per cent, rising 1.1 percentage points from Q2 2017, whilst nuclear electricity's share of generation dropped from 23.1 per cent to 21.7 per cent compared to the same period last year, due to outages.

Chart 5.4 UK trade in electricity (Table 5.6)

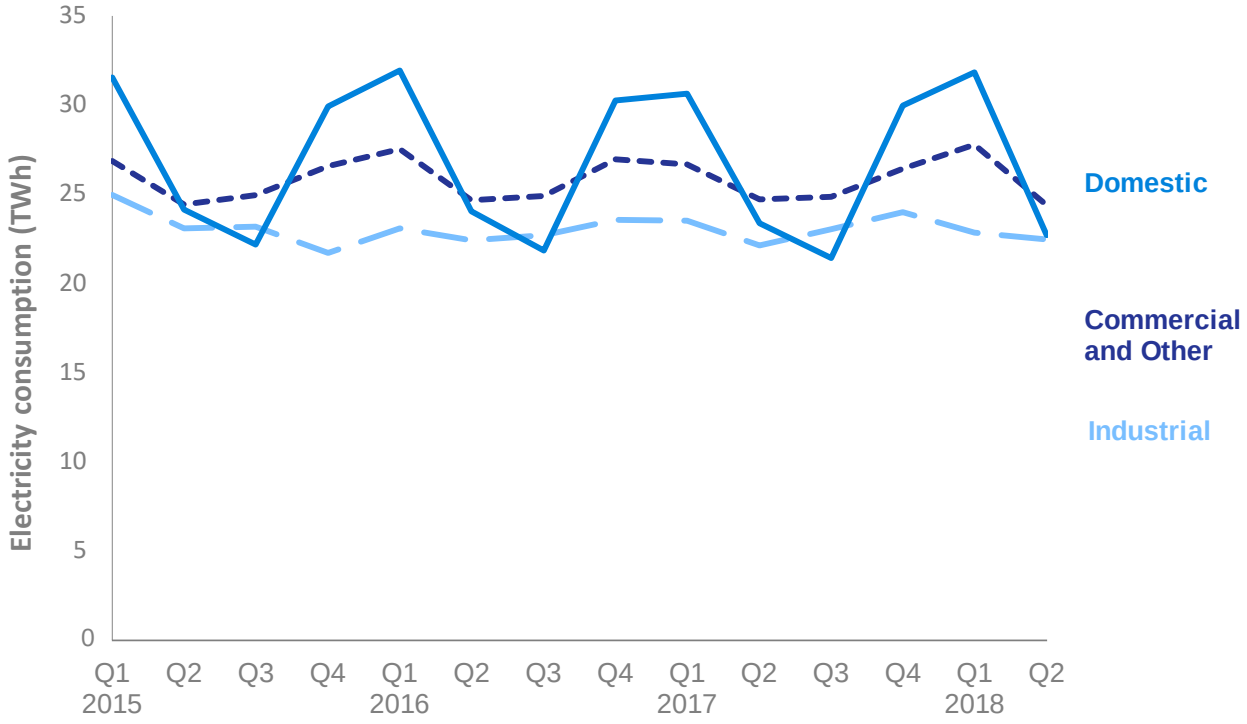


The UK has four interconnectors allowing trade with continental Europe: England-France (2 GW capacity), England-Netherlands (1 GW), Northern Ireland-Ireland (0.6 GW) and Wales-Ireland (0.5 GW).

In 2018 Q2, compared with the same period in 2017, imports of electricity were stable at 5.5 TWh, whilst exports increased by 31.4 per cent (+0.1 TWh). Following two quarters of being a net exporter in 2009 Q4 and 2010 Q1, the UK has remained a net importer in each quarter since.

Net imports of electricity dropped by 1.3 per cent to 5.2 TWh in 2018 Q2. Net imports accounted for 6.8 per cent of the total electricity supplied in 2018 Q2, remaining stable from the same period last year.

Chart 5.5 Electricity final consumption (Table 5.2)

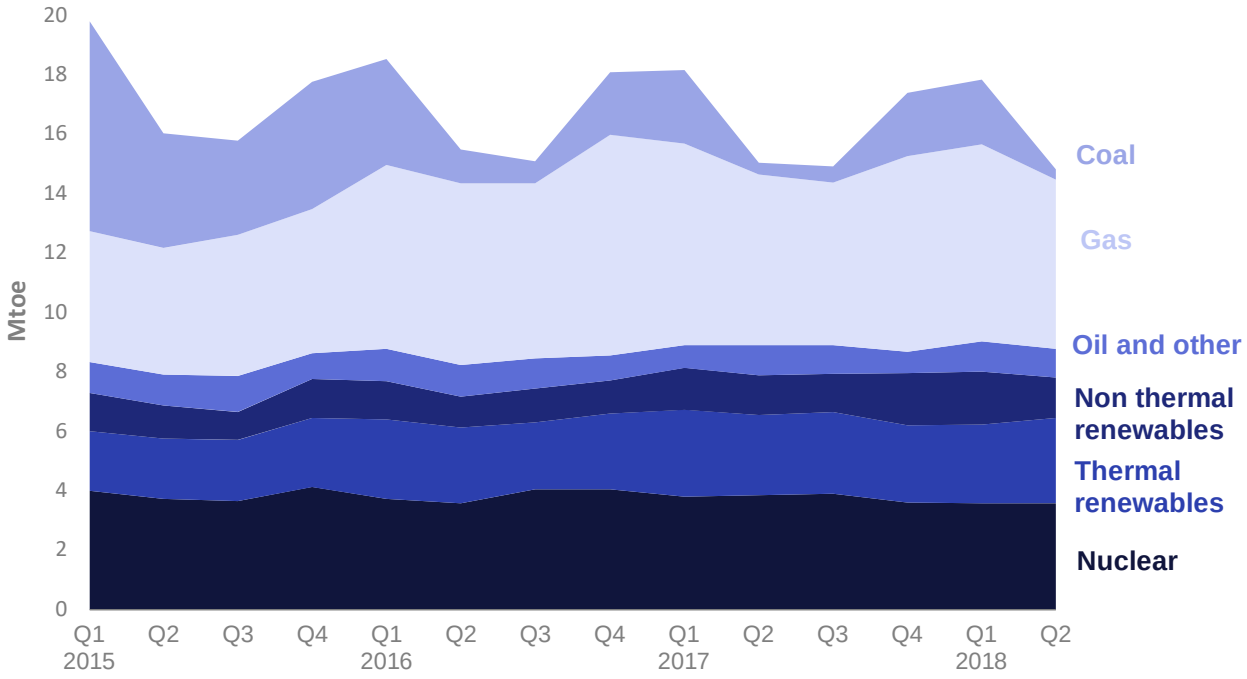


Final consumption of electricity fell by 1.0 per cent in 2018 Q2, from 70.2 TWh in 2017 Q2, to 69.5 TWh.

Domestic use fell by 2.9 per cent to a record low for Q2, from 23.4 TWh to 22.7 TWh, due to an increase in the average temperature compared to the same period in the previous year, as well as the positive impact of improved energy efficiency measures. Average temperatures increased by 1.3 per cent from 12.6 degrees Celsius in Q2 2017 to 12.8 degrees Celsius in the same period in 2018 – see Energy Trends table 7.1 at: www.gov.uk/government/statistics/energy-trends-section-7-weather.

Industrial use of electricity, including iron and steel, increased by 1.5 per cent, to 22.5 TWh, whilst consumption by commercial and other users decreased by 1.4 per cent to 23.2 TWh.

Chart 5.6 Fuel used for electricity generation (Table 5.1)



Fuel used by generators in 2018 Q2 fell by 1.5 per cent, from 15.0 mtoe in 2017 Q2 to 14.8 mtoe. A large reduction in coal usage contributed to this fall, though it was also caused by the continuing shift of the fuel mix to more efficient non-thermal renewables (note that for primary renewable sources, such as wind and solar, the fuel used is assumed the same as the electricity generated, unlike thermal generation where conversion losses are incurred).

In 2018 Q2, coal use was 17.4 per cent lower than a year earlier, reaching a new record low. Meanwhile, gas use was more stable, dropping by 0.5 per cent. This led to a 1.9 per cent decrease in fossil fuel use, though this still represents 41.4 per cent of total fuel use (including net imports). Nuclear use was 6.7 per cent lower than in Q2, 2017 due to outages at several large reactors. Renewable use (hydro, wind and solar and bioenergy) in 2018 Q2 was 4.3 per cent higher than in Q2 2017 and accounted for 28.5 per cent of all fuel used, compared to 27.0 per cent in the previous year.

5 ELECTRICITY

Table 5.1. Fuel used in electricity generation and electricity supplied

	2016	2017	per cent change	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	per cent change [1]
FUEL USED IN GENERATION													
All generating companies												**Million tonnes of oil equivalent**	
Coal	7.54	5.55	*-26.3*	1.13	0.74	2.09	2.49	0.41	0.55	2.11	2.17r	0.33	*-17.4*
Oil	0.58	0.49	*-15.9*	0.15	0.16	0.16	0.10	0.10	0.14	0.15	0.11	0.08	*-18.7*
Gas	25.61	24.59	*-4.0*	6.13	5.88	7.43	6.78	5.74	5.47	6.60	6.64	5.71	*-0.5*
Nuclear	15.41	15.12	*-1.9*	3.58	4.05	4.06	3.79	3.83	3.91	3.59	3.58	3.58	*-6.7*
Hydro	0.48	0.51	*+5.5*	0.08	0.10	0.11	0.16	0.08	0.11	0.16	0.12	0.07	*-4.5*
Wind and Solar [2]	4.10	5.29	*+29.1*	0.96	1.03	1.00	1.25	1.27	1.17	1.60	1.67r	1.28	*+0.3*
Bioenergy [3]	10.00	10.96	*+9.6*	2.54	2.25	2.55	2.93	2.70	2.73	2.60	2.64r	2.88	*+6.4*
Other fuels	1.90	1.69	*-10.9*	0.45	0.45	0.54	0.44	0.44	0.38	0.43	0.43	0.43	*-2.9*
Net imports	1.53	1.27	*-16.8*	0.46	0.41	0.14	0.22	0.45	0.46	0.14	0.46	0.45	*-1.3*
Total all generating companies	67.15	65.49	*-2.5*	15.48	15.08	18.07	18.16	15.03	14.92	17.37	17.83r	14.81	*-1.5*
ELECTRICITY GENERATED													
All generating companies												**TWh**	
Coal	30.67	22.53	*-26.5*	4.58	2.71	8.69	10.43	1.54	2.16	8.40	8.79r	1.24	*-19.5*
Oil	1.89	1.62r	*-14.3*	0.56	0.45	0.54	0.37	0.36	0.46	0.43	0.43r	0.28	*-21.4*
Gas	143.13	136.83r	*-4.4*	34.44	32.63	42.06	37.94	31.80	30.18	36.90r	36.93r	32.13	*+1.0*
Nuclear	71.73	70.34	*-1.9*	16.66	18.86	18.87	17.64	17.83	18.17	16.69	16.64	16.63	*-6.7*
Hydro (natural flow)	5.62	5.93	*+5.5*	0.98	1.20	1.26	1.90	0.91	1.32	1.80	1.39r	0.87	*-4.5*
Wind and Solar [2]	47.67	61.53	*+29.1*	11.12	11.93	11.63	14.50	14.80	13.59	18.64	19.39r	14.85	*+0.3*
- of which, Offshore [6]	16.41	20.96r	*+27.8*	3.25	3.58	4.42	5.17	3.99	3.96	7.84r	7.97r	4.75	*+19.0*
Bioenergy [3]	30.06	31.87	*+6.0*	7.71	6.22	7.61	8.92	7.84	7.78	7.33	7.46r	8.53	*+8.8*
Pumped Storage	2.96	2.87	*-2.9*	0.69	0.69	0.82	0.79	0.69	0.64	0.75	0.75	0.66	*-5.2*
Other fuels	5.57	5.13r	*-7.9*	1.30	1.34	1.53	1.29	1.30	1.30	1.24r	1.35r	1.36	*+4.6*
Total all generating companies	339.30	338.65	*-0.2*	78.02	76.05	93.01	93.79	77.08	75.60	92.18	93.13r	76.55	*-0.7*
SHARES OF ELECTRICITY GENERATED													
All generating companies													
Coal	9.0%	6.7%		5.9%	3.6%	9.3%	11.1%	2.0%	2.9%	9.1%	9.4%	1.6%	
Oil	0.6%	0.5%		0.7%	0.6%	0.6%	0.4%	0.5%	0.6%	0.5%	0.5%	0.4%	
Gas	42.2%	40.4%		44.1%	42.9%	45.2%	40.5%	41.3%	39.9%	40.0%	39.7%	42.0%	
Nuclear	21.1%	20.8%		21.4%	24.8%	20.3%	18.8%	23.1%	24.0%	18.1%	17.9%	21.7%	
Hydro (natural flow)	1.7%	1.8%		1.3%	1.6%	1.4%	2.0%	1.2%	1.7%	2.0%	1.5%	1.1%	
Wind and Solar [2]	14.1%	18.2%		14.2%	15.7%	12.5%	15.5%	19.2%	18.0%	20.2%	20.8%	19.4%	
- of which, Offshore [6]	4.8%	6.2%		4.2%	4.7%	4.8%	5.5%	5.2%	5.2%	8.5%	8.6%	6.2%	
Bioenergy [3]	8.9%	9.4%		9.9%	8.2%	8.2%	9.5%	10.2%	10.3%	7.9%	8.0%	11.1%	
Pumped Storage	0.9%	0.8%		0.9%	0.9%	0.9%	0.8%	0.9%	0.8%	0.8%	0.8%	0.9%	
Other fuels	1.6%	1.5%		1.7%	1.8%	1.6%	1.4%	1.7%	1.7%	1.3%	1.4%	1.8%	
Total all generating companies	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	
Renewable generation share	24.6%	29.3%		25.4%	25.5%	22.0%	27.0%	30.6%	30.0%	30.1%	30.3%	31.7%	
Low carbon generation share	45.7%	50.1%		46.7%	50.2%	42.3%	45.8%	53.7%	54.0%	48.2%	48.2%	53.4%	
ELECTRICITY SUPPLIED [4]													
All generating companies												**TWh**	
Coal	29.10	21.37	*-26.5*	4.34	2.57	8.25	9.90	1.46	2.05	7.97	8.34r	1.18	*-19.5*
Oil	1.71	1.48	*-13.7*	0.51	0.41	0.49	0.34	0.33	0.42	0.39	0.39r	0.26	*-20.8*
Gas	140.61	134.24	*-4.5*	33.82	32.04	41.30	37.25	31.22	29.62	36.15	36.26r	31.53	*+1.0*
Nuclear	65.15	63.89	*-1.9*	15.13	17.13	17.14	16.03	16.20	16.51	15.16	15.12	15.10	*-6.7*
Hydro	5.56	5.86	*+5.4*	0.97	1.19	1.25	1.88	0.90	1.30	1.79	1.38r	0.86	*-4.1*
Wind and Solar [2]	47.67	61.53	*+29.1*	11.12	11.93	11.63	14.50	14.80	13.59	18.64	18.93r	13.55	*-8.5*
- of which, Offshore [6]	16.41	20.96r	*+27.8*	3.25	3.58	4.42	5.17	3.99	3.96	7.84r	7.92r	4.72	*+18.3*
Bioenergy [3]	26.18	27.14	*+3.7*	6.72	5.38	6.62	7.64	6.67	6.61	6.21	6.32r	7.28	*+9.2*
Pumped Storage (net supply) [5]	-1.07	-1.00	*-6.4*	-0.26	-0.23	-0.30	-0.29	-0.25	-0.21	-0.25	-0.27	-0.27	*+9.4*
Other fuels	5.18	4.78	*-7.6*	1.20	1.25	1.43	1.18	1.19	1.19	1.22	0.94r	0.98	*-17.9*
Net imports	17.75	14.76	*-16.8*	5.36	4.74	1.61	2.61	5.25	5.30	1.60	5.38	5.18	*-1.3*
Total all generating companies	337.83	334.06	*-1.1*	78.91	76.42	89.41	91.03	77.78	76.38	88.86	92.79r	75.66	*-2.7*

1. Percentage change between the most recent quarter and the same quarter a year earlier.

2. Includes wave and tidal

3. Up to 2006 Q4, this includes non-biodegradable wastes. From 2007 Q1, this is included in 'Other fuels' (as it is not considered a renewable source).

4. Electricity supplied net of electricity used in generation

5. Net supply from pumped storage is usually negative, as electricity used in pumping is deducted.

6. This now includes a small amount of offshore wind generation from other generators

5 ELECTRICITY

Table 5.2 Supply and consumption of electricity

GWh

	2016	2017	Per cent change	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	Per cent change [1]
SUPPLY													
Indigenous production	339,301	338,649	*-0.2*	78,021	76,051	93,013	93,790	77,080	75,598	92,181	93,127r	76,545	*-0.7*
Major power producers [2 3]	289,984	284,924	*-1.7*	65,442	63,037	80,965	80,771	63,040	61,864	79,249	79,756r	62,728	*-0.5*
Auto producers	46,358	50,853	*+9.7*	11,890	12,322	11,233	12,228	13,346	13,097	12,181	12,625r	13,159	*-1.4*
Other sources [4]	2,959	2,872	*-2.9*	689	693	815	791	694	636	751	746	658	*-5.2*
Imports	20,018	18,167	*-9.2*	5,676	5,028	2,912	3,517	5,476	5,505	3,669	5,832	5,479	*+0.1*
Exports	2,273	3,407	*+49.9*	319	283	1,305	910	226	203	2,068	456	297	*+31.4*
Transfers	-	-		-	-	-	-	-	-	-	-	-	
Total supply	357,046	353,409	*-1.0*	83,378	80,796	94,621	96,397	82,330	80,899	93,783	98,503r	81,727	*-0.7*
Statistical difference	522	- 429		31	162	207	-221	-198	-367	356	104r	- 257	
Total demand	356,524	353,838	*-0.8*	83,348	80,634	94,414	96,618	82,527	81,266	93,427	98,399r	81,984	*-0.7*
TRANSFORMATION	-	-		-	-	-	-	-	-	-	-	-	
Energy industry use [5]	26,633	26,613	*-0.1*	6,297	6,273	7,091	7,128	6,396	6,365	6,725	6,900r	6,425	*+0.5*
Losses	26,096	26,554	*+1.8*	5,965	4,928	6,566	8,723	5,905	5,604	6,323	9,043r	6,018	*+1.9*
FINAL CONSUMPTION	303,795	300,670	*-1.0*	71,086	69,433	80,757	80,767	70,227	69,297	80,380	82,456r	69,541	*-1.0*
Iron & steel	2,847	2,677	*-6.0*	703	707	730	682	670	653	671	668	663	*-1.1*
Other industries	88,961	89,969	*+1.1*	21,728	22,000	22,845	22,808	21,459	22,389	23,313	22,185r	21,793	*+1.6*
Transport	4,686	4,783	*+2.1*	1,171	1,171	1,171	1,196	1,196	1,196	1,196	1,196	1,196	-
Domestic	107,971	105,396	*-2.4*	24,014	21,831	30,222	30,629	23,384	21,423	29,960	31,813r	22,703	*-2.9*
Other final users	99,331	97,846	*-1.5*	23,470	23,725	25,788	25,452	23,518	23,636	25,240	26,595r	23,186	*-1.4*
Non energy use	-	-		-	-	-	-	-	-	-	-	-	

1. Percentage change between the most recent quarter and the same quarter a year earlier.

2. Companies that produce electricity from nuclear sources plus all companies whose prime purpose is the generation of electricity are included under the heading "Major Power Producers". At the end of December 2017 they were:

AES Electric Ltd., Anesco Ltd., Acquisintionco, Baglan Generation Ltd., British Energy plc., British Solar Renewables Ltd., Centrica Energy, Centrica Renewable Energy Ltd., CEP Wind 2, Coolkeeragh ESB Ltd., Corby Power Ltd., Coryton Energy Company Ltd., Cubico Sustainable Investments Ltd., Deeside Power Development Company Ltd., DONG Energy Burbo UK Ltd., Drax Power Ltd., EDF Energy plc., EDF Energy Renewables Ltd., Eggborough Power Ltd., E.On UK plc., Eneco Wind UK Ltd., Energy Power Resources, Falck Renewables Ltd., Fellside Heat and Power Ltd., Ferrybridge Mulitfuel Energy Limited, First Hydro Company., Greencoat UK Wind plc., Immingham CHP, Infinis plc., International Power Mitsui, Lark Energy Ltd., Lightsource Renewable Energy Ltd., London Waste Ltd., Lynemouth Power Ltd., Magnox North Ltd., Marchwood Power Ltd., Peel Energy Ltd., Premier Power Ltd., REG BlackRock , Riverside Resource Recovery Ltd., Rocksavage Power Company Ltd., RWE Innogy Markinch Ltd., RWE Npower plc., Saltend Cogeneration Company Ltd., Scira Offshore Energy Ltd., Scotia Wind (Craigengelt) Ltd., Scottish Power plc., Scottish and Southern Energy plc., Seabank Power Ltd., SELCHP Ltd., Sembcorp Utilities (UK) Ltd., Severn Power Ltd., Slough Heat and Power Ltd., Spalding Energy Company Ltd., Statkraft Energy Ltd., Statkraft Wind UK Ltd.,Third Energy Trading Ltd., Viridor Waste Management Ltd., Xceco

3. This table includes the change of definition of Major power producers (MPPs) to include major wind farm companies. Details of this change of definition were given in an article on pages 43 to 48 of the September 2008 edition of Energy Trends.

4. Gross supply from pumped storage hydro.

5. Includes electricity used in generation and for pumping, along with energy used by other fuel industries (including coal and coke, blast furnaces, extraction of oil and gas, petroleum refiniries, nuclear fuel production and gas and electricity supply) .

Section 6 - Renewables

Key results show:

Renewables' share of electricity generation was a record 31.7 per cent in 2018 Q2, up 1.1 percentage points on the share in 2017 Q2, reflecting increased capacity as well as lower overall electricity generation. **(Chart 6.1)**

Renewable electricity generation was 24.3 TWh in 2018 Q2, an increase of 3.0 per cent on the 23.6 TWh in 2017 Q2, but 14 per cent lower than the previous quarter which had been a record for renewable electricity generation (28.2 TWh). **(Chart 6.2)**

Onshore wind generation decreased by 12 per cent (0.8 TWh). Offshore wind rose by 19 per cent (0.8 TWh), to 4.8 TWh but was still 40 per cent lower than the previous quarter when wind average speeds were much higher. The largest increase among the other technologies was for plant biomass (wood) which increased by 12 per cent (0.6 TWh) to 5.5 TWh due increased capacity. **(Chart 6.2)**

Renewable electricity capacity was 42.2 GW at the end of 2018 Q2, a 10 per cent increase (3.9 GW) on a year earlier, and a 1.4 per cent (0.6 GW) increase on the previous quarter, with over half of the annual increase coming from offshore wind. **(Chart 6.3)**

In 2018 Q2, just 37 MW of capacity eligible for the Feed in Tariff scheme was installed, increasing the total to 6.4 GW, across 939,000 installations. **(Chart 6.5)**

Liquid biofuels consumption increased by 14 per cent, from 404 million litres in 2017 Q2 to 460 million litres in 2018 Q2, boosted by a 27 per cent increase in biodiesel consumption. In 2017 Q2, liquid biofuels represented 3.8 per cent of petrol and diesel consumed in road transport, up from 3.4 per cent a year earlier. **(Chart 6.6)**

Relevant tables

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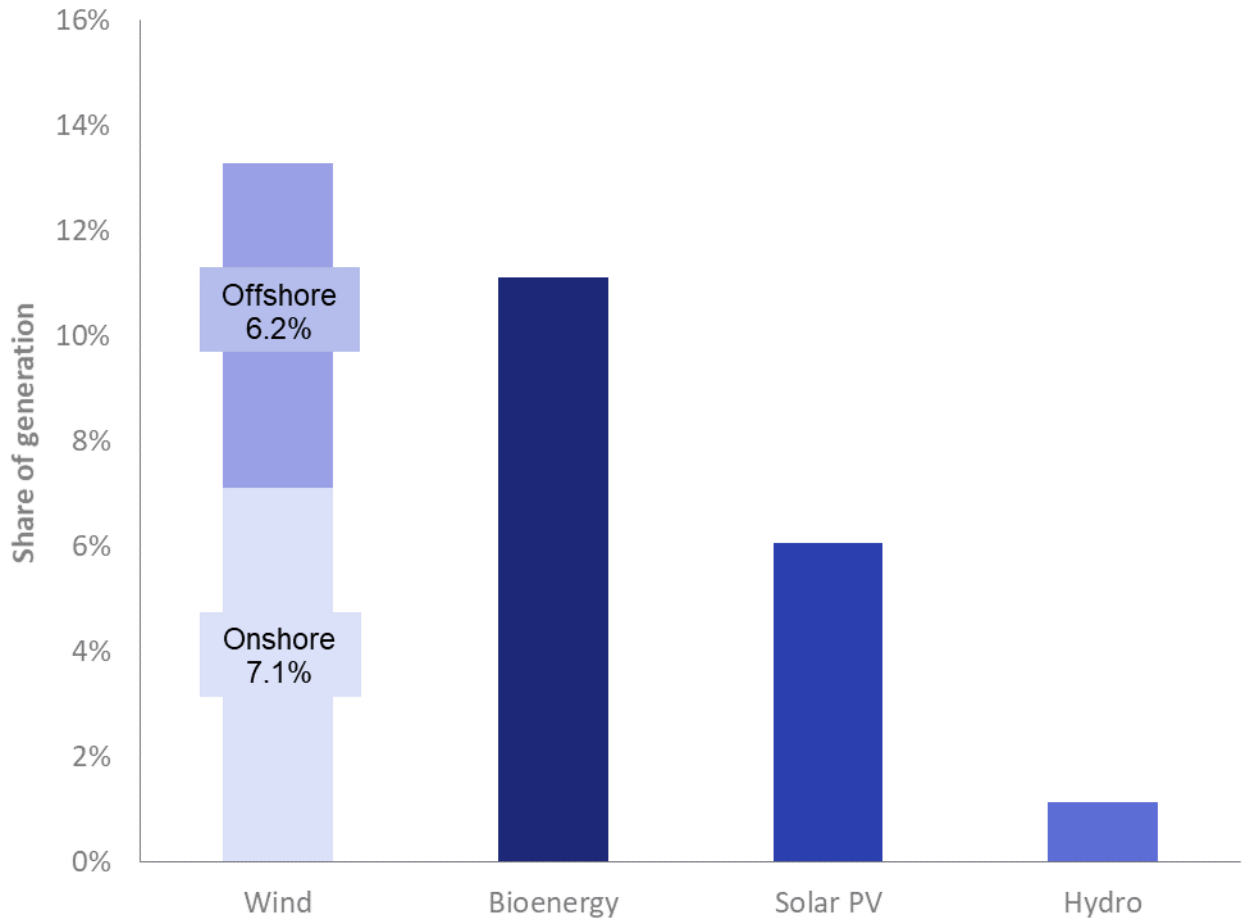
Chart 6.1 Renewables' share of electricity generation (Table 6.1)



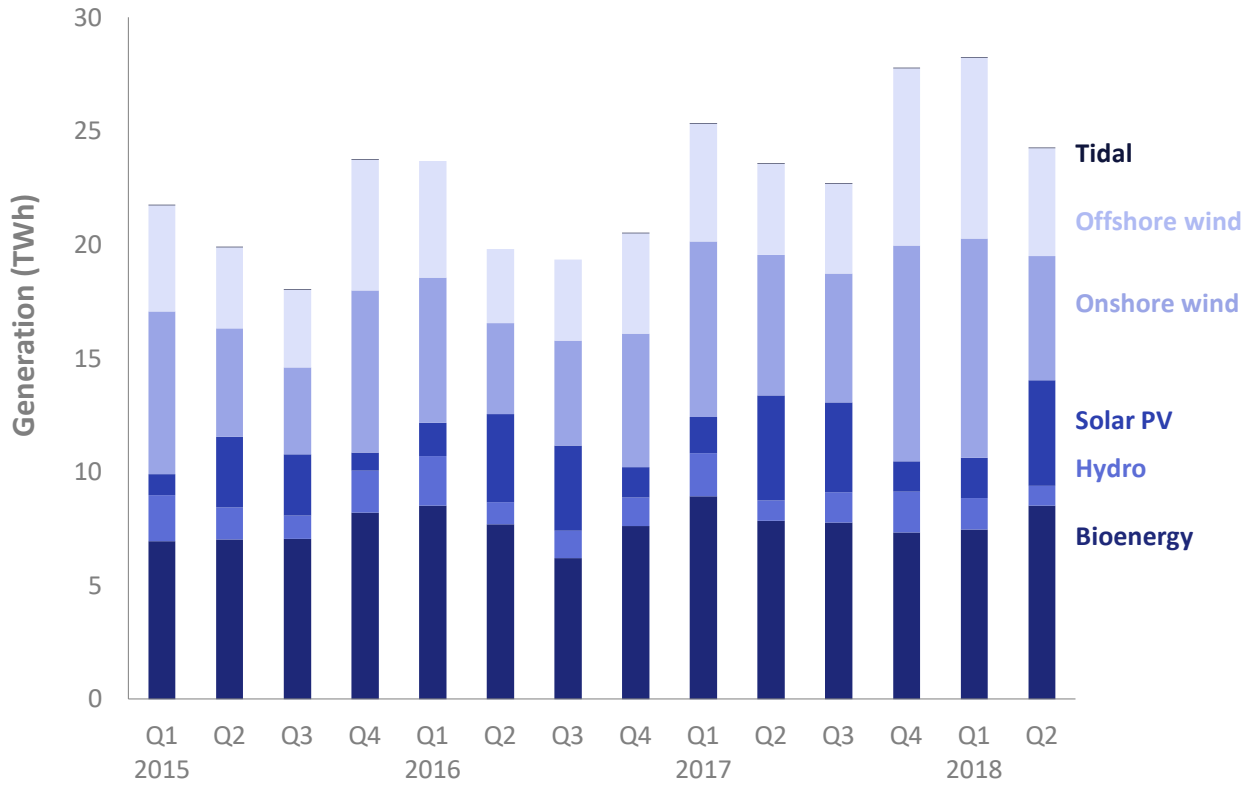
Renewables' share of electricity generation increased to a record 31.7 per cent in 2018 Q2 from 30.6 per cent in 2017 Q2 which had previously been a record.

The increased share on a year earlier mostly reflects increased capacity, particularly in wind and solar PV, as well as lower overall generation.

Total electricity generated from renewables in 2018 Q2 was up by 0.7 TWh (3.0 per cent) on 2017 Q2, to 24.3 TWh, but remained 4.0 TWh (14 per cent) lower than previous quarter which was a record of 28.2 TWh. Despite a fall from the previous quarter, the percentage share of electricity generated from renewables increased as overall generation was much lower (by 18 per cent on the first quarter of the year).

Total electricity generation figures (all generating companies) can be found in table ET 5.1, at: www.gov.uk/government/statistics/electricity-section-5-energy-trends

Chart 6.2 Renewable electricity generation (Table 6.1)



In 2018 Q2, electricity generated from onshore wind decreased by 12 per cent, from 6.2 TWh in 2017 Q2 to 5.5 TWh. However, generation from offshore wind was up by 19 per cent (0.8 TWh), to 4.8 TWh but was still 40 per cent lower than the previous quarter when wind average speeds were much higher. Wind speeds in 2018 Q2, at 7.6 knots, were down 0.7 knots on 2017 Q2, and lower than the long term mean - see Energy Trends table 7.2 at:
www.gov.uk/government/statistics/energy-trends-section-7-weather.

Generation from solar photovoltaics increased 0.9 per cent to 4.6 TWh compared to 2017 Q2 to set a new record for solar generation as a result of increased capacity and average sunlight hours per day being 0.4 hours higher than the long term mean.

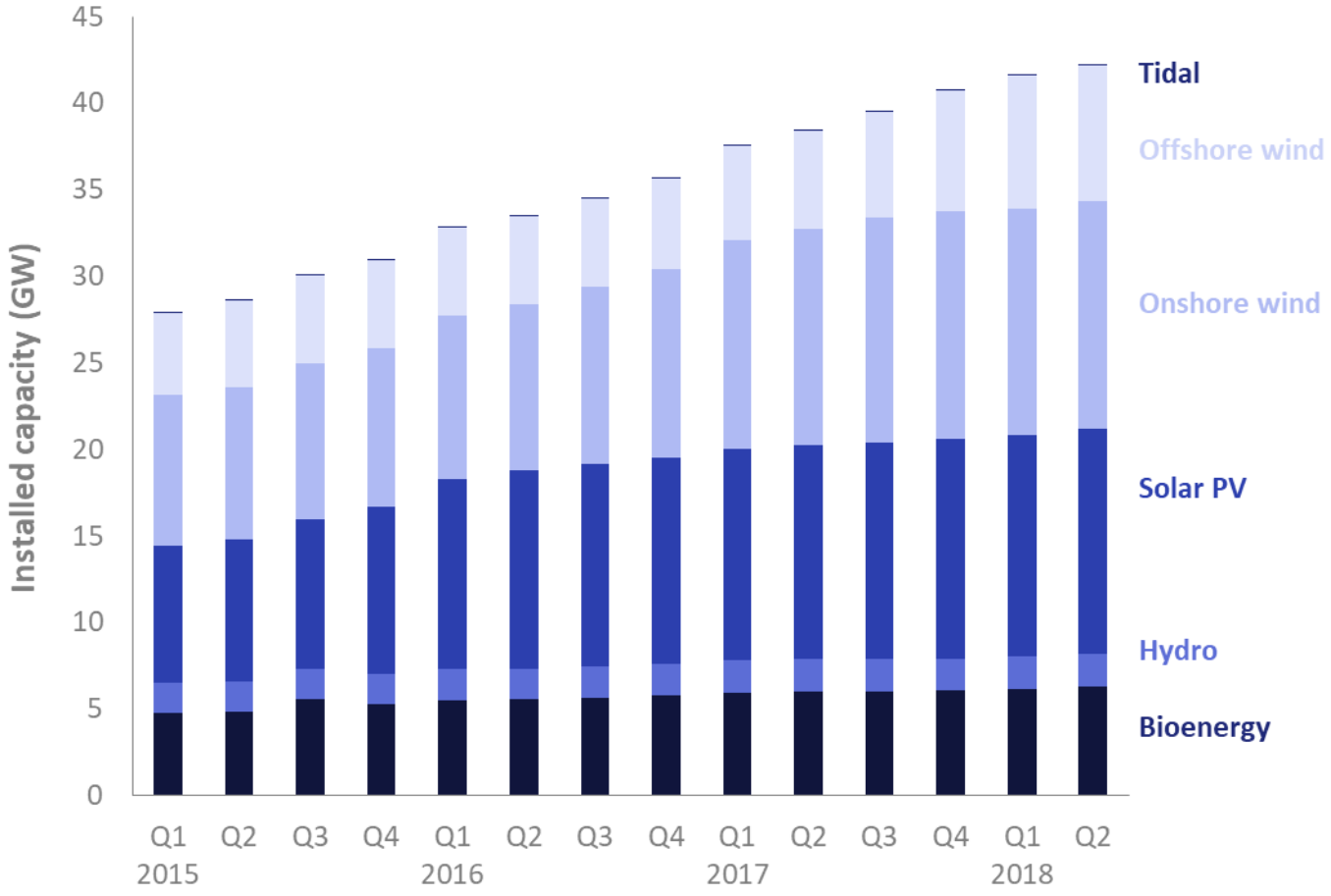
Hydro generation dropped 4.5 per cent but remains at 0.9 TWh when rounded; there was an increase in capacity but average rainfall (in the main hydro catchment areas) fell by 15 per cent during the quarter; Energy Trends table 7.4 at:
www.gov.uk/government/statistics/energy-trends-section-7-weather.

In 2018 Q2, generation from bioenergy[1], at 8.5 TWh, was up by 8.8 per cent on a year earlier. Within this, the largest increase came from plant biomass (burning wood) which was up by 0.6 TWh (12 per cent) on 2017 Q1. Generation from biodegradable waste was up 12 per cent and animal biomass was up by 15 per cent but this only represents a small fraction of bioenergy. These increases were offset by reduced generation from landfill gas and anaerobic digestion.

Bioenergy had the largest share of generation (35 per cent), 22 per cent came from onshore wind, 20 per cent from offshore wind, 19 per cent from solar PV and 3.6 per cent from hydro.

[1] Bioenergy consists of: landfill gas, sewage gas, biodegradable municipal solid waste, plant biomass, animal biomass, anaerobic digestion and co-firing (generation only)

Chart 6.3 Renewable electricity capacity (as at end of quarter) (Table 6.1)



At the end of 2018 Q2, the UK's renewable electricity capacity totalled 42.2 GW, an increase of 10 per cent (3.9 GW) on that installed at the end of 2017 Q2, and 1.4 per cent (0.6 GW) higher than the previous quarter.

At the end of 2018 Q2, onshore wind and solar PV, both represented around 31 per cent of all renewable capacity, the highest share of renewable technologies. This was followed by offshore wind (19 per cent) and bioenergy.[2]

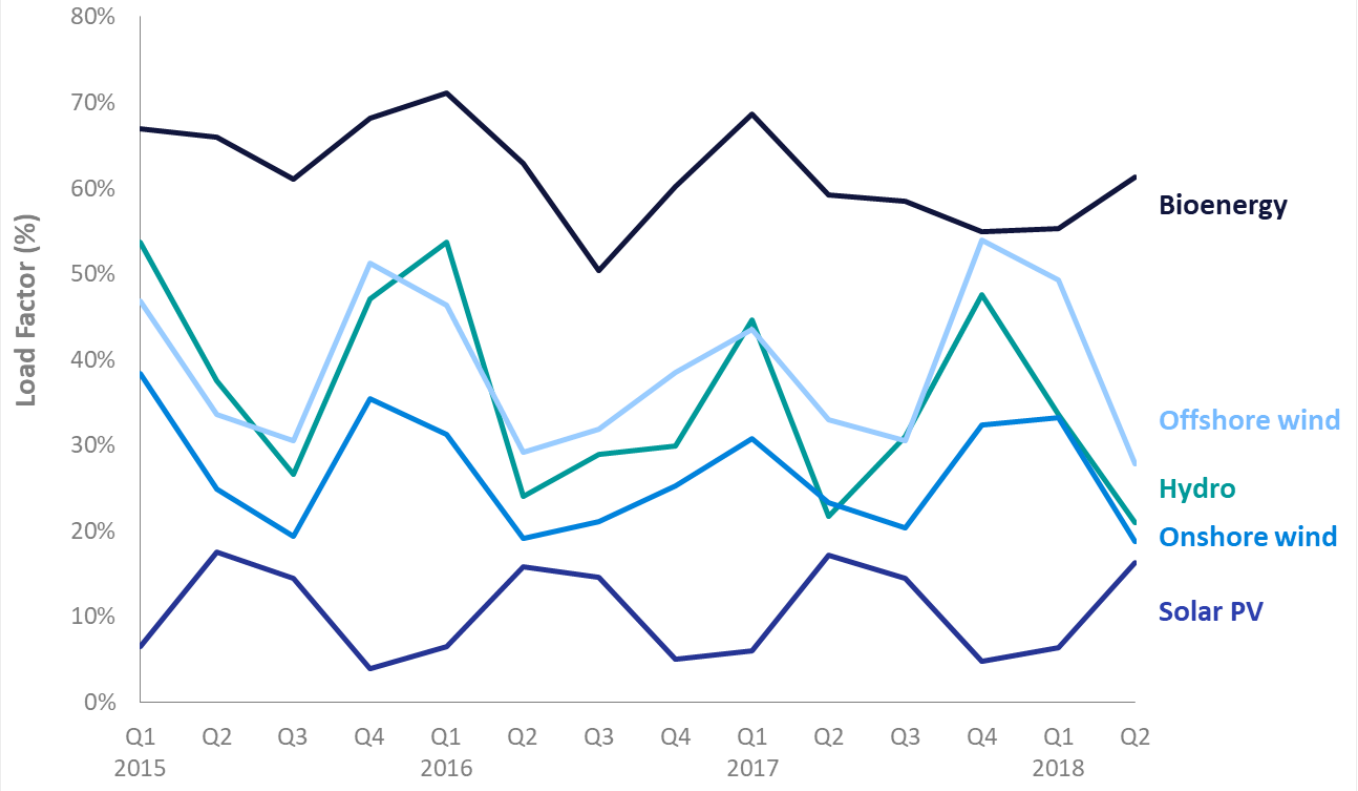
Compared with 2017 Q2, the biggest increase was in offshore wind capacity which rose by 2.2 GW (38 per cent). Most of the increase was seen in 2018 Q1 where there was a large expansion to an existing site. Onshore wind capacity increased by around 0.8 GW and solar PV capacity by around 0.6 GW.

Increases in Solar PV capacity are slower than the rapid expansion seen in 2010 – 2016, partly due to the close of the Renewables Obligation (RO).

Across the year, bioenergy capacity increased by 257 MW, including a new Biodegradable MSW scheme in the latest quarter.

[2] To note that renewable generation and capacity figures include installations accredited on all support schemes (Renewables Obligation, Feed in Tariffs, Contracts for Difference), as well as those not eligible for support or are commissioned but awaiting support accreditation. This should particularly be noted for solar PV (and onshore wind), where figures consist of many installations across several or all of these categories.

Chart 6.4 Renewable electricity load factors (Table 6.1)



In 2018 Q2, onshore wind's load factor fell by 4.2 percentage points, from 23.2 per cent in 2017 Q2 to 19.0 per cent, due to lower onshore wind speeds. Offshore wind's load factor decreased by 5.1 percentage points, from 32.9 per cent in 2017 Q2 to 28.1 per cent in 2018 Q2. [3]

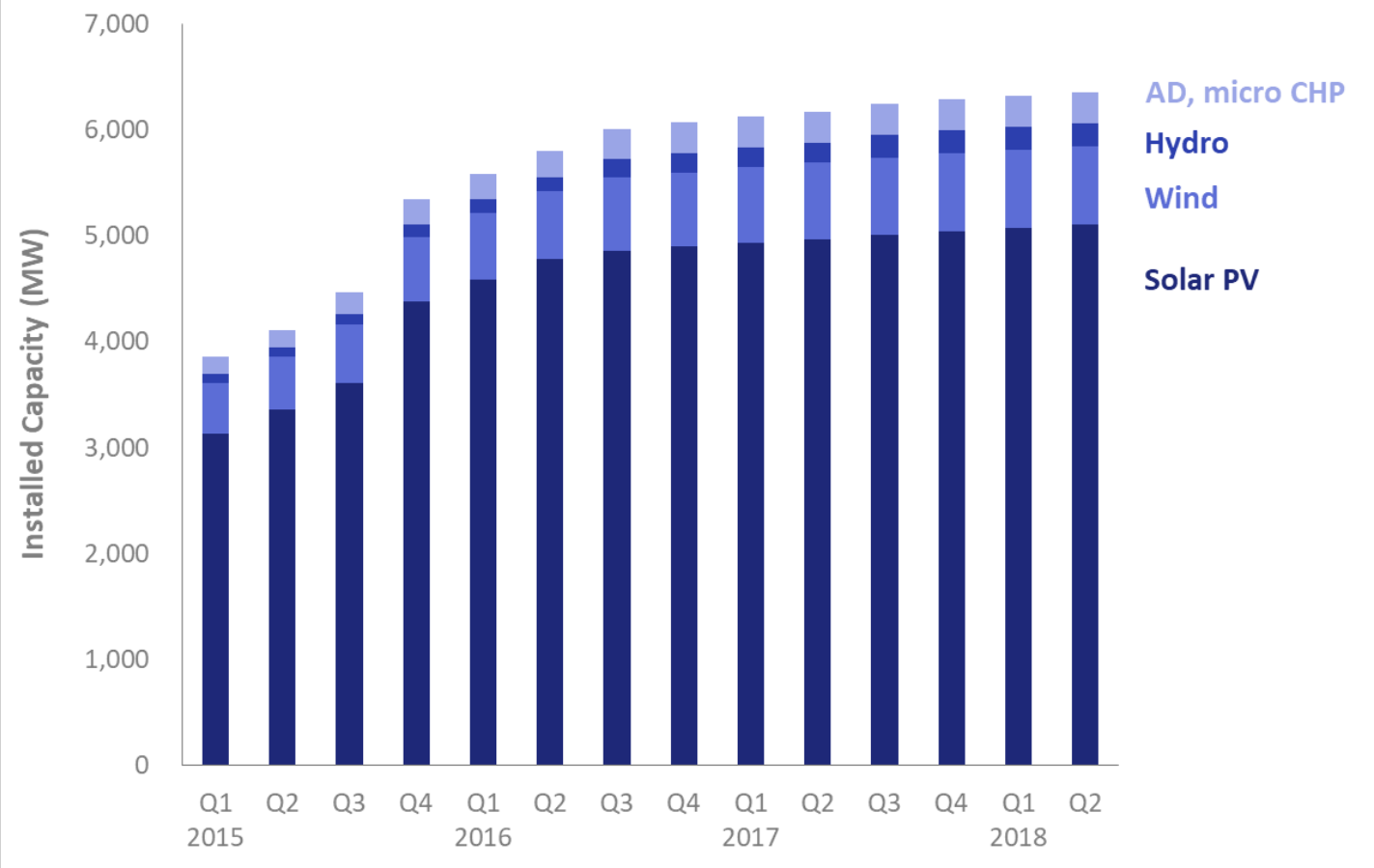
Wind factors for onshore and offshore wind were only around half of the level of the previous quarter as winds speeds were on average 2.1 knots lower.

Hydro's load factor in 2017 Q2 decreased by 1.4 percentage points, from 22.6 per cent in 2017 Q2 to 21.2 per cent, due to lower rainfall, the lowest for Q2 since 2010. Compared with the most recent quarter, hydro's load factor in 2018 Q2 was 13 percentage points lower, with rainfall in the main hydro areas only around half that of Q1 2018.

For bioenergy, the load factor in 2018 Q2, at 62.8 per cent, up by 3.0 percentage points on a year earlier. Generation in Q1 2017 had been affected by an outage at Drax, the largest generator within the bioenergy category, which reduced the load factor in that quarter.

[3] Load Factors are calculated using an average of capacity at the start and end of the quarter. Therefore, they can be influenced by the time in the quarter when any new capacity came online.

Chart 6.5 Feed in Tariffs: eligible installed capacity (as at end of quarter)



At the end of 2018 Q2, 6,355 MW of capacity was installed and eligible for the GB Feed in Tariff (FiT) scheme[4]. This was a 3.0 per cent increase on that installed at the end of 2017 Q2, but just 0.6 per cent (37 MW) up on the previous quarter.

In terms of number of installations, at the end of 2018 Q2, there were over 939,000 installed and eligible for the FiT scheme, a 3.7 per cent increase on the number installed a year earlier.

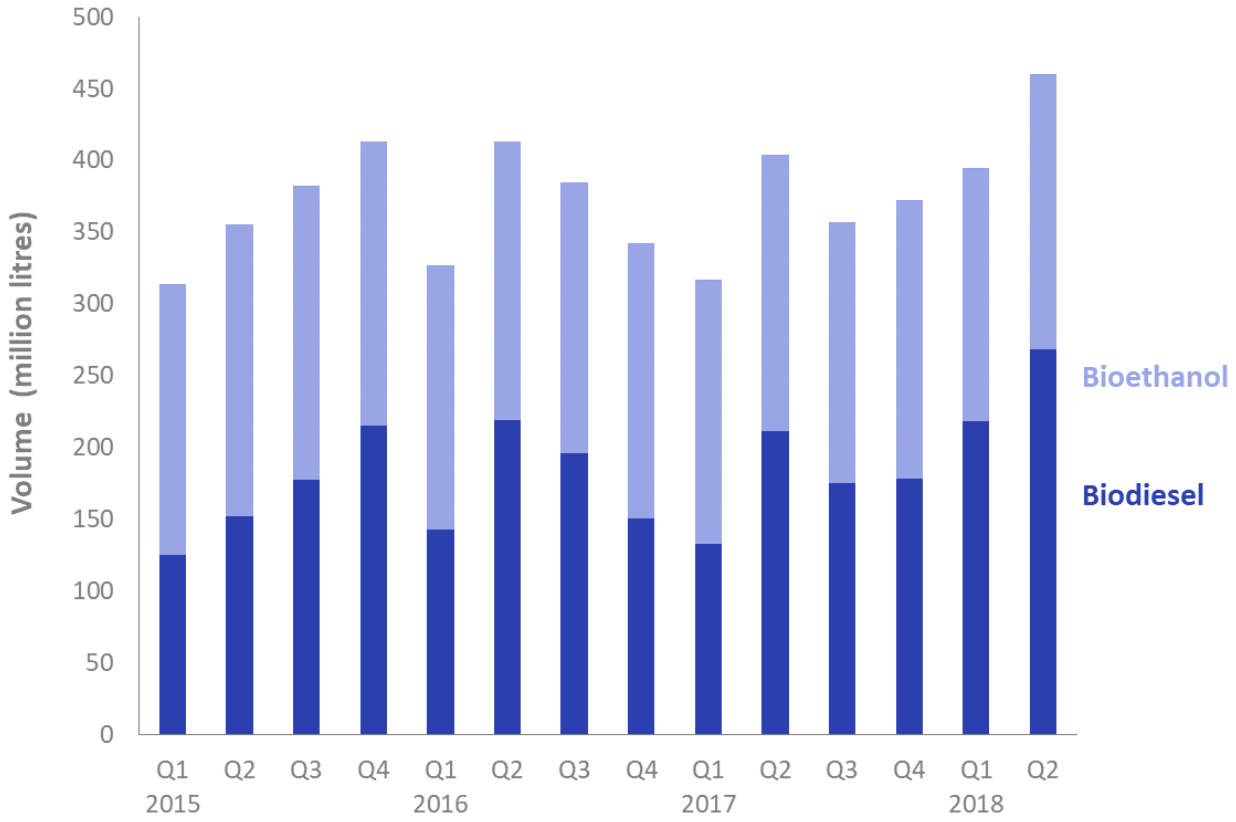
Solar photovoltaics (PVs) represent the majority of both installations and installed capacity on FiTs, with, respectively, 99 per cent and 80 per cent of the total. Nearly half of FiT-eligible PV installations are sub-4 kW retrofitted schemes, 2.501 MW (49 per cent) in 2018 Q2.

Renewable installations eligible for FiTs (all except MicroCHP) represented 15 per cent of all renewable installed capacity.

Statistics on Feed in Tariffs can be found at:
www.gov.uk/government/collections/feed-in-tariff-statistics

[4] Data are for schemes accredited under the Microgeneration Certification Scheme (MCS) and ROOFIT, which are pre-requisites for registering for the FIT scheme; not all of these installations will eventually be confirmed onto the FIT scheme.

Chart 6.6 Liquid biofuels for transport consumption (Table 6.2)



In 2018 Q2, 460 million litres of liquid biofuels were consumed in transport, an increase of 14 per cent compared to 2017 Q2 (404 million litres).

Bioethanol consumption fell slightly (0.5 per cent) from 193 million litres in 2017 Q2 to 192 million litres in 2018 Q2. Biodiesel increased by 27 per cent from 211 million litres in 2017 Q2 to 268 million litres in 2018 Q2.

Biodiesel accounted for 58 per cent of biofuels consumption, with bioethanol accounting for the remaining 42 per cent.

In the second quarter of 2018, bioethanol accounted for 4.5 per cent of motor spirit, and biodiesel 3.4 per cent of diesel (DERV). Their combined contribution was 3.8 per cent, an increase of 0.4 percentage points compared to 2017 Q2.

6 RENEWABLES

Table 6.1. Renewable electricity capacity and generation

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter	2017 3rd quarter	2017 4th quarter	2018 1st quarter	2018 2nd quarter p	*per cent change* [11]
Cumulative Installed Capacity [1]												**MW**	
Onshore Wind	10,880	12,847	*+18.1*	9,600	10,236	10,880	12,103	12,345	12,682r	12,847	13,113	13,170	*6.7*
Offshore Wind	5,293	6,988	*+32.0*	5,095	5,095	5,293	5,455	5,653	6,101	6,988	7,669	7,823	*38.4*
Shoreline wave / tidal	13	18	*+36.4*	8	8	13	18	18	18	18	18	20	*10.9*
Solar photovoltaics	11,912	12,776	*+7.3*	11,467	11,748	11,912	12,263	12,442	12,568	12,776	12,766	13,012	*4.6*
Small scale Hydro	359	396	*+10.4*	311	343	359	361	366	406	396	397	397	*8.4*
Large scale Hydro	1,477	1,479	*+0.1*	1,477	1,477	1,477	1,479	1,479	1,479	1,479	1,479	1,479	-
Landfill gas	1,062	1,066	*+0.4*	1,062	1,062	1,062	1,066	1,066	1,066	1,066	1,067	1,067	*0.1*
Sewage sludge digestion	257	245	*-4.6*	257	257	257	245	245	245	245	246	246	*0.3*
Energy from waste	1,028	1,091	*+6.1*	939	988	1,028	1,077	1,077	1,077	1,091	1,118	1,128	*4.7*
Animal Biomass (non-AD) [2]	129	129	-	129	129	129	129	129	129	129	129	129	-
Anaerobic Digestion	426	460	*+7.9*	368	385	426	445	448	449	460	409	412	*-8.0*
Plant Biomass [3]	2,852	3,055	*+7.1*	2,788	2,798	2,852	3,003	3,055	3,055	3,055	3,194	3,296	*7.9*
Total	35,690	40,551	*+13.6*	33,502	34,526	35,690	37,645r	38,324r	39,276r	40,551	41,605	42,178	*10.1*
Co-firing [4]	13	9	*-34.5*	13	13	13	9	9	9	9	10	11	*22.8*
Generation [5]												**GWh**	
Onshore Wind [6]	20,857	29,088	*+39.5*	3,996	4,604	5,877	7,723	6,204	5,655	9,506	9,631	5,453	*-12.1*
Offshore Wind [6, 7]	16,406	20,916	*+27.5*	3,253	3,584	4,419	5,166	3,993	3,961	7,795	7,967	4,752	*19.0*
Shoreline wave / tidal [6]	0	4	*(+)*	-	-	0	0	0	2	1	3	2	*(+)*
Solar photovoltaics [6]	10,411	11,525	*+10.7*	3,868	3,747	1,333	1,610	4,606	3,972	1,336	1,787	4,647	*0.9*
Hydro [6]	5,617	5,928	*+5.5*	977	1,201	1,264	1,898	909	1,317	1,803	1,388	868	*-4.5*
Landfill gas [6]	4,703	4,284	*-8.9*	1,171	1,158	1,156	1,093	1,055	1,065	1,071	1,013	973	*-7.8*
Sewage sludge digestion [6]	950	967	*+1.8*	251	229	234	241	247	235	244	239	258	*4.3*
Energy from waste [8]	2,740	3,386	*+23.6*	626	678	710	848	823	871	844	889	922	*12.0*
Co-firing with fossil fuels	117	54	*-54.1*	15	5	47	52	0	1	-	-	111	*(+)*
Animal Biomass (non-AD) [2, 6]	650	649	*-0.2*	165	141	173	172	164	141	173	191	189	*15.3*
Anaerobic Digestion	2,082	2,470	*+18.6*	500	531	561	601	619	629	621	550	539	*-12.9*
Plant Biomass [3, 6]	18,822	20,059	*+6.6*	4,979	3,479	4,728	5,916	4,933	4,838	4,373	4,575	5,536	*12.2*
Total	83,354	99,330	*+19.2*	19,800	19,356	20,503	25,321	23,554	22,687	27,768	28,233	24,251	*3.0*
Non-biodegradable wastes [9]	2,742	3,485	*+27.1*	626	678	710	809	859	911	905	900	901	*4.9*
Load Factors [10]													
Onshore Wind	23.6%	28.0%		19.2%	21.0%	25.2%	31.1%	23.2%	20.5%	33.7%	34.3%	19.0%	
Offshore Wind	36.0%	38.9%		29.2%	31.9%	38.5%	44.5%	32.9%	30.5%	53.9%	50.3%	28.1%	
Solar photovoltaics	11.0%	10.7%		15.8%	14.6%	5.1%	6.2%	17.1%	14.4%	4.8%	6.5%	16.5%	
Hydro	35.4%	36.5%		25.0%	30.2%	31.3%	47.8%	22.6%	32.0%	43.5%	34.3%	21.2%	
Landfill gas	50.4%	46.0%		50.5%	49.4%	49.3%	47.6%	45.3%	45.2%	45.5%	43.9%	41.7%	
Sewage sludge digestion	44.3%	43.9%		44.7%	40.3%	41.3%	44.3%	46.1%	43.3%	45.1%	45.0%	48.0%	
Energy from waste	31.9%	36.5%		30.7%	31.8%	31.9%	37.3%	35.0%	36.6%	35.3%	37.3%	37.6%	
Animal Biomass (non-AD)	61.7%	57.3%		58.5%	49.2%	60.7%	61.4%	58.1%	49.2%	60.6%	68.3%	67.0%	
Anaerobic Digestion	62.2%	63.6%		62.7%	64.0%	62.7%	63.9%	63.5%	63.6%	61.9%	58.6%	60.1%	
Plant Biomass	78.5%	77.5%		81.8%	56.4%	75.8%	93.6%	74.6%	71.7%	64.8%	67.8%	78.1%	
Total (excluding co-firing and non-biodegradable wastes)	28.4%	29.7%		27.3%	25.8%	26.4%	31.9%	28.4%	26.5%	31.5%	31.8%	26.4%	
Renewable share of electricity generation (%)													
Onshore wind	6.1%	8.6%		5.1%	6.1%	6.3%	8.3%	8.1%	7.5%	10.1%	10.3%	7.1%	
Offshore wind	4.8%	6.2%		4.2%	4.7%	4.8%	5.5%	5.2%	5.2%	8.4%	8.6%	6.2%	
Shoreline wave / tidal	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Solar photovoltaics	3.1%	3.4%		5.0%	4.9%	1.4%	1.7%	6.0%	5.3%	1.4%	1.9%	6.1%	
Hydro	1.7%	1.8%		1.2%	1.5%	1.3%	1.9%	1.1%	1.7%	2.1%	1.5%	1.1%	
Bioenergy	8.9%	9.4%		9.9%	8.2%	8.2%	9.5%	10.2%	10.3%	7.9%	8.0%	11.1%	
All renewables	**24.6%**	**29.3%**		**25.3%**	**25.4%**	**22.0%**	**27.0%**	**30.6%**	**30.0%**	**30.1%**	**30.3%**	**31.7%**	

1. Cumulative capacity at the end of the quarter/year
2. Includes the use of poultry litter and meat and bone.
3. Includes the use of straw and energy crops. Also includes high-range co-firing (>85% biomass).
4. This is the amount of fossil fuelled capacity used for co-firing of renewables based on the proportion of generation accounted for by the renewable source over the course of the year.
5. Generation figures for the latest quarter are highly provisional, particularly for the thermal renewable technologies (such as landfill gas) in the lower half of the table.
6. Actual generation figures are given where available, but otherwise are estimated using a typical load factor or the design load factor, where known. Generation from FiT schemes is estimated this way.
7. For 2009, shoreline wave and tidal are included in offshore wind.
8. Biodegradable part only, which accounts for 50% from 2015.
9. Non-biodegradable (50%, from 2015) part of Energy from Waste, plus a small quantity of generation from waste tyres, hosptal waste and general industrial waste.
10. Load factors are calculated based on installed capacity at the beginning and the end of the quarter/year. These can be influenced by the time in the period when new capacity came online.
Load factors on an *unchanged configuration* basis, which consider just those sites operational throughout the year, are available annually in table DUKES 6.5, at:
https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes
11. Percentage change between the most recent quarter and the same quarter a year earlier; (+) represents a positive percentage change greater than 100%.

6 RENEWABLES

Table 6.2. Liquid biofuels for transport consumption

	2016	2017	*per cent change*	2016 2nd quarter	2016 3rd Quarter	2016 4th Quarter	2017 1st Quarter	2017 2nd Quarter	2017 3rd Quarter	2017 4th Quarter	2018 1st Quarter	2018 2nd Quarter p	*per cent change*[1]
Volume (million litres)												**Million litres**	
Bioethanol	759	753	*-0.8*	194	189	192	184	193	182	194	177	192	*-0.5%*
Biodiesel	708	697	*-1.6*	219	196	150	133	211	175	178	218	268	*27.0%*
Total biofuels for transport	1,467	1,450	*-1.2*	413	385	342	317	404	357	372	395	460	*13.9%*
Energy (thousand toe)												**Thousand tonnes of oil equivalent**	
Bioethanol	428	424	*-0.8*	109	107	108	104	109	103	109	100	108	*-0.5%*
Biodiesel	582	573	*-1.6*	180	161	123	109	173	144	146	179	220	*27.0%*
Total biofuels for transport	1,010	997	*-1.2*	289	268	231	213	282	246	256	279	328	*16.4%*
Shares of road fuels													
Bioethanol as per cent of Motor Spirit	4.4%	4.5%		4.4%	4.4%	4.5%	4.6%	4.5%	4.3%	4.6%	4.6%	4.5%	
Biodiesel as per cent of DERV	2.4%	2.3%		2.9%	2.6%	1.9%	1.9%	2.7%	2.3%	2.3%	3.0%	3.4%	
Total biofuels as per cent of road fuels	3.1%	3.1%		3.4%	3.2%	2.8%	2.8%	3.4%	3.0%	3.1%	3.6%	3.8%	
Shares of road fuels - % change on quarter in previous year													
Bioethanol as per cent of Motor Spirit				-0.2%	-0.3%	-0.1%	0.1%	0.1%	-0.1%	0.1%	0.0%	0.0%	
Biodiesel as per cent of DERV				0.8%	0.2%	-0.9%	-0.1%	-0.1%	-0.3%	0.3%	1.2%	0.7%	
Total biofuels as per cent of road fuels				0.4%	0.0%	-0.7%	-0.1%	-0.1%	-0.2%	0.2%	0.7%	0.4%	

1. Percentage change between the most recent quarter and the same quarter a year earlier.
Source: HM Revenue and Customs Hydrocarbon Oils Bulletin, available at:
www.uktradeinfo.com/Statistics/Pages/TaxAndDutybulletins.aspx

Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2017

Introduction

This article provides information and analysis on the amount of electricity from renewable sources, disaggregated below UK level. It includes information on capacity, generation and number of operational sites, as well as derived load factors, for the four UK countries and the nine English regions. In addition, information is given for UK Local Authorities.[1] [2] [3] It updates that published in the September 2017 edition of *Energy Trends*

The totals published here are consistent with that published for the UK in Table 6.4 of the Digest of United Kingdom Energy Statistics 2018 (DUKES), and use similar categories[4]. However, there are some minor differences at national level with those published in DUKES as further work is carried out to locate sites for this publication. These data cover all renewable electricity schemes, including those accredited under the Renewables Obligation (RO), Feed in Tariff (FiT) and Contracts for Differences support mechanisms and those not eligible for support, such as pre-April 2002 large-scale hydro and non-CHP energy from waste schemes.

The tables below , and previous *Energy Trends* articles, show snapshots of the position at the time of publication for 2017. Consistent time-series data for each year from 2003 for data shown in Tables 1 to 3 and for Local Authority data from 2014, are available as Excel spreadsheets at: www.gov.uk/government/statistics/regional-renewable-statistics.

Key points – 2017:

- England had the most renewable capacity and generation, largely due to the three biomass units at Drax in Yorkshire and the Humber.
- Scotland had the highest capacity per £ of GVA.
- Scotland had the highest generation per £ of GVA.
- The highest technology growth in capacity was onshore wind, primarily in Scotland, driven by large-scale schemes supported by the RO. Next highest was offshore wind, primarily in the East of England. After this was solar PV in the South West, followed closely by the East Midlands and Northern Ireland, and finally biomass and waste, with Wales showing the largest increase, followed closely by the South West and West Midlands.
- For the third consecutive year (in 18 years), England continues to have the highest onshore wind load factor though Scotland is now no longer the lowest which implies that there have been fewer significant outages and curtailments than were noted in previous years for some large Scottish wind farms.

[1] Offshore wind is allocated to the region to which its output is connected. The exceptions are Robin Rigg, which comes ashore at Seaton, Cumbria but whose generation is associated with Scotland, and Burbo Bank, which comes ashore in Wales but whose generation is associated with the North West. https://orsted.co.uk/-/media/WWW/Docs/Corp/UK/Project-Summaries/Project-Summary_Burbo-Bank-Extension.ashx?la=en&hash=81E63DC2093EDF092966228DA9E3D7602051C15F&hash=81E63DC2093EDF092966228DA9E3D7602051C15F

[2] Part of the tables published by the Department for Business, Energy & Industrial Strategy (BEIS) that show a range of renewable electricity data for the devolved administrations and regions of England: www.gov.uk/government/statistics/regional-renewable-statistics

[3] Where disclosure of confidential generation data was likely at the site level, this has been addressed, where possible, by replacing this with data from publicly available sources. Where this is not possible, the data has been removed, and added to the unallocated row at the bottom of the Local Authority listings.

[4] On occasion, it has been necessary to combine some renewable sources into categories so that information about individual sites provided in confidence (rather than from publicly available sources) to Ricardo Energy & Environment and (BEIS) is not disclosed.

The largest new schemes (including capacity increases) in 2017 were as follows:

Onshore wind	Pen y Cymoid (capacity increase) Kilgallioch (capacity increase) Beinneun (capacity increase) Ray Wind Farm Clyde Wind Farm Extension (Clyde 2)	72 MW 222 MW 109 MW 54 MW 172 MW
Offshore wind	Dudgeon Offshore Wind Farm Race Bank Galloper Wind Farm Walney Offshore Wind Phase III Rampion	402 MW 548 MW 72 MW 330 MW 183 MW
Solar PV	Henley Hall Lough Road Bann Road	22 MW 32 MW 46 MW
Biomass and waste	Mersey Bioenergy Widnes Biomass CHP Margam REP	20 MW 40 MW

UK country summary

Table 1 and Chart 1 show that there were 5,643 non-Solar PV sites in England generating electricity from renewable sources, with 4,343 non-Solar PV sites in Scotland, 1,092 in Wales and 1,355 in Northern Ireland. In addition, there were 697,907 solar PV sites reported for England, 54,945 for Scotland, 53,257 for Wales and 23,696 for Northern Ireland[5].

[5] No geographical information was available for a further 106,673 PV schemes, 277 wind schemes, 51 hydro schemes and 12 anaerobic digestion schemes

Table 1: Number of sites generating electricity from renewable sources, 2017[1]

	Wind[2]	Onshore Wind	Offshore Wind	Wave and tidal	Solar PV	Hydro	Landfill gas	Sewage gas	AD	Biomass and Waste[3]	Total excluding PV	**Total**
England	**4,039**	**4,009**	**30**	**2**	**697,907**	**344**	**369**	**168**	**404**	**317**	**5,643**	**703,550**
East Midlands	429	426	3	-	83,354	27	39	15	77	30	617	**83,971**
East of England	888	879	9	-	98,666	6	72	15	58	30	1,069	**99,735**
North East	271	268	3	-	45,510	17	20	7	14	15	344	**45,854**
North West	517	509	8	-	81,096	73	49	24	38	45	746	**81,842**
London	31	31	-	-	22,904	-	5	10	4	14	64	**22,968**
South East	109	104	5	-	105,815	24	71	35	29	29	297	**106,112**
South West	820	820	-	1	115,420	124	39	18	68	53	1,123	**116,543**
West Midlands	176	176	-	-	65,248	23	30	19	77	51	376	**65,624**
Yorkshire and the Humber	798	796	2	1	79,894	50	44	25	39	50	1,007	**80,901**
Northern Ireland	**1,160**	**1,160**	**-**	**-**	**23,696**	**69**	**20**	**2**	**82**	**22**	**1,355**	**25,051**
Scotland	**3,453**	**3,448**	**5**	**15**	**54,945**	**703**	**49**	**8**	**54**	**61**	**4,343**	**59,288**
Wales	**690**	**687**	**3**	**1**	**53,257**	**293**	**26**	**16**	**28**	**38**	**1,092**	**54,349**
Other Sites	277	277	-	-	106,673	51	-	-	12	-	340	**107,013**
UK Total	**9,619**	**9,581**	**38**	**18**	**936,478**	**1,460**	**464**	**194**	**580**	**438**	**12,773**	**949,251**

Components may not add exactly to totals because of rounding.
Totals for England, Northern Ireland, Scotland and Wales may not match DUKES exactly due to reallocation of Other sites.
1 As at 31 December 2017.
2 Offshore Wind is allocated to regions/countries where the cabling comes ashore.
3 Four of these sites are sites that co-fire renewables with fossil fuels (see also note 4, below).
4 This is the proportion of non-fossil fuelled capacity used for co-firing of renewables based on the proportion of generation accounted for by the renewable source. This estimate has not been disaggregated into regional values since the figure will vary annually, and is not dedicated renewable capacity.
5 Includes bioenergy sources co-fired with fossil fuels.

Table 2: Installed capacity of sites generating electricity from renewable sources, 2017[1]

	Wind[2]	Onshore Wind	Offshore Wind	Wave and tidal	Solar PV	Hydro	Landfill gas	Sewage gas	AD	Biomass and Waste[3]	MW Total
England	**9,086.6**	**3,071.1**	**6,015.5**	**0.1**	**10,885.2**	**41.6**	**880.2**	**225.5**	**344.0**	**3,850.7**	**25,314.0**
East Midlands	911.4	447.0	464.4	-	1,474.0	4.9	68.0	20.5	68.1	148.1	**2,694.9**
East of England	2,561.8	474.1	2,087.7	-	1,924.3	0.1	185.6	19.2	62.5	245.0	**4,998.5**
North East	593.1	486.9	106.3	-	213.7	8.2	45.0	11.5	22.5	161.5	**1,055.4**
North West	2,155.3	479.5	1,675.8	-	536.0	9.9	134.8	31.4	33.4	209.2	**3,110.0**
London	11.3	11.3	-	-	113.2	-	25.8	51.7	5.3	188.0	**395.2**
South East	1,360.7	108.3	1,252.4	-	2,058.7	1.4	166.6	36.1	29.8	301.9	**3,955.2**
South West	342.2	342.2	-	-	3,180.7	11.3	100.5	15.3	47.8	160.7	**3,858.5**
West Midlands	15.4	15.4	-	-	841.5	1.2	60.9	23.6	48.4	186.2	**1,177.3**
Yorkshire and the Humber	1,135.4	706.4	429.0	0.1	543.1	4.7	93.0	16.3	26.2	2,250.1	**4,068.9**
Northern Ireland	**1,186.6**	**1,186.6**	**-**	**-**	**253.0**	**10.4**	**23.3**	**0.2**	**43.4**	**33.6**	**1,550.6**
Scotland	**7,790.2**	**7,543.8**	**246.4**	**17.9**	**310.3**	**1,643.3**	**115.8**	**7.2**	**44.9**	**250.5**	**10,180.2**
Wales	**1,756.8**	**1,030.8**	**726.0**	**0.4**	**1,050.3**	**168.1**	**46.7**	**12.5**	**17.2**	**140.8**	**3,192.9**
Other Sites	15.1	15.1	0.0	0.0	276.8	11.1	0.0	0.0	10.4	-	**313.3**
UK Total	**19,835.2**	**12,847.4**	**6,987.9**	**18.4**	**12,775.7**	**1,874.6**	**1,066.1**	**245.5**	**459.9**	**4,275.6**	**40,551.0**
Co-firing[4]					-			-		6.2	**6.2**

Components may not add exactly to totals because of rounding.
Totals for England, Northern Ireland, Scotland and Wales may not match DUKES exactly due to reallocation of Other sites.
1 As at 31 December 2017.
2 Offshore Wind is allocated to regions/countries where the cabling comes ashore.
3 Four of these sites are sites that co-fire renewables with fossil fuels (see also note 4, below).
4 This is the proportion of non-fossil fuelled capacity used for co-firing of renewables based on the proportion of generation accounted for by the renewable source. This estimate has not been disaggregated into regional values since the figure will vary annually, and is not dedicated renewable capacity.
5 Includes bioenergy sources co-fired with fossil fuels.

Table 3: Generation of electricity from renewable sources, 2017[1]

	Wind[2]	Onshore Wind	Offshore Wind	Wave and tidal	Solar PV	Hydro	Landfill gas	Sewage gas	AD	Biomass and Waste[5]	GWh Total
England	**25,120.6**	**7,250.7**	**17,869.9**	**-**	**9,966.3**	**116.5**	**3,590.5**	**886.1**	**1,843.3**	**21,817.5**	**63,340.7**
East Midlands	2,682.7	1,048.1	1,634.6	-	1,341.7	18.6	253.2	97.1	366.2	694.5	**5,454.1**
East of England	6,758.4	1,123.8	5,634.6	-	1,794.5	0.4	771.9	76.2	349.0	1,268.2	**11,018.7**
North East	1,404.8	1,179.9	224.9	-	192.9	14.1	140.0	34.0	102.6	537.1	**2,425.5**
North West	6,268.0	1,168.4	5,099.7	-	475.3	31.2	433.6	122.2	154.7	887.4	**8,372.4**
London	17.0	17.0	-	-	102.4	-	154.3	147.6	29.0	631.1	**1,081.5**
South East	3,716.9	233.2	3,483.6	-	1,926.4	4.1	770.4	153.6	161.0	972.6	**7,705.0**
South West	741.5	741.5	-	-	2,908.9	30.3	410.0	56.9	262.7	481.8	**4,892.1**
West Midlands	35.9	35.9	-	-	736.0	3.5	275.3	119.4	275.3	632.2	**2,077.6**
Yorkshire and the Humber	3,495.4	1,702.9	1,792.5	-	488.0	14.3	381.7	79.2	142.7	15,712.5	**20,313.9**
Northern Ireland	**2,504.2**	**2,504.2**	**-**	**-**	**184.6**	**29.0**	**106.2**	**0.6**	**256.1**	**185.0**	**3,265.7**
Scotland	**17,475.1**	**16,860.4**	**614.6**	**4.2**	**275.3**	**5,395.1**	**445.5**	**36.0**	**220.4**	**1,484.9**	**25,336.4**
Wales	**4,873.8**	**2,442.4**	**2,431.3**	**-**	**903.0**	**370.7**	**141.6**	**44.6**	**92.9**	**660.8**	**7,087.4**
Other Sites	30.0	30.0	-	-	195.8	16.8	-	-	57.1	-	**299.6**
UK Total	**50,003.7**	**29,087.7**	**20,915.9**	**4.2**	**11,524.9**	**5,928.1**	**4,283.8**	**967.3**	**2,469.7**	**24,148.2**	**99,329.8**

Components may not add exactly to totals because of rounding.
Totals for England, Northern Ireland, Scotland and Wales may not match DUKES exactly due to reallocation of Other sites.
1 As at 31 December 2017.
2 Offshore Wind is allocated to regions/countries where the cabling comes ashore.
3 Four of these sites are sites that co-fire renewables with fossil fuels (see also note 4, below).
4 This is the proportion of non-fossil fuelled capacity used for co-firing of renewables based on the proportion of generation accounted for by the renewable source. This estimate has not been disaggregated into regional values since the figure will vary annually, and is not dedicated renewable capacity.
5 Includes bioenergy sources co-fired with fossil fuels.

In capacity terms, England had more than two and a half times more renewable electricity capacity than Scotland (Table 2 and Chart 3). This is mainly because of England's considerable bioenergy (88 per cent of the UK's bioenergy capacity) and solar PV capacity (85 per cent of the UK's solar PV capacity). For similar reasons, generation from renewable sources in England during 2017 was two and a half times higher than Scotland, with the higher utilisation rates of bioenergy offset by the lower rates of the more intermittent solar PV which accounted for 16 per cent of English renewable generation (Table 3, Chart 7).

Regional analysis by technology

In England, the number of renewable sites (excluding solar PV) in each region varies from 64 in London to 1,123 in the South West (Table 1 and Chart 2). The highest capacity in England (including solar PV) is in the East of England, followed by Yorkshire and the Humber and the South East (Table 2 and Chart 4). In the East of England, 51 per cent of capacity is from wind (42 per cent offshore and 9 per cent onshore) and 38 per cent is from solar PV. In Yorkshire and the Humber, 55 per cent of capacity is from biomass and waste (mostly from Drax dedicated biomass), 28 per cent from wind and 13 per cent is from solar PV. In the South East, 52 per cent of capacity is from solar PV, 34 per cent from wind (32 per cent offshore and 3 per cent onshore) and 8 per cent from biomass and waste.

Chart 1: Number of sites by country[1]

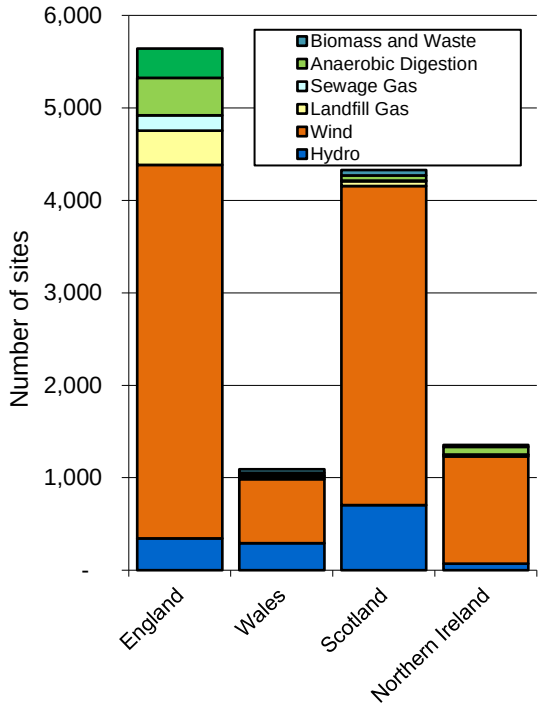
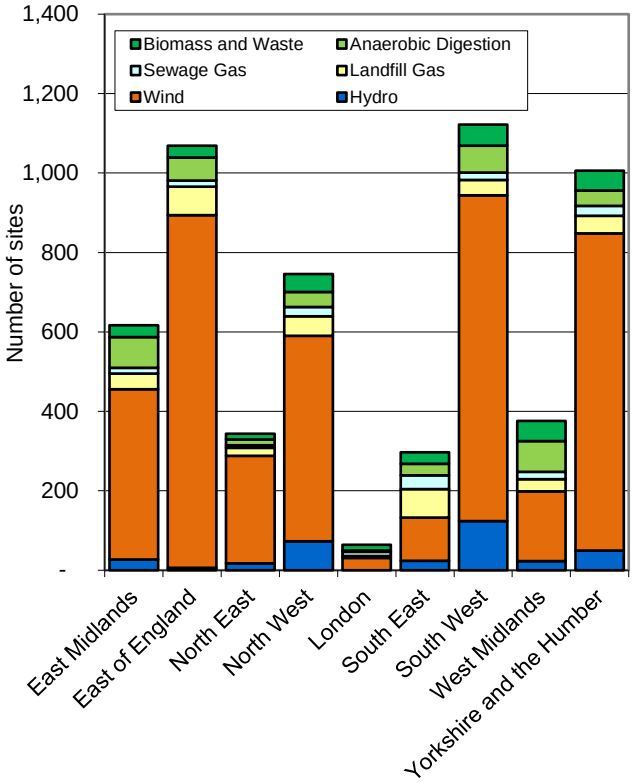


Chart 2: Number of sites by English region[1]



1. Excludes Solar PV, due to the high numbers of small-scale schemes, disproportionate to all other technologies. Wave and Tidal are included with offshore wind.

The East of England has 17 per cent of the UK's landfill gas capacity. The South East (with 16 per cent of the UK's landfill gas capacity), and the North West (with 13 per cent of the UK's landfill gas capacity), are the other English regions with notably large shares. The East of England, North West and the South East regions together accounted for 46 per cent of UK generation from landfill gas.

England has 85 per cent of the total UK solar capacity and 86 per cent of the total UK generation.

The South West accounts for 25 per cent of the total UK solar capacity (25 per cent of the generation), the South East 16 per cent (17 per cent of the generation) and the East of England 15 per cent (16 per cent of the generation), reflecting the construction of more schemes in areas with higher than average solar irradiance[6].

England accounts for 46 per cent of wind capacity and 50 per cent of generation. About two-thirds of England's wind capacity is offshore (6 GW), which also represents 86 per cent of the UK's 7 GW of offshore capacity. The Burbo Bank Extension currently operates the largest offshore turbines of 8 MW each.

Scotland had 39 per cent of the UK's wind capacity and produced 35 per cent of the output (Tables 2 and 3; Charts 5a, 5b, 9a and 9b). 97% of Scotland's wind capacity was from onshore wind, showing no change on the previous year. This comprises 3,448 onshore wind sites, including the UK's largest, Whitelee (539 MW) followed closely by Clyde (522.4 MW). Other regions with high wind capacity are:

- East of England with 10.5 percent offshore (11 per cent generation), due to Race Bank (548 MW), Greater Gabbard (504 MW), Dudgeon (402 MW) and Sheringham Shoal (317 MW), and 2.4 per cent onshore (2 per cent generation)
- the North West with 2.4 per cent onshore capacity (2 per cent of generation) and 8.4 per cent offshore capacity (10 per cent of generation) that includes Walney plus extension (698 MW) and Burbo Bank plus extension (349 MW)
- Wales has 8.0 per cent onshore capacity (8.4 per cent of generation), and 10.4 per cent offshore capacity (11.6 per cent of generation) (Tables 2 and 3).

Ninety-two per cent of the UK generation from sewage took place in England. The major sewage gas generating regions were, the South East (16 per cent), London (15 per cent), the North West (13 per cent) and the West Midlands (12 per cent). This is reflected in capacity terms with London being the highest (21 per cent), followed by the South East (15 per cent), the North West (13 per cent) and the West Midlands (10 per cent).

90 per cent of the UK generation from biomass and waste (including that used for co-firing) took place in England, with nearly two thirds in Yorkshire and the Humber (65 per cent) mostly from Drax, followed by Scotland (6 per cent), East of England (5 per cent) and the South East (4 per cent). Excluding bioenergy sources used for standard co-firing (which cannot be allocated to regions – see note 4 to Table 2), Yorkshire and the Humber more than half of capacity to generate from biomass and waste (53 per cent of the UK total), mostly from the three 645 MW converted units at Drax. This is followed by the South East (7 per cent) and Scotland (6 per cent).

[6] JRC Solar radiation and photovoltaic electricity potential http://re.jrc.ec.europa.eu/pvgis/cmaps/eu_cmsaf_opt/G_opt_UK.png.

Chart 3: Renewable capacity by country

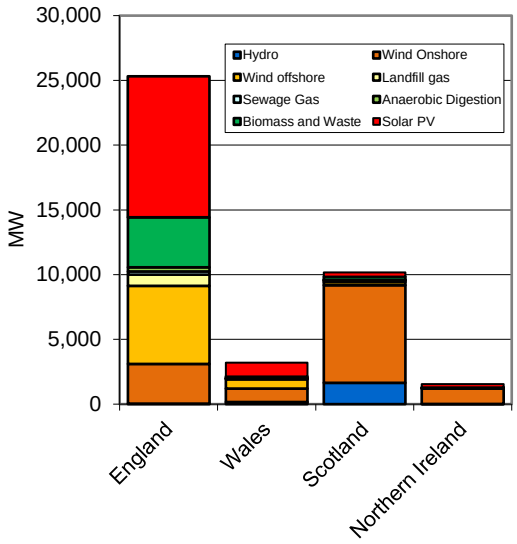


Chart 4: Renewable capacity by English region

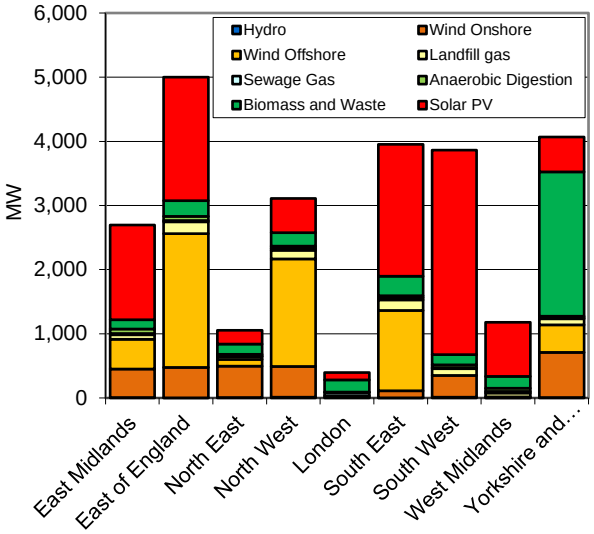


Chart 5a: Onshore wind capacity by country

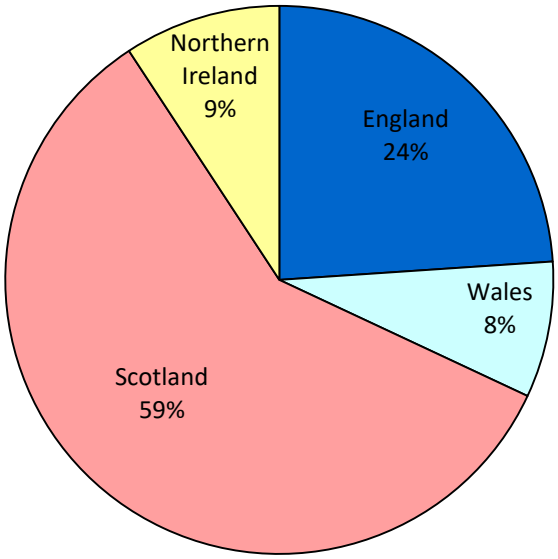


Chart 5b: Offshore wind capacity by country

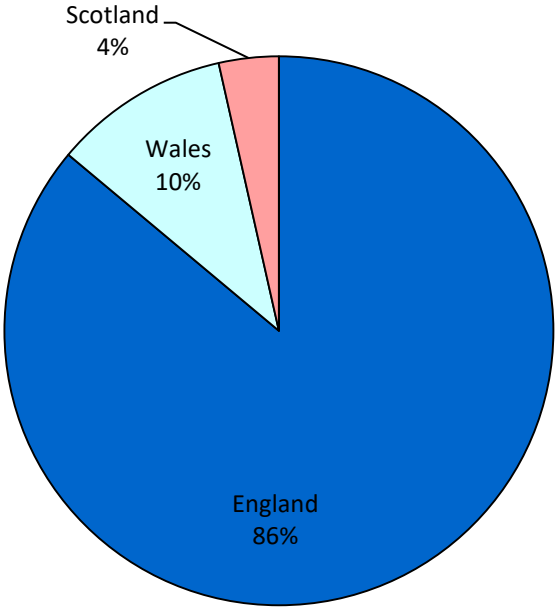


Chart 6a: Onshore wind capacity by English region

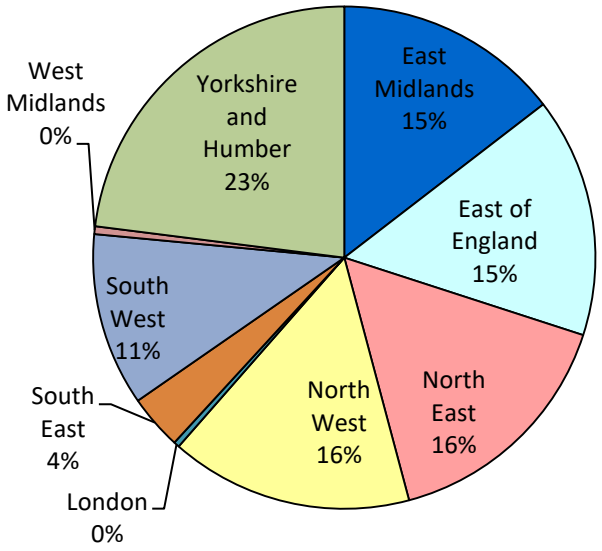


Chart 6b: Offshore wind capacity by English region

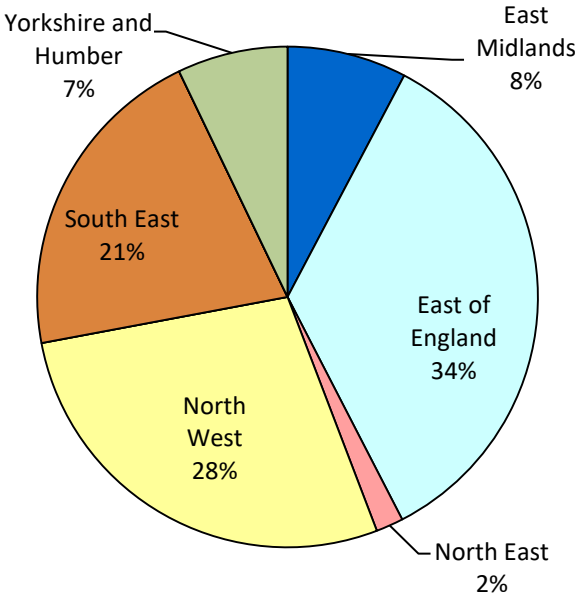


Chart 7: Renewable generation by country

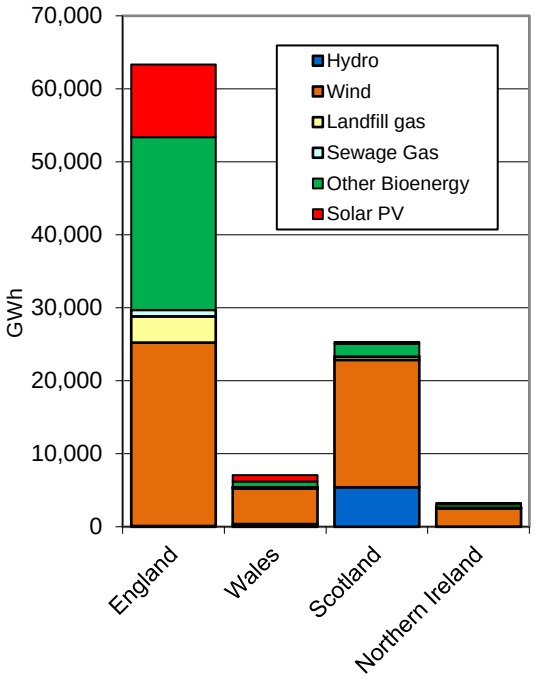


Chart 8: Renewable generation by English region

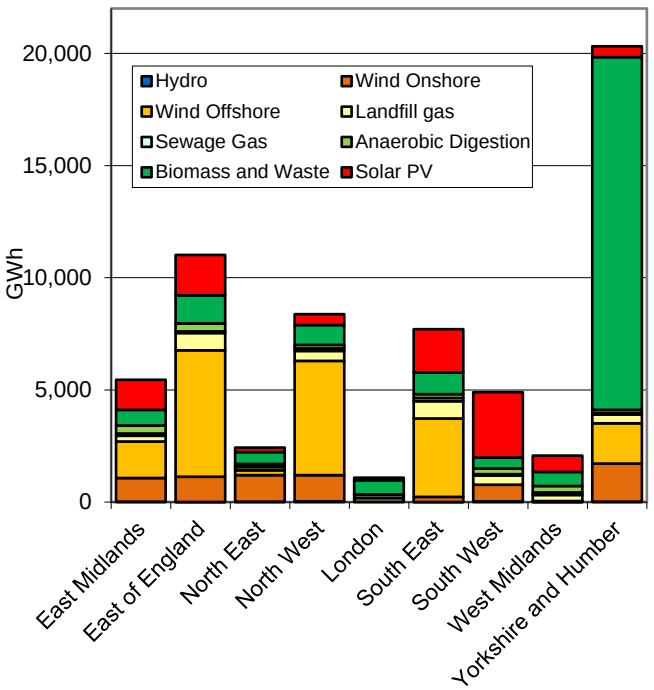


Chart 9a: Onshore wind generation by country

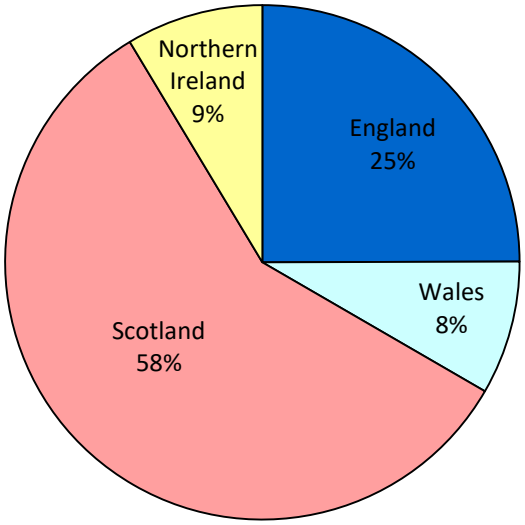


Chart 9b: Offshore wind generation by country

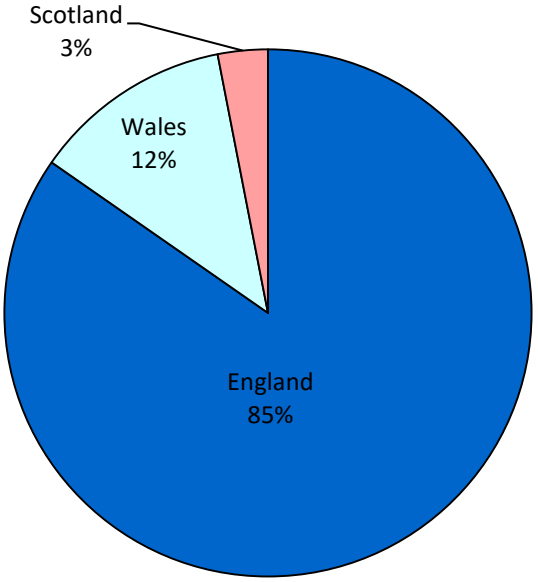


Chart 10a: Onshore wind generation by English region

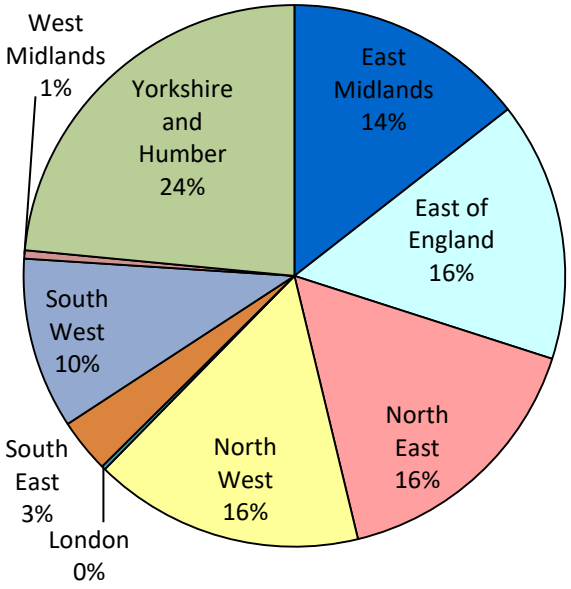
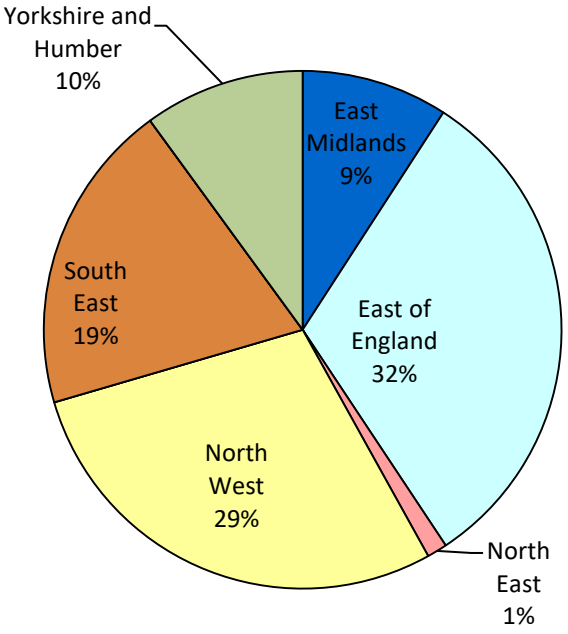


Chart 10b: Offshore wind generation by English region



Regional trends: 2017

In terms of change to total renewables generating capacity, Scotland (+1,355 MW), East of England (+1,100 MW), North West (+510 MW), Northern Ireland (+437 MW) and Wales (+331 MW) have all shown considerable growth this year. The growth in overall renewables capacity in the UK has primarily come from onshore wind (40 per cent), offshore wind (35 per cent) and solar (18 per cent). Table 4 summarises the schemes that accounted for much of the capacity growth in 2017 for each region.

Total UK onshore wind capacity has increased by 40 per cent with capacity increases to Pen y Cymoedd (72 MW), Kilgallioch (222 MW) and Beinneun (109 MW), plus new installations at Ray Wind Farm (54 MW), Clyde Wind Farm Extension (Clyde 2) (172 MW). Total UK offshore wind capacity has increased 35 per cent with the Dudgeon Offshore Wind Farm (402 MW), Race Bank (548 MW), Galloper Wind Farm (72 MW), Walney Offshore Wind Phase III (330 MW) and Rampion (183 MW).

Total UK solar PV capacity has increased by 18 per cent in 2017 which was driven by the pending closure of RO and the reduction in FiT financial support mechanisms, as well as decreasing technology costs. Fewer large solar farms were built this year, with most of the large solar farms being built in Northern Ireland including Lough Road PV (32 MW) and Bann Road PV (46 MW).

Biomass and wastes accounted for 5.5 per cent of the total growth in capacity. This includes the Mersey Bioenergy Widnes Biomass CHP (20 MW) and Margam REP (40 MW) biomass schemes and the Municipal Solid Waste Combustion schemes at Liberty Steel Lochaber (17 MW), EnviRecover (15.5 MW) and European Metal Recycling Ltd (17.4 MW).

Regional trends: 2003-2017

Between 2003 and 2017, overall **capacity** from renewables in the UK increased more than ten-fold (1,073 per cent). Faster rates of growth were recorded in individual regions. These include:

- East Midlands (3,307 per cent), largely from solar PV and wind
- Yorkshire and the Humber (3,097 per cent), primarily due to Drax
- the South West (3,177 per cent), from primarily solar PV
- Northern Ireland (3,097 per cent), mainly from onshore wind
- the South East (2,361 per cent), largely from solar PV and offshore wind
- East of England (1,835 per cent), also driven by solar PV and offshore wind
- the North West (1,489 per cent) from offshore wind
- the North East (1,205 per cent) from onshore wind (see charts 11 and 12).

Between 2003 and 2017, there was a 837 per cent increase in overall **generation** from renewables in the UK, but faster rates of growth were recorded in Northern Ireland (3,031 per cent), Yorkshire and the Humber (3,019 per cent), the East Midlands (1,161 per cent), the South West (981 per cent), the North West (875 per cent), the South East (872 per cent) and the North East (842 per cent), (see charts 13 and 14).

The reason for these differences in growth rates for both capacity and generation is not only dependent on the local resource (such as wind and solar), but also (notably in the case of Drax), the availability of existing fossil fuel capacity suitable for conversion to biomass. There was very little use of some technologies in some regions driven primarily by resource availability (e.g. wind in London and hydro in the East of England).

Table 4: Regional capacity growth, 2017

Region	Key Technology	Growth (MW)	Key Schemes
East Midlands	Solar PV	118	Langar Lane plus medium and small-scale projects
	Onshore Wind	43	Bishopthorpe plus medium and small-scale projects
	Biomass and Waste	27	Derby and Derbyshire Waste Treatment Centre, The Sawmill,
East of England	Offshore Wind	1,023	Dudgeon, Race Bank, Galloper Wind Farm
	Solar PV	41	Triangle Solar Farm Park
	Biomass and Waste	17	MEPALCHP
North East	Onshore Wind	90	Ray Wind Farm, Red Gap Moor Wind Farm, Moor House Wind
	Offshore Wind	40	Blyth
	AD	6	Dean Group Business Park - Hartlepool
	Solar PV	3	Mainly medium and small-scale projects
North West	Offshore Wind	390	Burbo Bank Extension (Burbo Bank 2), Walney Offshore Wind Phase III
	Solar PV	57	Mainly medium and small-scale projects
	Onshore Wind	38	Beck Burn (resubmission)
	Biomass and Waste	25	Mersey Bioenergy Widnes Biomass CHP - FULL
London	Solar PV	3	Primarily FiT
	Sewage gas -	7	Mogden STW, Deephams STW (replacement schemes with small capacities)
South East	Offshore Wind	183	Rampion
	Solar PV	69	Land to the north and south of Snettisham Lane (Wilsom) plus medium and small-scale projects
South West	Solar PV	120	Lower Severalls Farm plus medium and small-scale projects
	Biomass and Waste	44	Severnside Energy Recovery Centre
West Midlands	Solar PV	96	Henley Hall, Land On The East Side Of Fosse Way
	Biomass and Waste	41	EnviRecover, European Metal Recycling Ltd
	Sewage gas -	11	MINWORTH SEWAGE WORKS (CLOSED)
Yorkshire and Humber	Onshore Wind	41	Ovenden Moor (Repower) plus numerous small-scale projects
	Solar PV	32	Mainly medium and small-scale projects
	Biomass and Waste	28	Ferrybridge Multifuel 1 ('C') Power Station, Holbrook Community Renewable Energy Centre, Equitix ESI CHP (Sheffield) Limited
Northern Ireland	Onshore Wind	301	Brockaghboy Full, Wheelhouse Energy (NI) Limited, Slieve
	Solar PV	116	Ballinderry Road Solar Phase 1 (Lisburn), Lough Road PV, Bann Road PV (includes second Bann record)
	AD	11	Tully Quarry AD Plant plus small-scale projects
Scotland	Onshore Wind	1,212	Kilgallioch, Beinneun, Bhlaraidh Wind Farm, Brockloch Rig (Windy Standard 3), Clyde Wind Farm Extension (Clyde 2), Aikengall II - Wester Dod Community Wind Farm
	Offshore Wind	59	Hywind Scotland Pilot Park (Hywind 2) and Demonstrator
	Plant Biomass	24	Liberty Steel Lochaber
Wales	Onshore Wind	187	Pen y Cymoedd, Garreg Llwyd (GB)
	Solar PV	95	Mainly medium and small-scale projects
	Biomass and Waste	47	Margam REP

Chart 11: Trends in capacity from renewables by country

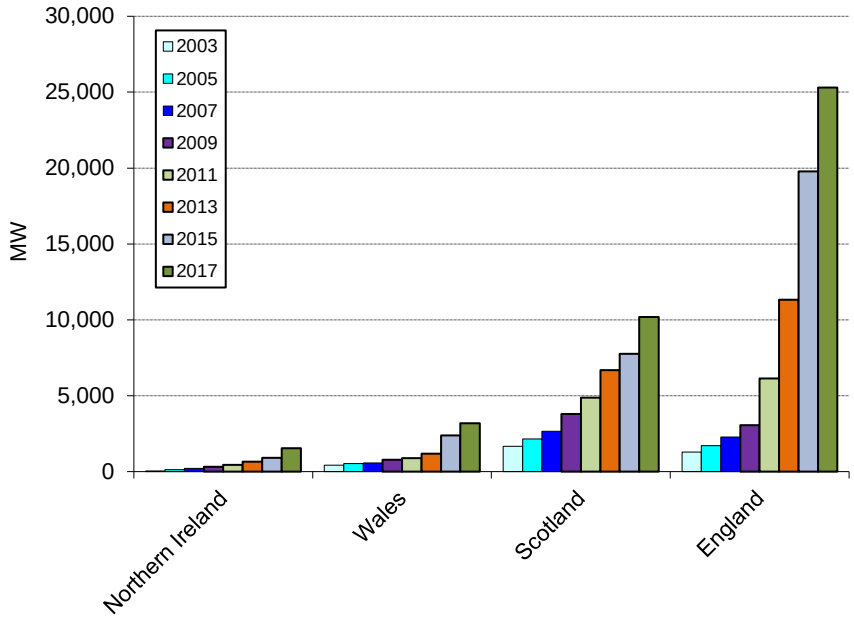


Chart 12: Trends in capacity from renewables by English region

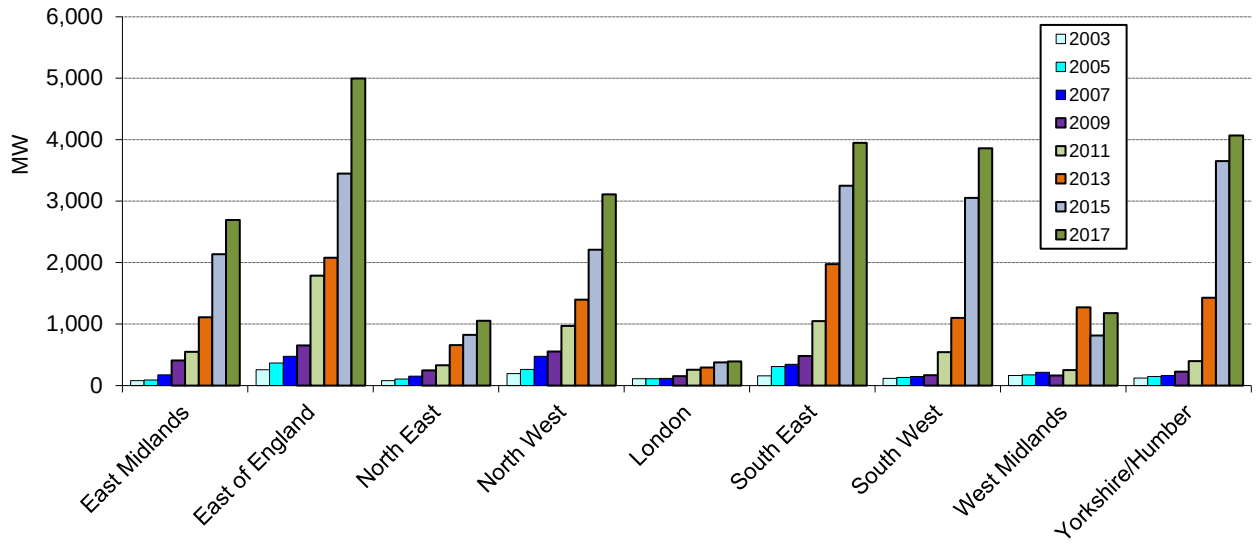


Chart 13: Trends in generation from renewables by country

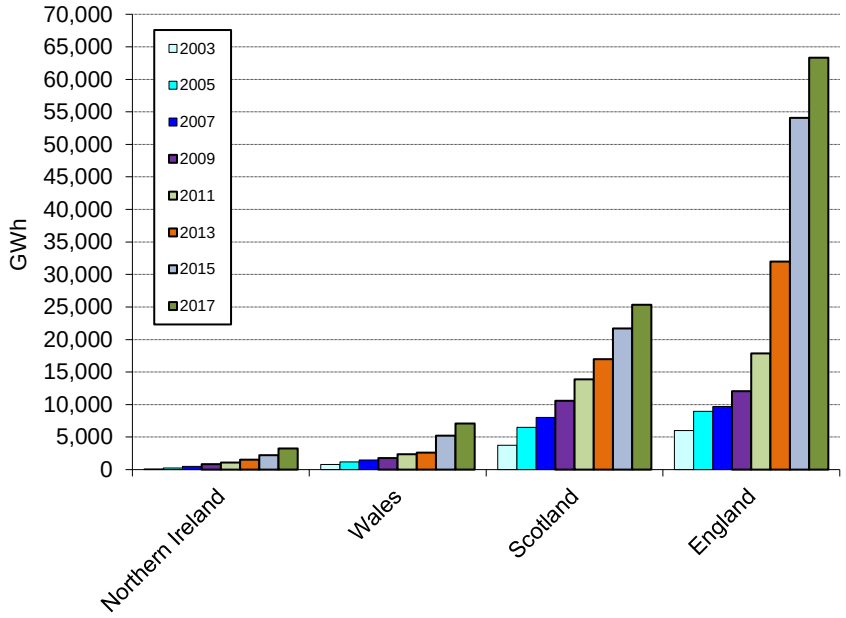
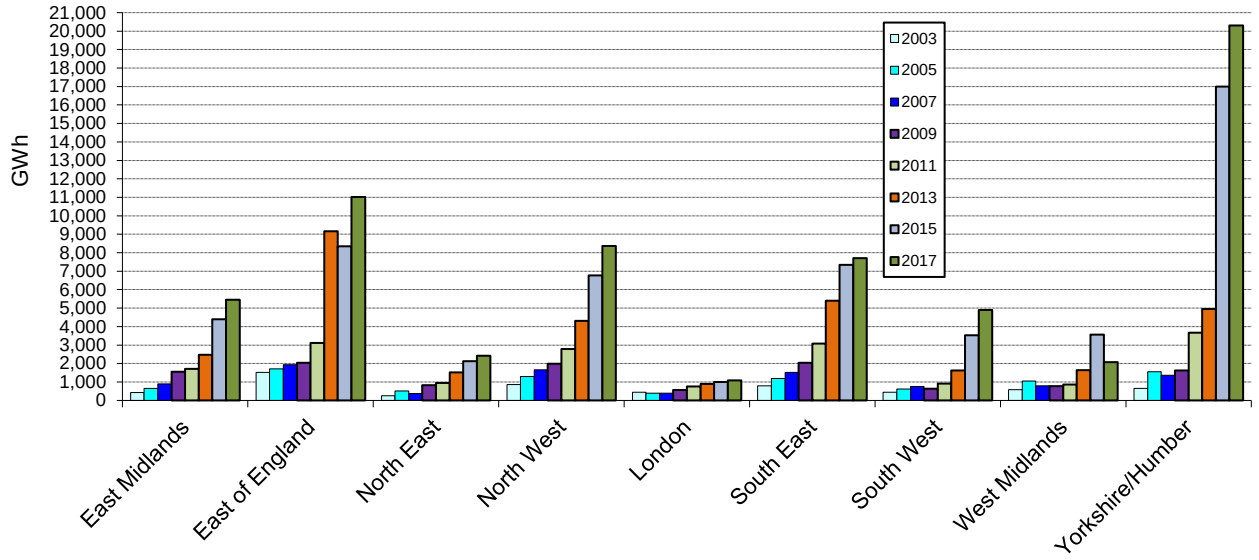


Chart 14: Trends in generation from renewables by English region



Time series data for several technologies also show interesting trends. In the case of the installed capacity for solar PV, following a period of rapid growth encouraged by the RO and FiT schemes, the rate of growth now seems to have slowed down (Chart 15), which is also reflected in the corresponding generation figures (Chart 16), this is probably a combination of effects due to the closure of the RO, a reduction in FiT financial support mechanisms, and the rapid exploitation of prime development sites.

Chart 15: Rate of growth of solar PV capacity by country

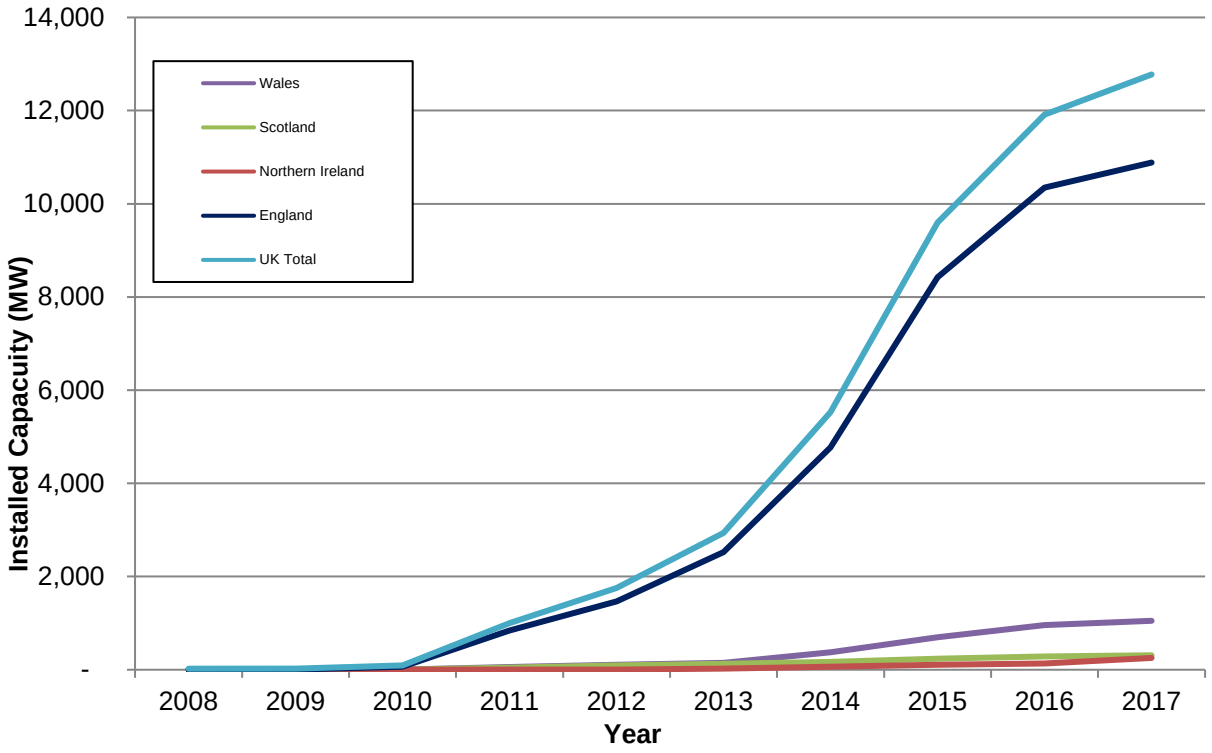
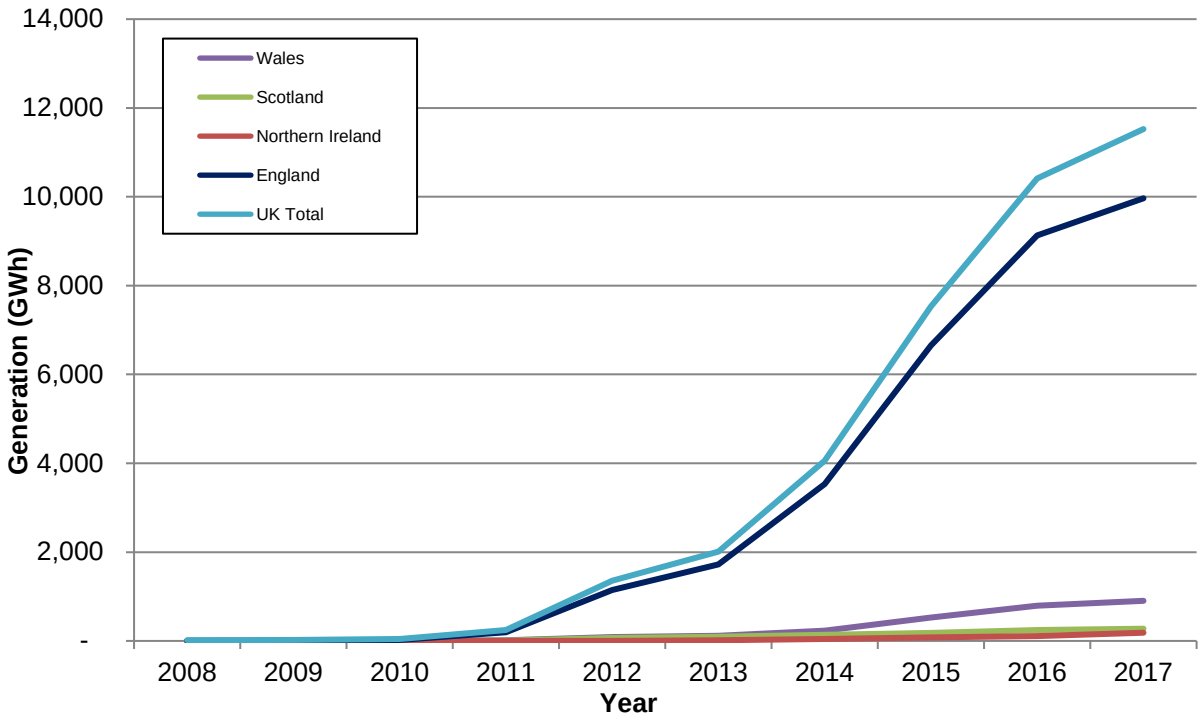


Chart 16: Rate of growth of solar PV generation by country



In the case of landfill gas, the rate of exploitation of prime sites reached saturation several years ago (Chart 17) but interestingly, there is no similar plateauing of generation data but instead decreases with time. This is because biogas production rates reduce with time as the biodegradable resource gets exploited (Chart 18). This is further discussed in the section on load factor analysis.

Chart 17: Rate of growth of landfill gas capacity by country

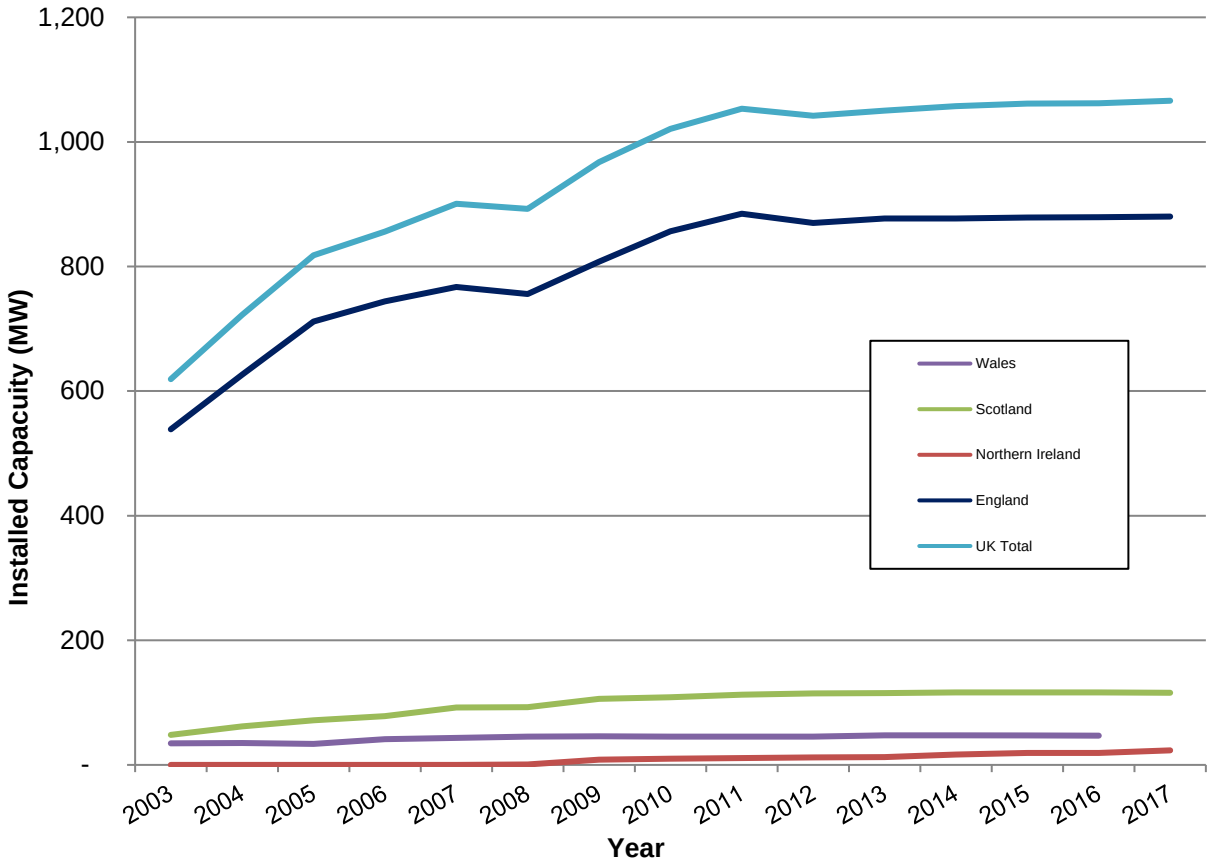
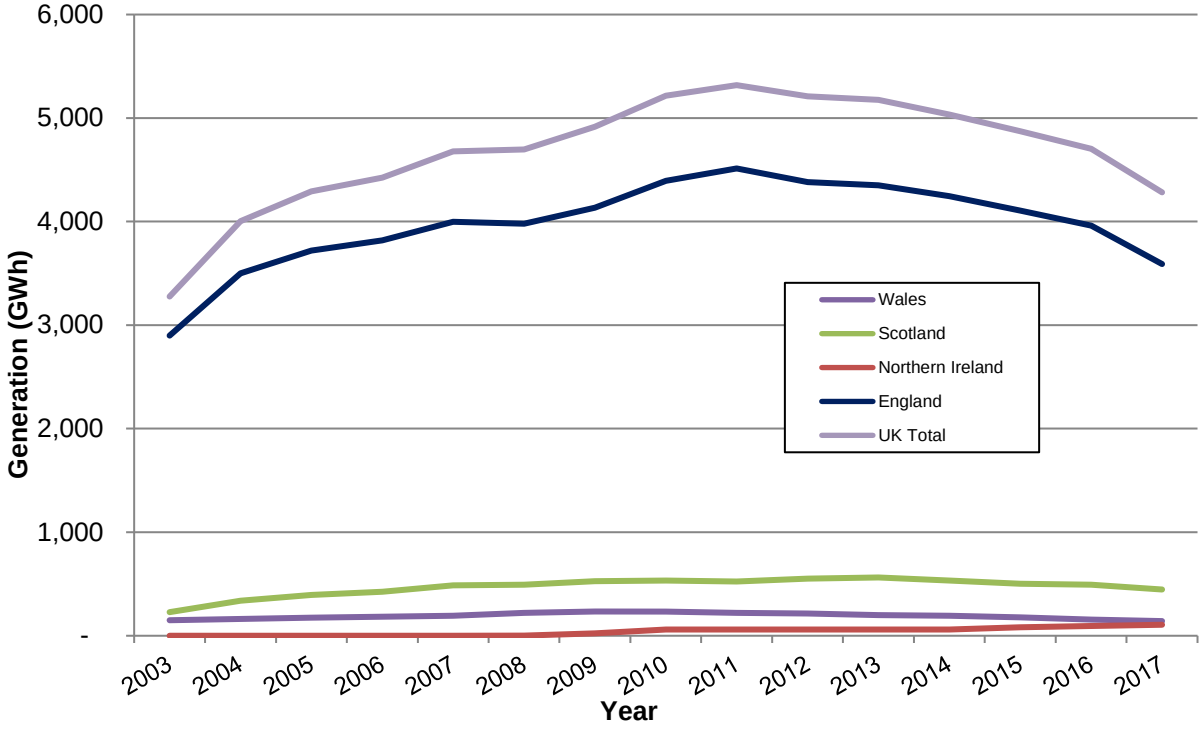


Chart 18: Rate of growth of landfill gas generation by country

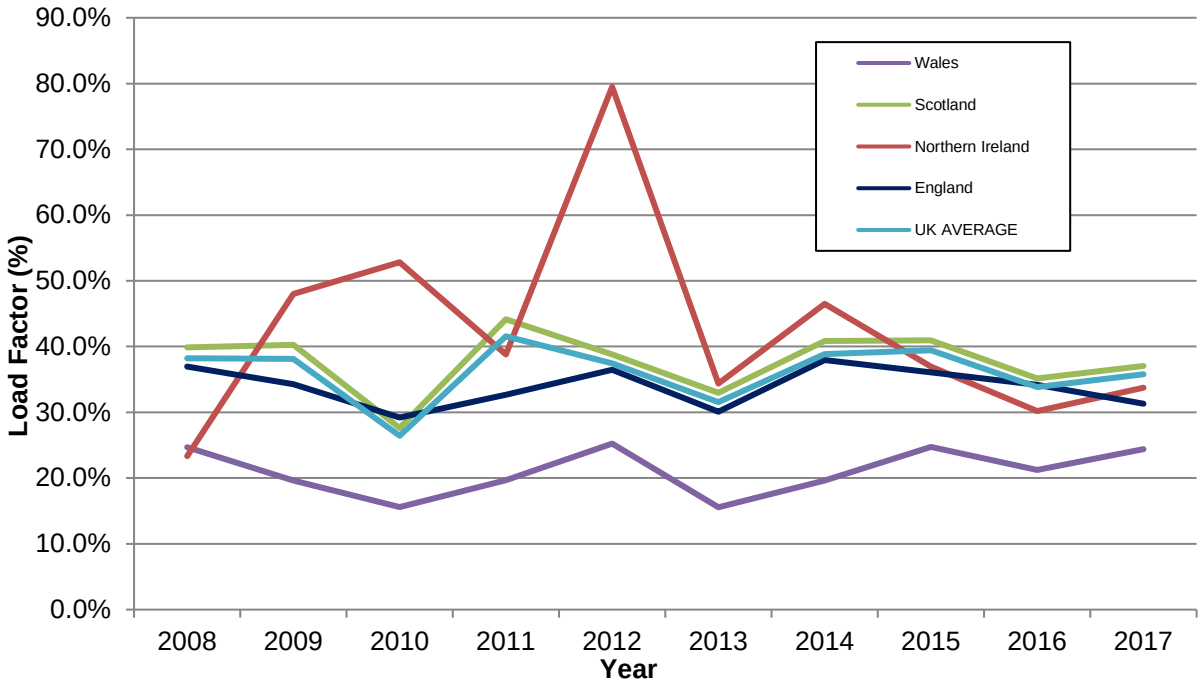


Load factor analysis

Load factors for the various technologies, presented on an unchanged configuration basis [7] [8], are shown in Table 5 from data provided in Tables 2 and 3 of this article[9], together with time-series data in several charts[10].

The load factors for hydro range from 47.4 per cent in the East Midlands to 22.4 per cent in the North East, with the UK average (mean) and median values for the UK overall of 35.8 and 31.1 per cent respectively. Rainfall for 2017 was slightly lower than for 2016 and the third lowest recorded over a 10-year period; this is reflected in the low load factors for hydro though (with the exception of England) this is not as low as might have been expected compared with the previous year. Chart 19 shows the time series variation in load factors and whilst Scotland generally follows variations in annual rainfall, Wales, England and Northern Ireland exhibit more unusual behaviour with a time lag following the record high rainfall in 2011.

Chart 19: Hydro load factor on an unchanged configuration basis, by UK country



[7] Previously, load factors were presented in terms of installed capacity and expressed the average hourly quantity of electricity generated as a percentage of the average capacity at the beginning and end of the year. These can still be found in the load factor time-series spreadsheets, available at: *www.gov.uk/government/collections/renewables-statistics*. However, this method does not consider the impact of new schemes being constructed but not operating fully in the year. This can result in a distorted picture, depending on the timing and magnitude of new capacity coming on stream, and can even result in values >100%. The *unchanged configuration* basis for load factor calculations has therefore been used in this article.

The term "load factor on an unchanged configuration basis" describes the amount of electricity generated from schemes that have been operating throughout the whole of the calendar year with the same installed capacity configuration. The formula for calculating this is:

$$\frac{\text{Electricity generated during the year (MWh)}}{\text{Installed capacity of schemes operating throughout the year with an unchanged capacity configuration (MW)} \times \text{hours in year}}$$

In view of the interest shown nationally in this measure, this is now calculated for several renewable technologies. These data are only reported where the region contains three or more operational schemes. The England figure includes data from all English schemes regardless of how many were operational within each region of England.

[8] A limitation of this analysis is the availability of Renewables Obligation Certificates (ROCs) data, which may not be complete when DUKES is compiled (April 2018) as 2017 data is still provisional. This can have an impact on the schemes included in the unchanged configuration definition as new data could include or remove schemes.

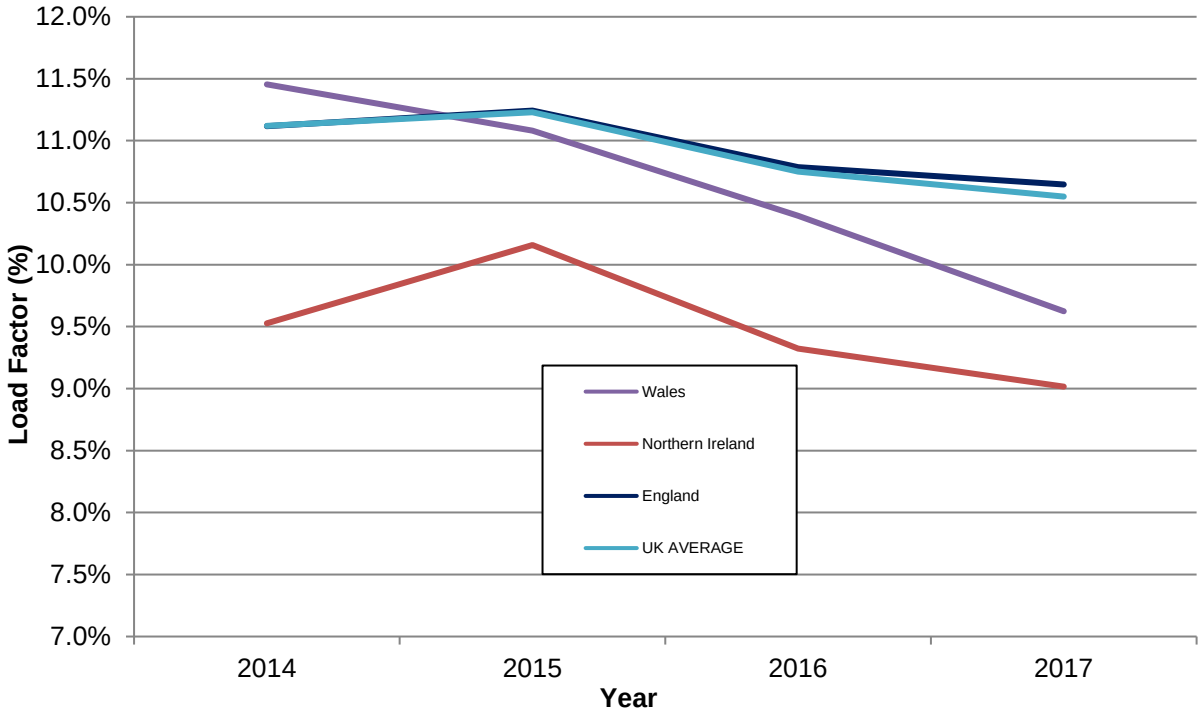
[10] Gaps in the time-series were due to insufficient data with which to accurately report AD UCLF time series statistics

Table 5: Regional load factors on an unchanged configuration basis, 2017

	Onshore Wind	Offshore Wind	Solar PV	Hydro	Hydro (small scale)	Hydro (large scale)	Landfill gas	Sewage gas	AD	Biomass and Waste
England	**27.8%**	**40.7%**	**10.6%**	**31.3%**	**38.5%**	**12.9%**	**46.5%**	**46.0%**	**60.0%**	**77.2%**
East Midlands	27.3%	40.2%	10.5%	47.4%	47.4%		42.2%	54.1%	75.6%	70.0%
East of England	27.7%	39.9%	10.8%				47.5%	45.4%	68.8%	65.3%
North East	28.9%	37.9%		22.4%	74.3%	12.9%	35.6%	33.2%	36.4%	61.5%
North West	29.3%	43.0%	10.0%	38.6%	38.6%		36.4%	44.5%	49.2%	70.1%
London			10.1%				72.2%	32.7%		72.2%
South East	23.9%	36.7%	11.0%	28.4%	28.4%		53.4%	49.7%	58.1%	61.9%
South West	25.8%		10.6%	27.8%	27.8%		46.5%	42.5%	63.9%	17.3%
West Midlands			10.2%	23.5%	23.5%		51.6%	57.7%	76.0%	72.7%
Yorkshire and the Humber	27.8%	47.7%	10.1%	36.1%	36.1%		46.7%	57.6%	37.2%	83.0%
Northern Ireland	**26.3%**		**9.0%**	**33.7%**	**33.7%**		**52.4%**		**82.1%**	**66.5%**
Scotland	**27.2%**	**33.4%**	**10.2%**	**37.0%**	**38.9%**	**36.9%**	**43.4%**	**56.8%**	**49.1%**	**76.9%**
Wales	**26.7%**	**38.2%**	**9.6%**	**24.4%**	**33.1%**	**23.0%**	**34.4%**	**40.4%**	**75.3%**	**77.0%**
UK AVERAGE	**27.3%**	**40.0%**	**10.5%**	**35.8%**	**37.9%**	**35.6%**	**45.8%**	**46.1%**	**63.2%**	**77.1%**
MEDIAN	27.3%	39.0%	10.2%	31.1%	34.9%	23.0%	46.6%	45.4%	63.9%	70.1%

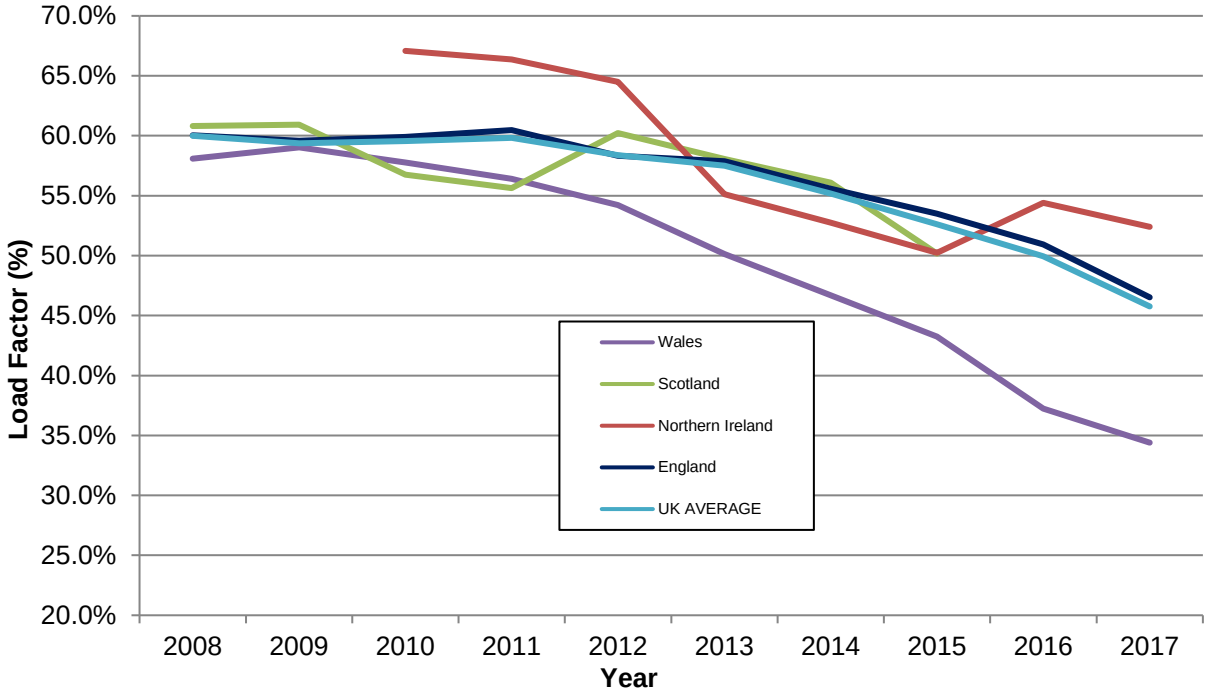
Load factors for solar PV range from 9 per cent in Northern Ireland to 11 per cent in the South East, reflecting the differences in solar irradiance levels in the UK. The UK average is 10.5 per cent, with Scotland and the West Midlands jointly occupying the median of 10.2 per cent. Average daily hours of sunshine in 2017 were slightly less than that for 2016 which is reflected in the correspondingly lower load factors (Chart 20).

Chart 20: Solar PV load factor on an unchanged configuration basis, by UK country



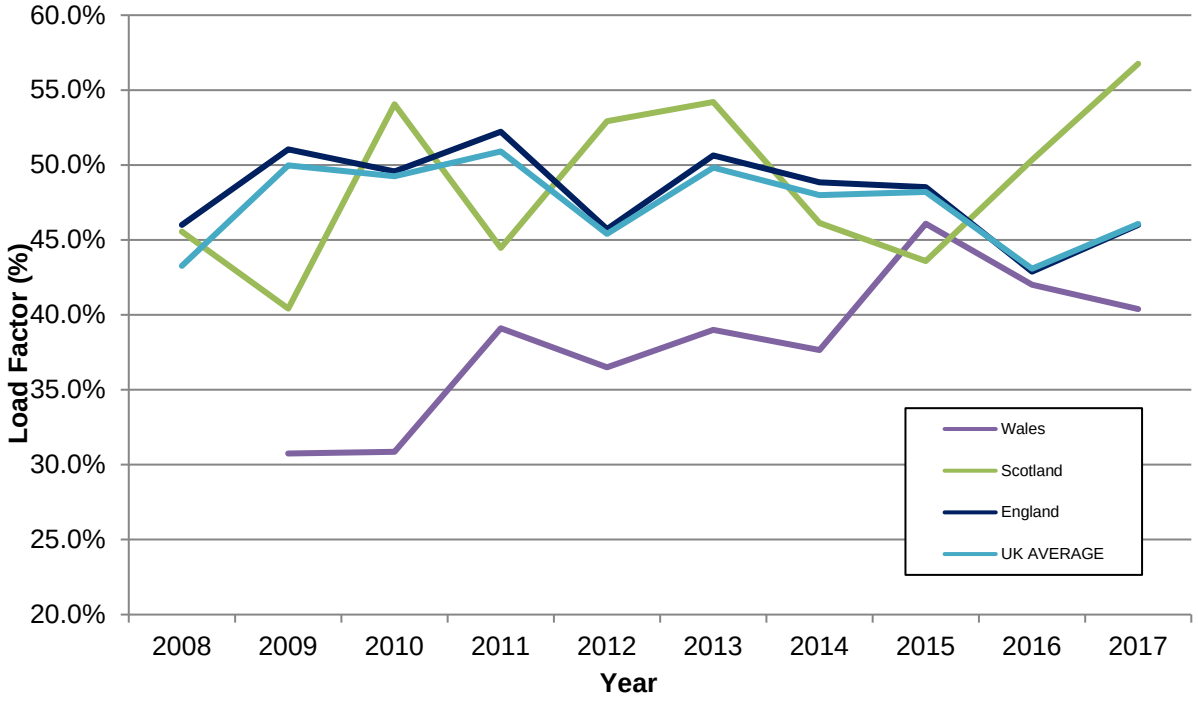
For landfill gas, the load factors vary from 72.2 per cent for London to 34.4 per cent in Wales, with UK mean and median values of 45.8 and 46.6 per cent respectively. Chart 21 shows that the landfill gas load factor has been steadily decreasing each year and this could be attributed to reductions in the quantity of waste landfilled since the early 2000s leading to less efficient gas abstraction. In the case of Northern Ireland, there was a growth in capacity and load factors as new sites were exploited but this has now settled down to similar values to the rest of the UK.

Chart 21: Landfill gas load factor on an unchanged configuration basis, by UK country



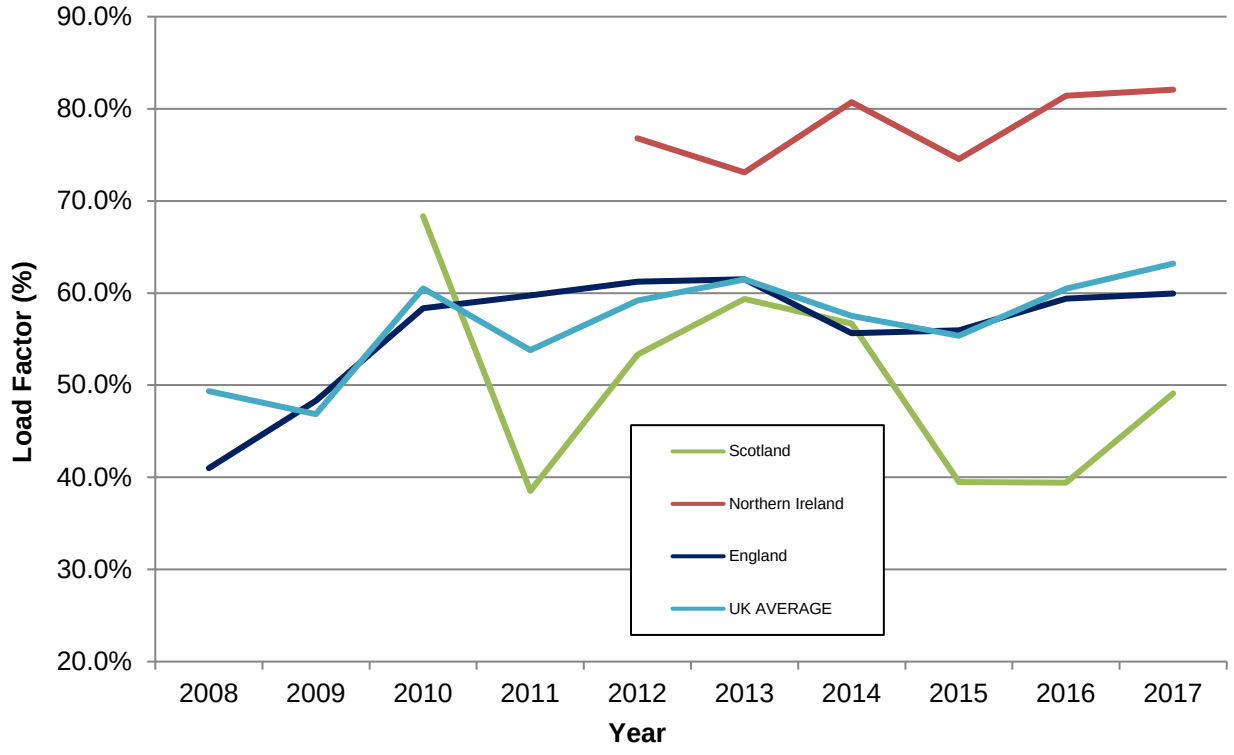
Sewage gas load factors range from 40 to 58 per cent (Chart 22) but historically there have been some unaccounted for low load factors for Wales and extreme changes for Scotland. Unfortunately, there are insufficient reliable data with which to report on the time series performance of sewage gas in Northern Ireland.

Chart 22: Sewage gas load factor on an unchanged configuration basis, by UK country



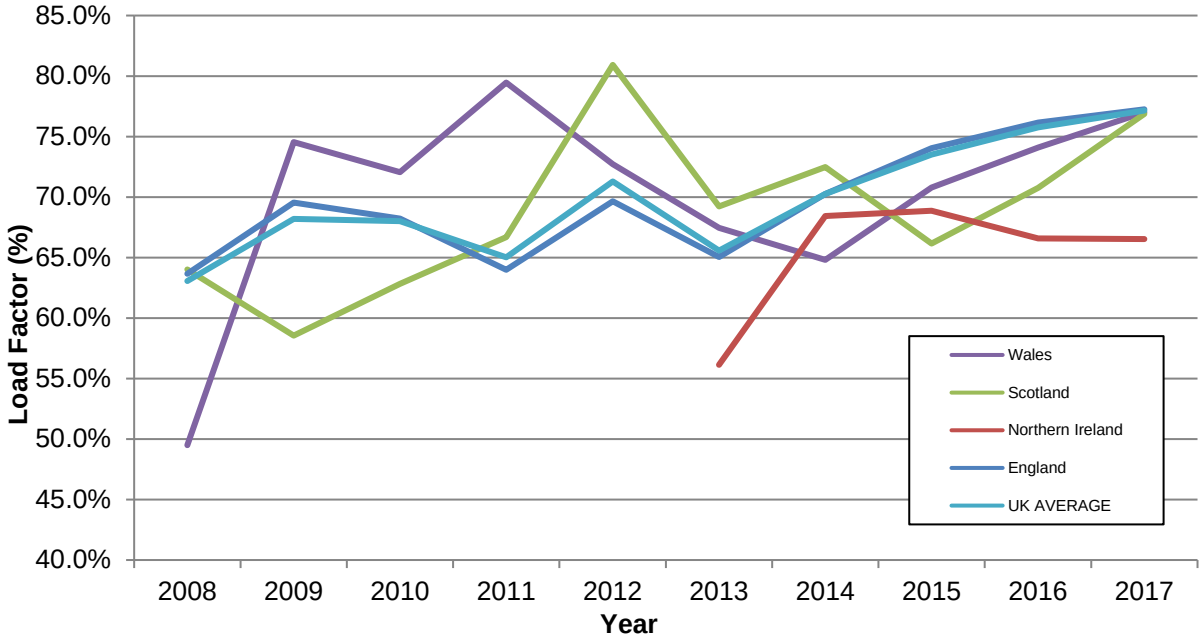
For AD, load factors can vary significantly as, depending on the feedstock, full plant output post commissioning of new schemes is not fully achieved for between 3-6 months as shown by the variations in Chart 23. This year saw only an 8 per cent increase in installed capacity but a UK load factor of 63.2% which represents the highest recorded to date. There continues to be insufficient reliable data with which to report on Wales. The load factors for Northern Ireland remain high compared with GB data for reasons still unknown.

Chart 23: AD load factor on an unchanged configuration basis, by UK country



The regional variation in load factors for biomass and waste ranges from 83.0 per cent in Yorkshire and the Humber (due to the high utilisation rates of Drax), to 17.3 per cent in the South West (due to ongoing issues with several Advanced Conversion Technology (ACT) schemes in the region). Interestingly, the load factors for England, Scotland and Wales now show convergence in Chart 24.

Chart 24: Biomass and waste load factor on an unchanged configuration basis, by UK country



For onshore wind, the load factors ranged from 23.9 per cent in the South East to 31.9 per cent in the West Midlands, with East Midlands occupying the median position at 27.3 per cent.

Chart 25 shows the annual variation in onshore wind load factors compared to the UK's average wind speed[11]. Over the 15-year period from 2001 to 2015, 2015 was the windiest year, slightly exceeding 2008; the least windy year was 2010. Thus, 2015's load factors for both onshore and offshore wind were the highest in the sixteen-year time-period. The average wind speed for 2017 (8.8 knots) was more than for 2016 (8.4 knots) which is reflected in the correspondingly higher load factors for this year's onshore wind.

[11] Source: Energy Trends table ET 7.2, available at: *www.gov.uk/government/statistics/energy-trends-section-7-weather*. Further information on the methodology used is given in Energy Trends Special feature article,
Dagnall, S.P., Janes, M. and Tipping, A, March 2006, 'UK Onshore Wind capacity factors 1998-2004', Energy Trends, p28

Chart 25: Annual variation in wind speed and UK onshore wind load factor on an unchanged configuration basis

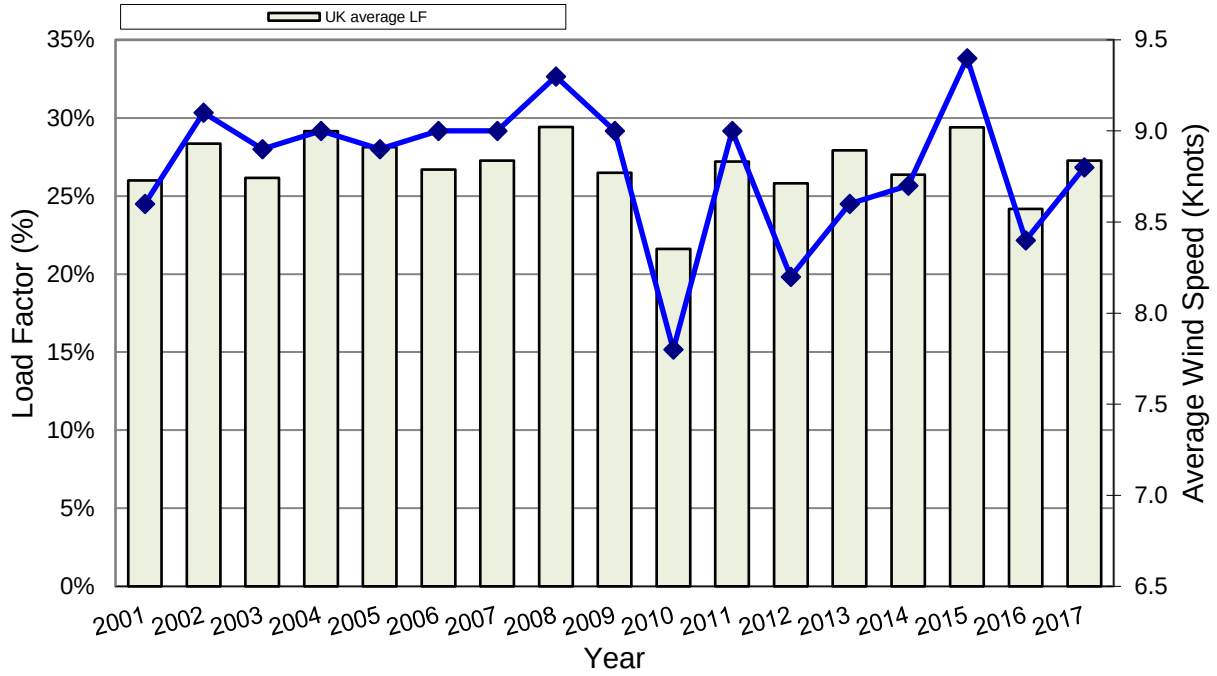
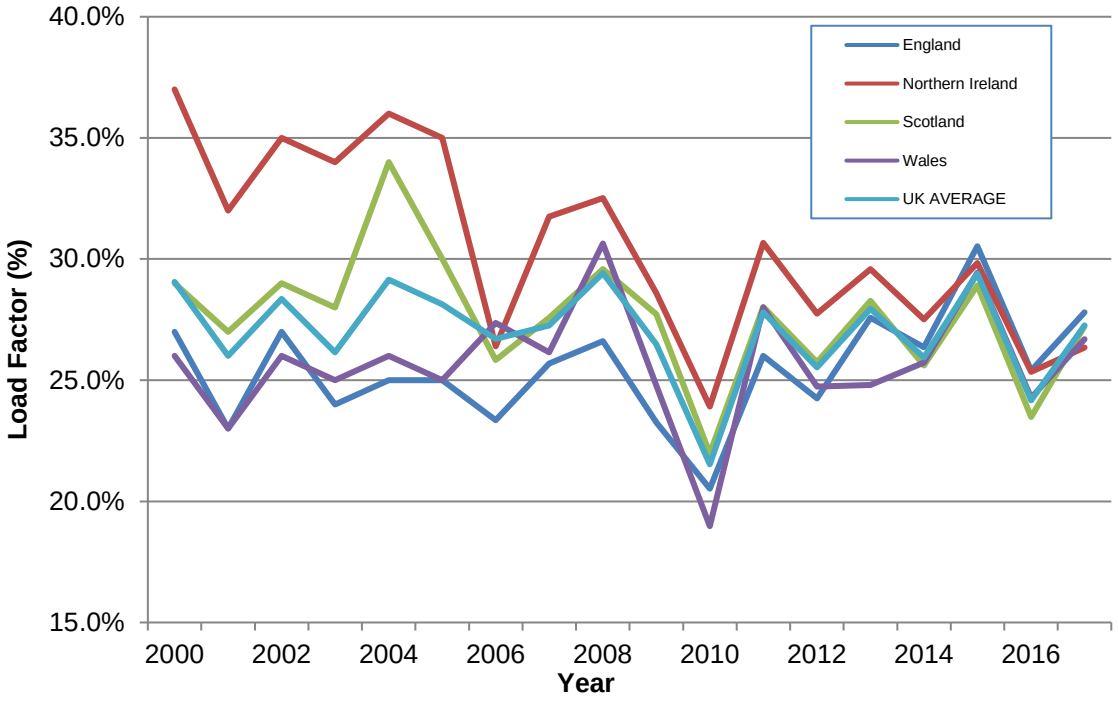


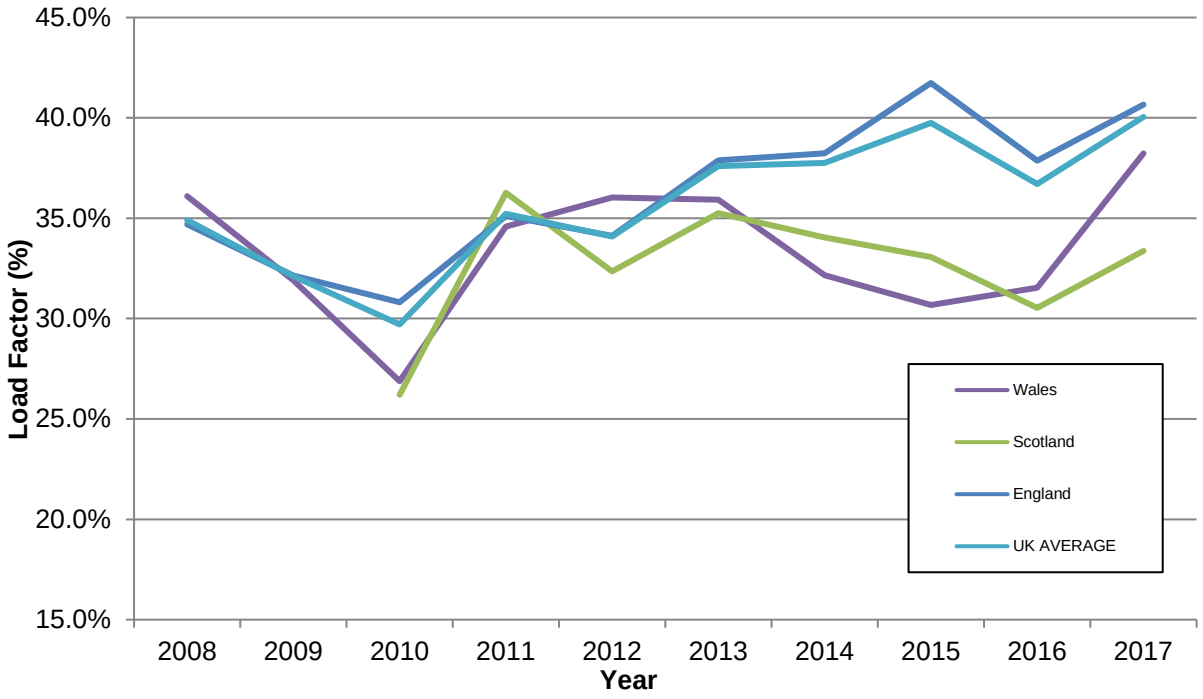
Chart 26 compares the onshore wind load factors for the four UK countries. For most of the seventeen years, the highest load factors have been experienced in the windier countries, Northern Ireland (averaging 30.8 per cent) followed by Scotland (averaging 27.6 per cent), Wales (averaging 25.6 per cent) and England (averaging 25.3 per cent). However, in 2014- 2016, Scotland's load factor fell beneath that of the other three countries, due to continued outages and curtailments at some of Scotland's largest wind farms. In 2017, Scotland's load factor for onshore wind remains less than that for England it is now greater than that for both Northern Ireland and Wales. In England, the North West continues to have the highest load factor of the English regions (29.3 per cent) closely followed by the North East (27.8 per cent).

Chart 26: Onshore wind load factor on an unchanged configuration basis, by UK country



Offshore wind load factors ranged from 33.4 per cent in Scotland to 40.7 per cent on average in England, with Yorkshire and the Humber achieving 47.7 per cent, driven by high-performing sites including Westernmost Rough (which utilises the largest turbines operational throughout 2017, at 6 MW, though now superseded by BBE's 8 MW turbines, and Humber Gateway), followed by the North West at 43 per cent. The East of England and Wales (38.2 per cent) jointly occupy the median position at 39 per cent. Chart 27 shows the effect of the variation in average wind speed data described above.

Chart 27: Offshore wind load factor on an unchanged configuration basis, by UK country



Local authority analysis

Tables 6 to 8 rank the top five Local Authorities (LAs), per: number of installations, installed capacity, and generation for key technologies; this is also shown graphically in Charts 28 to 30.

For overall **number of sites**, Cornwall remains the top ranked (17,384), reflecting the large number of solar PV schemes installed in the South West. In terms of individual technologies, the top ranking LAs for number of installations for onshore wind, PV, hydro, landfill gas, anaerobic digestion and plant biomass are, respectively: The Orkney Islands, Cornwall, Highland, Thurrock, Shropshire and Mendip.

Highland became the top ranked this year for overall **capacity**, primarily from wind and hydro, followed closely by Selby, primarily from Plant Biomass (Drax Dedicated Biomass). In terms of installed capacity of individual technologies, the top ranking LAs for onshore wind, PV, hydro, landfill gas, anaerobic digestion and plant biomass are, respectively: Highland, Wiltshire, Highland, Thurrock, Shropshire and Selby.

The top ranked LAs for **generation** was Selby, primarily from Plant Biomass, but in terms of individual technologies, the top ranking LAs for onshore wind, PV, hydro, landfill gas, anaerobic digestion and plant biomass are, respectively: Highland, Cornwall, Highland, Thurrock, Shropshire and Selby.

Cornwall and Wiltshire continue to have large numbers of PV sites with correspondingly high capacity and generation which represents the installation of large solar farms. Interestingly, Sunderland and County Durham between them have an unusually large number of PV sites, especially for a region

with low solar irradiance, however, they have much lower capacities and generation. This large number of small schemes probably represents the uptake of domestic installations.

The Highland's overall capacity and generation is driven by the construction of large-scale wind farms. Whilst the Orkneys has the highest number of wind sites, almost 3 times that of the Highland's, it has little capacity or generation; most likely because these are mainly small projects meeting local needs. Although much wind capacity exists in Scotland, grid connection issues mean there are currently limitations on how much can be exported to other parts of the UK until this has been resolved.

Shropshire continues to show the highest number of AD facilities as well as capacity and generation, and probably reflects the availability of AD feedstock because of the high levels of livestock farming undertaken in this District.

Chart 28: Top five Local Authorities ranked by number of sites

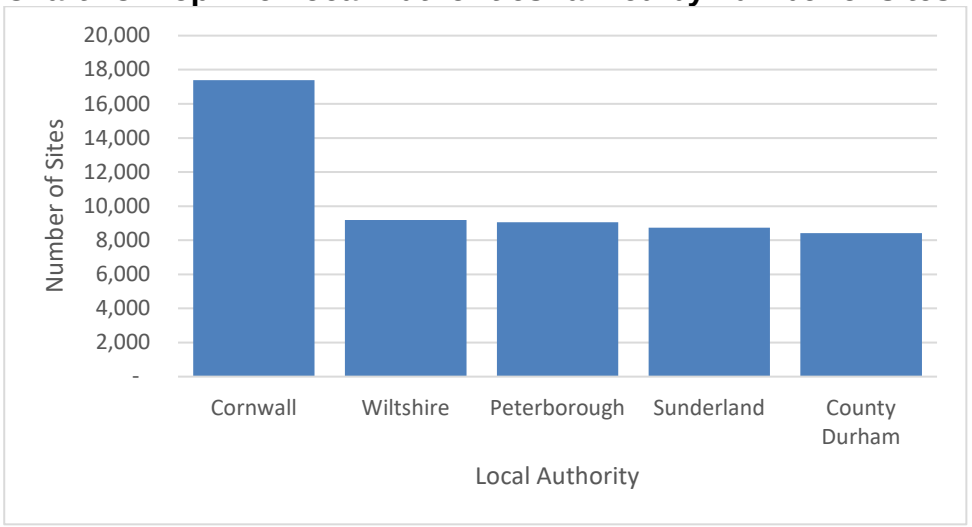


Chart 29: Top five Local Authorities ranked by capacity

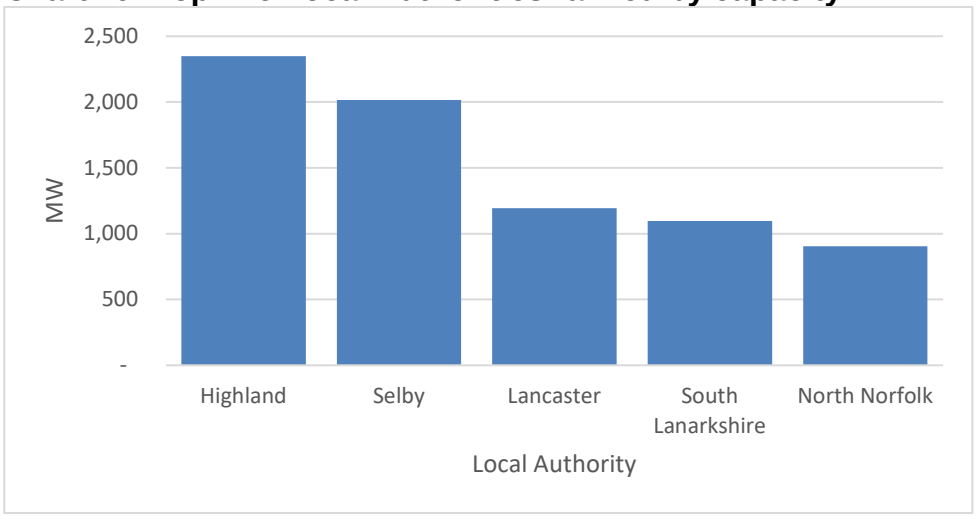


Chart 30: Top five Local Authorities ranked by generation

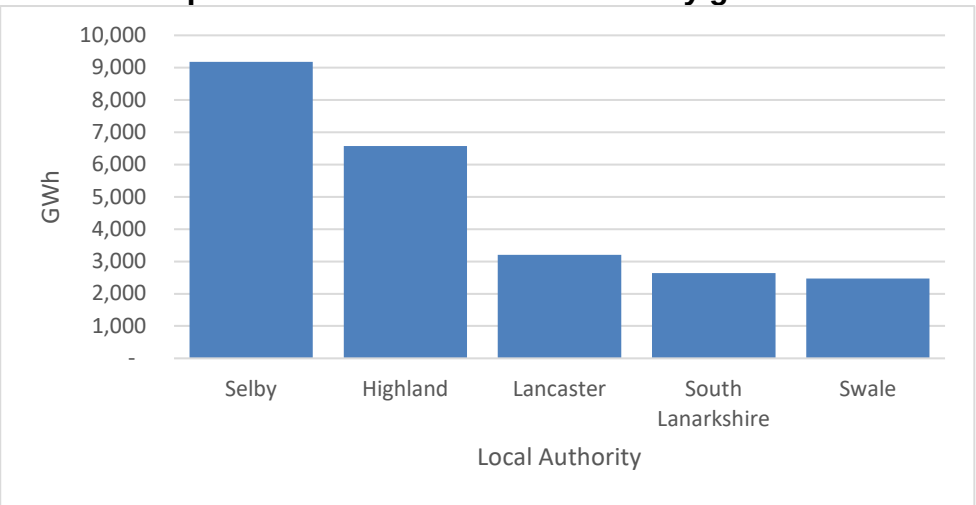


Table 6: Local Authority: Number of sites generating electricity from renewable sources, 2017[1]

Number

Onshore Wind		Solar PV		Hydro		Landfill gas		Anaerobic Digestion		Plant Biomass		Total [2]	
Orkney Islands	773	Cornwall	16,924	Highland	278	Thurrock	10	Shropshire	34	Mendip	29	Cornwall	17,384
Aberdeenshire	572	Wiltshire	9,153	Argyll & Bute	115	Doncaster	8	Herefordshire County of	20	Dumfries & Galloway	14	Wiltshire	9,179
Cornwall	427	Peterborough	9,053	Gwynedd	113	North Lanarkshire	8	Strabane	18	Herefordshire County of	10	Peterborough	9,061
Dumfries & Galloway	293	Sunderland	8,733	Perth & Kinross	88	Warrington	8	Dumfries & Galloway	15	East Riding of Yorkshire	8	Sunderland	8,742
Highland	249	County Durham	8,291	Dumfries & Galloway	83	Wiltshire	8	East Lindsey	9	Sheffield	8	County Durham	8,411
								East Lindsey	8				
								East Lindsey	8				
								East Lindsey	8				
UK Total	9,586		942,550		1,507		464		585		372		955,383

Table 7: Local Authority: Installed capacity of sites generating electricity from renewable sources, 2017[1]

MW

Onshore Wind		Solar PV		Hydro		Landfill gas		Anaerobic Digestion		Plant Biomass		Total [2]	
Highland	1,484	Wiltshire	581	Highland	804	Thurrock	44	Shropshire	19	Selby	1,958	Highland	2,348
South Lanarkshire	1,055	Cornwall	581	Argyll & Bute	296	Central Bedfordshire	33	Redcar and Cleveland	10	Fife	77	Selby	2,015
South Ayrshire	653	South Cambridgeshire	284	Perth & Kinross	278	Warrington	32	Herefordshire County of	9	Slough	63	Lancaster	1,194
Scottish Borders	637	Shropshire	227	Dumfries & Galloway	152	North Lanarkshire	26	Breckland	9	Sheffield	62	South Lanarkshire	1,096
Aberdeenshire	577	Pembrokeshire	201	Stirling	85	Aylesbury Vale	21	East Lindsey	8	Neath Port Talbot	56	North Norfolk	905
UK Total	12,853		12,823		1,886		1,066		469		3,055		40,630

Table 8: Local Authority: Generation of electricity from renewable sources, 2017[1]

GWh

Onshore Wind		Solar PV		Hydro		Landfill gas		Anaerobic Digestion		Plant Biomass		Total [2]	
Highland	3,282	Cornwall	531	Highland	3,108	Thurrock	173	Shropshire	102	Selby	9,081	Selby	9,180
South Lanarkshire	2,497	Wiltshire	531	Perth & Kinross	776	Aylesbury Vale	133	Redcar and Cleveland	55	Fife	428	Highland	6,577
Scottish Borders	1,574	South Cambridgeshire	269	Argyll & Bute	583	Havering	128	Herefordshire County of	49	Allerdale	362	Lancaster	3,203
Aberdeenshire	1,465	Shropshire	186	Dumfries & Galloway	446	Central Bedfordshire	127	Breckland	48	Dumfries & Galloway	353	South Lanarkshire	2,637
Dumfries & Galloway	1,096	Pembrokeshire	173	Stirling	313	Warrington	122	Strabane	46	Sheffield	328	Swale	2,472
UK Total	29,113		11,505		5,917		4,284		2,518		20,059		99,372

1 Top five ranked Local Authorities (LAs). Where more than five schemes are listed, this indicates that more than one LA has the same ranking.
2 Totals include offshore wind sites allocated to nearest Local Authority.

Comparison with economic activity

Economic activity in each country or region can be measured in terms of Gross Value Added (GVA). Table 9 shows that Scotland continues to show the largest generating capacity from renewables in terms of capacity per unit of GVA, followed closely by Wales and Northern Ireland. Scotland shows the largest generation per unit of GVA, due to Drax, followed by Yorkshire and the Humber and Wales. Among the English regions, the highest generating capacity per unit of GVA after Yorkshire and the Humber is the East of England, followed by the South West and the East Midlands. In terms of Generation per unit of GVA, Yorkshire and the Humber is followed by the East of England, the East Midlands and the North West.

Table 9: Density of renewables generation in different areas

	Electrical generating capacity from renewable sources kW/GVA (£million)[1,2]	Electricity generated from renewable sources kWh/GVA (£million)[1]
England	**16.90**	**42,277**
East Midlands	26.93	54,493
East of England	33.92	74,763
North East	20.83	47,864
North West	18.67	50,272
London	0.97	2,648
South East	15.26	29,750
South West	30.33	38,428
West Midlands	9.30	16,412
Yorkshire and the Humber	36.27	181,060
Northern Ireland	**41.64**	**87,700**
Scotland	**75.95**	**189,024**
Wales	**53.59**	**118,945**
UK average	**23.02**	**56,665**

1. GVA is Gross Value Added as published as Total GVA in Regional Gross Value Added (Income Approach), December 2015 at: www.ons.gov.uk/economy/grossvalueaddedgva/bulletins/regionalgrossvalueaddedbalanceduk/1998to2016

2. Excludes capacity attributable to co-firing of bioenergy which has not been allocated to regions (see footnote 4 to Table 2).

Revisions

Historic revisions this year were only carried out to the 2015 and 2016 datasets. Whilst this has resulted in changes to both capacity and generation for all but two regions (including the minor changes to Northern Ireland), these are primarily due to the reassignment of unknown FiT data from the Other category. These revisions are summarised in the following table:

Table 10: Historic capacity and generation revisions				
Year	**2015**		**2016**	
	MW	GWh	MW	GWh
England				
East Midlands	115	66	145	238
East of England	0	0	0	0
North East	15	4	25	21
North West	52	21	93	96
London	11	4	17	11
South East	100	32	148	149
South West	226	67	293	278
West Midlands	61	27	103	108
Yorkshire and the Humber	0	0	0	0
Northern Ireland	**0**	**-1**	**1**	**-3**
Scotland	**102**	**113**	**183**	**376**
Wales	**81**	**32**	**151**	**170**
Other	**-692**	**-406**	**-1169**	**-1544**
TOTAL	72	-42	-10	-99

Further information

For further details on the sub-national renewable analysis in this article please contact:

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Combined Heat and Power in Scotland, Wales, Northern Ireland and the regions of England in 2017

Background

Combined Heat and Power (CHP) is the simultaneous generation of usable heat and power (usually electricity) in a single process. CHP data for the UK as a whole are updated annually and published in the Digest of United Kingdom Energy Statistics (DUKES), the latest edition of which was published in July 2018. This article updates statistics published in the September 2017 edition of Energy Trends and provides a breakdown of CHP in the Devolved Administrations and English regions in 2017[1].

The data presented originates from a CHP database maintained by Ricardo Energy & Environment on behalf of The Department of Business Energy and Industrial Strategy (BEIS). Data relating to the overwhelming majority of CHP electrical capacity (>99 per cent of total capacity) is received annually from the reliable sources of the Combined Heat and Power Quality Assurance (CHPQA) programme, the Iron and Steel Statistics Bureau (ISSB) and from Ofgem's Renewable Obligations Certificates (ROCs) returns. Another source of data is the sales databases of the Association for Decentralised Energy (ADE). Data from CHP schemes not covered by the above sources are extrapolated from historic data. There is an ongoing data quality assurance exercise in respect of these schemes.

Between 2016 and 2017 there was a net increase in Good Quality CHP[2] capacity of 209 MWe and a net increase of 162 in the number of CHP schemes in the database (194 new schemes and the removal of 32 schemes). Good Quality CHP capacity in the UK increased from 5,625 MWe (revised 2016 figure) to 5,835 MWe in 2017. As discussed in the 2018 edition of the Digest, the availability of new information regarding a number of Anaerobic Digestion (AD) schemes has made it possible to classify these schemes as CHP, as defined for the purposes of Chapter 7 of the Digest and this paper. These AD schemes have made a significant contribution to the aforementioned 209 MWe increase in capacity and the increase in renewable fuel consumption, discussed later in the paper.

Regional Trends[3]

Tables 1 and 1B show a comparison of the number of schemes, electrical capacity, electricity generated and heat generated in the regions[4] for the period 2015 to 2017. During this time, the total number of schemes increased from 2,130 to 2,386 and the capacity increased from 5,708 MWe to 5,835 MWe. Over this period, every region saw an increase in the number of CHP schemes and the capacity increased in all regions with the exception of North East, North West and South East. Capacity falls in these three regions were substantially driven by the closure of large industrial CHP plant, with closures in the Chemicals, Paper and Iron and Steel sectors driving the falls in the North West, South and North East regions, respectively.

[1] Similar articles on CHP have appeared in previous Energy Trends publications from 2001 to 2016. The figures within any one article are a snapshot of the position as seen at the time and therefore figures between articles do not constitute a time series. For example, there have been revisions made to the installed capacity for 2014 and 2015 shown in this article compared to the installed capacity shown for those years in last year's edition of this article.

[2] Good Quality CHP denotes schemes that have been certified as being highly efficient through the UK's CHP Quality Assurance (CHPQA) programme.

[3] Note: The figures for previous years are revised on an annual basis to account for late information submitted after the publication date of the article. This is to ensure that the true trends are captured in the data. The figures herein therefore supersede the previous articles published.

[4] These regions are the Government Office Regions of England and Devolved Administrations of Scotland, Wales and Northern Ireland.

Table 1: Trend in number of CHP schemes and their electrical capacity over the period 2015-2017

	Number of Schemes			Electrical Capacity (MWe)		
	2015	**2016**	**2017**	**2015**	**2016**	**2017**
England	**1,799**	**1,878**	**1,998**	**4,918**	**4,772**	**4,948**
East Midlands	115	116	130	130	131	151
Eastern	168	183	196	310	313	340
London	303	323	336	226	244	236
North East	111	113	127	374	333	360
North West	291	295	312	741	695	721
South East	298	316	323	896	819	851
South West	144	153	165	116	120	132
West Midlands	176	182	200	110	111	135
Yorkshire/Humberside	193	197	209	2,016	2,006	2,022
Scotland	137	150	170	525	553	557
Wales	117	120	132	184	220	235
Northern Ireland	77	76	86	82	81	96
UK Total	**2,130**	**2,224**	**2,386**	**5,708**	**5,625**	**5,835**

Table 1B: Trend in CHP electricity and heat generated over the period 2015-2017

	Electricity Generated (GWh)			Heat Generated (GWh)		
	2015	**2016**	**2017**	**2015**	**2016**	**2017**
England	**16,228**	**17,027**	**17,840**	**32,020**	**32,108**	**33,538**
East Midlands	622	636	725	1,355	1,336	1,433
Eastern	1,381	1,341	1,495	1,994	1,820	1,921
London	584	649	720	1,194	1,299	1,341
North East	1,078	1,079	1,341	4,094	3,580	4,018
North West	2,527	2,533	2,688	7,678	7,610	7,956
South East	2,726	2,747	3,009	6,393	6,509	6,778
South West	407	603	666	503	555	576
West Midlands	480	472	595	761	843	878
Yorkshire/Humberside	6,424	6,966	6,601	8,048	8,555	8,638
Scotland	2,435	2,329	2,655	5,760	6,121	6,205
Wales	613	712	769	1,931	1,934	1,989
Northern Ireland	258	337	384	524	507	506
UK Total	**19,534**	**20,405**	**21,648**	**40,234**	**40,670**	**42,238**

The region with the highest proportion of the UK's electrical capacity is still the Yorkshire and Humberside region with a 35 per cent share, followed by the South East (15 per cent) the North West (12 per cent) and Scotland (10 per cent). The Yorkshire and Humberside region hosts the largest CHP scheme in the UK and this contributes significantly to the dominance of this region in terms of capacity. In all, 80 per cent of the electricity capacity shown in Table 1 for 2017 is taken up by just 136 of the 2,386 schemes.

The four largest regions in terms of installed capacity were also the four largest regions in terms of electricity generation. In 2017, the Yorkshire and Humberside region accounted for 30 per cent of all Good Quality electricity generated in the UK, which is a decrease from 34 per cent (revised) in 2016. As with capacity, a very large proportion of Good Quality electricity generated is taken up by a very small number of schemes.

With 20 per cent of the total CHP heat delivered, the Yorkshire and Humber region provided the largest share of CHP heat in 2017. However, the dominance of CHP heat generation of this region is not as great as for CHP electricity generation. This is a consequence of the CHP technology supplying the very large majority of electricity generated (Combined Cycle Gas Turbines), where the ratio of heat to power generation is much lower than for other CHP technologies.

Chart 1: CHP generation by area in 2017

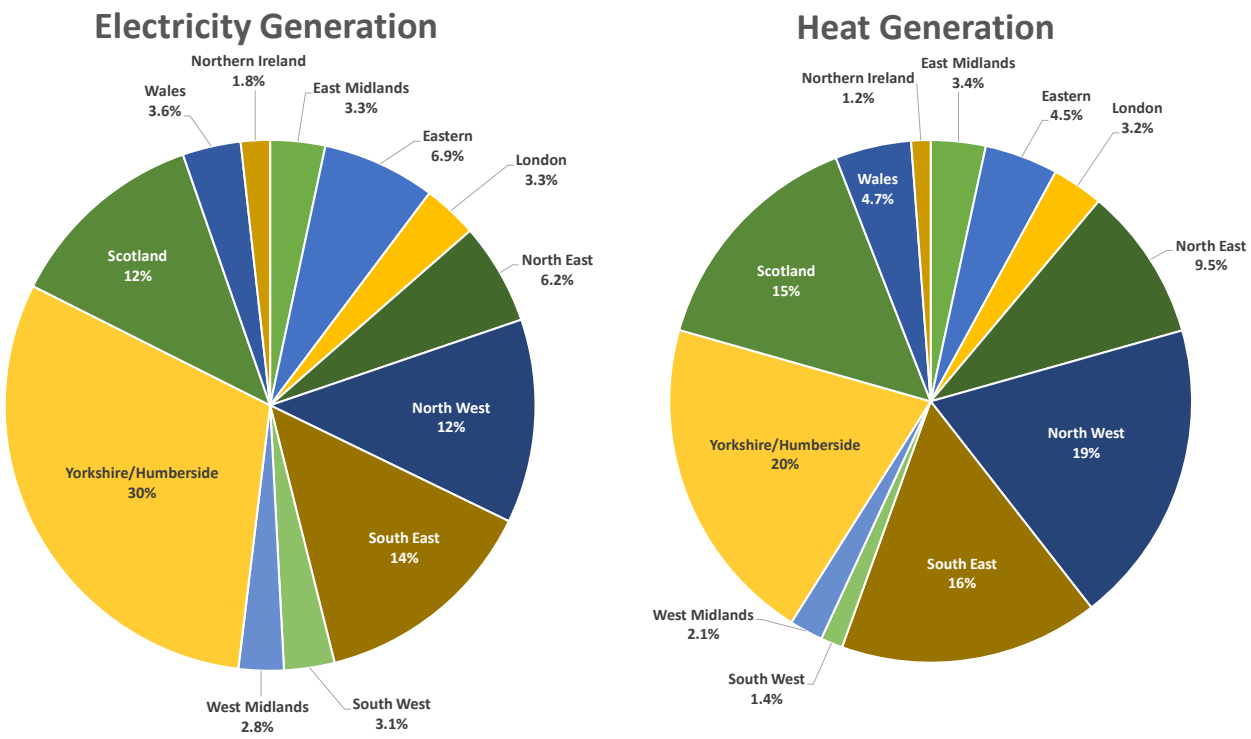


Table 2 shows an overview of CHP plant data broken down between the English regions and devolved administrations. The extent to which CHP capacity is utilised can be expressed by the Load Factor (LF). LF is the actual power generation as a proportion of the theoretical maximum power that can be generated for a given total installed capacity (TPC). The power output that is actually generated is the total power output (TPO). For 2017, the TPC was 8,615 MWe[5] and the TPO was 42,586 GWh, giving a LF of 56.4 per cent. This is a lower value than for 2016 (60.0 per cent). In 2016 there were notably large LF values at a number of large power generating sites in the Yorkshire and Humber and South East regions which was not repeated in 2017.

Higher LF values tend to be found when CHP is deployed to satisfy industrial heat loads. This is because the demand for heat extends over a greater proportion of the year at industrial sites than at sites where CHP is deployed to satisfy space heating, where demand is seasonal. The regions with the highest load factors tend to be those with very large proportions of power output generated at CHP situated at industrial sites, while low load factors tend to be found in regions where large proportions of power is generated at CHP situated at non-industrial sites.

[5] The Total Power Capacity (TPC) is the registered maximum power generating capacity of a CHP scheme. It should be distinguished from Qualifying Power Capacity (QPC). QPC is defined under the CHPQA Standard and is also known as Good Quality capacity. QPC is the registered power generation capacity that achieves a QI of 100 or more under conditions of Maximum Heat Output under Normal Operating Conditions, as defined in the CHPQA Standard. Where a CHP scheme does achieve a QI of 100 or more under these conditions, its TPC and QPC are the same. Where it does not, then the capacity considered Good Quality is scaled- back and under these circumstances TPC>QPC. Unless otherwise stated, QPC is the basis of all power capacities quoted in this article.

Table 2: Overview of CHP schemes in 2017

	Number of Schemes	Electrical Capacity (QPC)* MWe	Electrical Capacity (TPC) MWe	Heat Capacity MWth	Fuel Used* GWh	Electricity Generated (QPO)* GWh	Electricity Generated (TPO) GWh	Heat Generated GWh	Load Factor** (%)
England	**1,998**	**4,948**	**7,485**	**16,417**	**71,789**	**17,840**	**36,646**	**33,538**	55.9%
East Midlands	130	151	193	632	3,129	725	1,121	1,433	66.3%
Eastern	196	340	340	933	4,710	1,495	1,524	1,921	51.2%
London	336	236	270	953	2,801	720	1,091	1,341	46.1%
North East	127	360	386	936	7,090	1,341	1,885	4,018	55.7%
North West	312	721	864	4,213	13,928	2,688	4,099	7,956	54.2%
South East	323	851	2,054	3,182	13,468	3,009	8,562	6,778	47.6%
South West	165	132	132	305	2,332	666	692	576	59.9%
West Midlands	200	135	150	523	2,481	595	744	878	56.7%
Yorkshire/Humberside	209	2,022	3,096	4,740	21,850	6,601	16,927	8,638	62.4%
Scotland	170	557	710	2,629	12,698	2,655	3,863	6,205	62.1%
Wales	132	235	324	910	4,267	769	1,685	1,989	59.3%
Northern Ireland	86	96	96	235	1,525	384	392	506	46.7%
UK Total	**2,386**	**5,835**	**8,615**	**20,191**	**90,279**	**21,648**	**42,586**	**42,238**	**56.4%**

∗This represents Good Quality CHP capacity (QPC), Good Quality CHP power output (QPO) and the fuel associated with the Good Quality CHP outputs. For further details on how these are defined, see Dukes 2018 Chapter 7 and the Combined Heat and Power Quality Assurance (CHPQA) Standard Issue 5): www.gov.uk/government/uploads/system/uploads/attachment_data/file/335471/CHPQAStandardIssue5.pdf

** These load factors are based on the total power output (TPO) and total power capacity (TPC) of the CHP (for partially and fully qualified schemes). This gives the true utilisation of the power generating plant.

Importance of CHP in the Regional Economies

Chart 1 shows the CHP outputs of each region and is derived from the data contained in Table 1B. It portrays only a limited picture as it does not account for the varying size of each region's economy. To allow for this, CHP heat capacity and electrical capacity have been compared with the level of economic activity in each region as measured by Gross Value Added (in £ million) in Table 3. Chart 2 maps the heat capacity per unit of GVA for the different regions.

CHP continues to be a very important part of the economies of the Yorkshire/Humber, North West, Scotland and North East regions, as evidenced by the large heat capacities per unit of GVA in these regions. This is due to the prominence of the chemicals and oil refining industries in these regions, which are heat intensive sectors and are suited to CHP.

Table 3: Density of CHP in different areas, ordered by heat capacity

	Heat capacity per unit GVA kWt/ (£million)*	Electrical capacity per unit GVA kWe/ (£million)*
Yorkshire/Humberside	41.04	17.51
North West	25.48	4.36
Scotland	**19.56**	**4.14**
North East	18.17	6.98
Wales	**15.23**	**3.92**
South East	12.37	3.31
England	**10.98**	**3.31**
East Midlands	6.22	1.48
Eastern	6.21	2.26
Northern Ireland	**6.17**	**2.52**
West Midlands	4.07	1.05
London	2.41	0.60
South West	2.35	1.02
UK total	**11.69**	**3.38**

*GVA is provisional gross value added in 2016 (income approach) at current prices[6]

The distribution of CHP capacity across the regions and economic sectors is summarised in Table 4, which shows the proportion of total CHP capacity in a particular economic sector in each region. The most striking feature of Table 4 is the very large proportion (62 per cent) of CHP capacity serving the oil refineries and oil and gas terminals sector being located in the Yorkshire and Humber regions. Nearly 85 per cent of CHP capacity in the Chemicals sector is to be found in just three regions (Yorkshire and Humber, North West and North East), which is consistent with the

[6] www.ons.gov.uk/economy/grossvalueaddedgva/datasets/regionalgrossvalueaddedincomeapproach

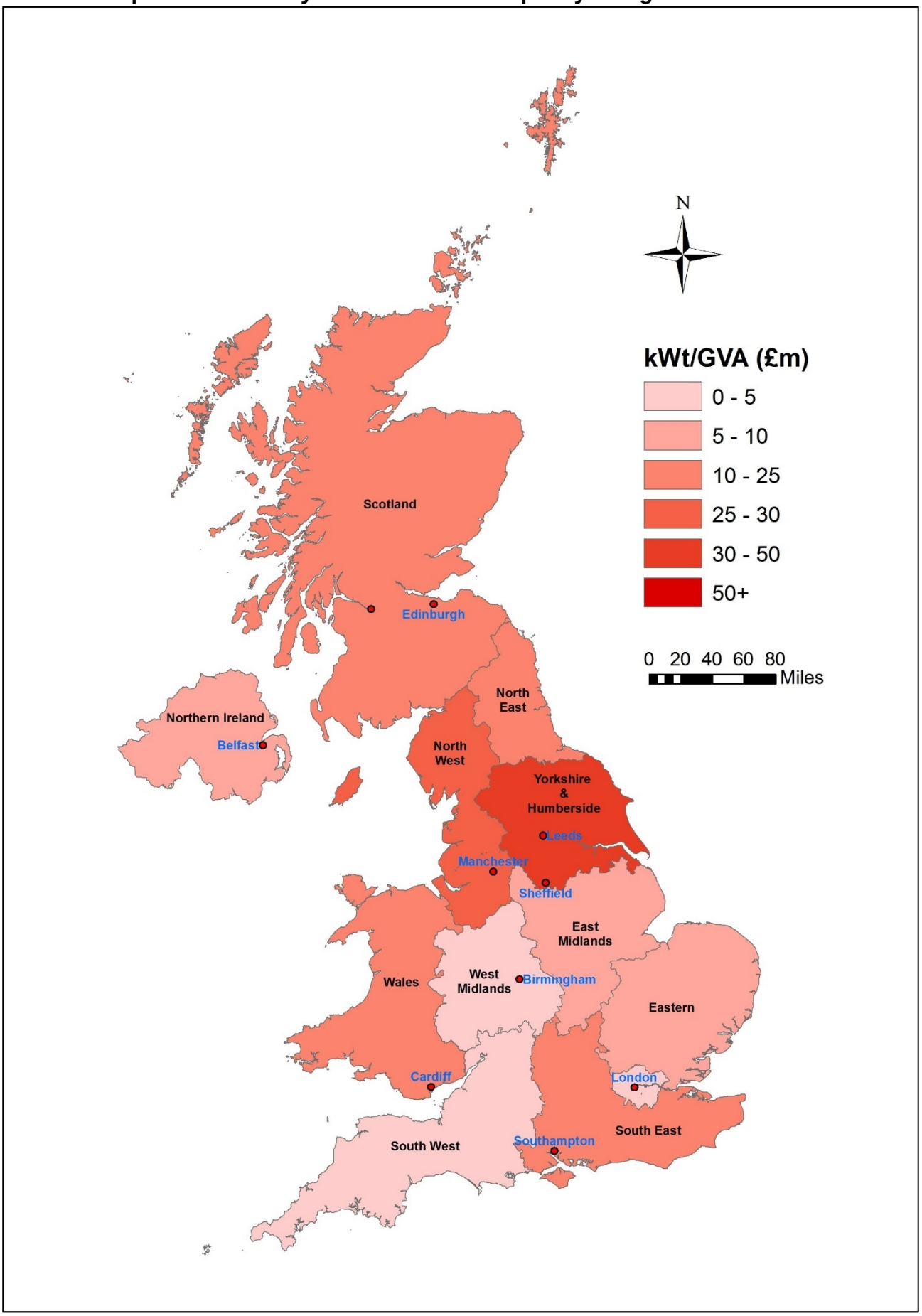
importance of the Chemical industry to the economies of these parts of the country. A large proportion (nearly 83 per cent) of CHP capacity serving the Paper sector is installed in just three regions (South East, North West and Scotland), attesting to the concentration of this industry in these regions. The dominance of the South East region for CHP serving the Paper sector has reduced in recent years due to site closures. In 2010 51 per cent of all CHP capacity operating in the paper sector was located in the South East. In 2017 this had fallen to 35 percent.

The large proportion of capacity installed in the Food and Drink sector in the Eastern region (42 per cent), is substantially due to that region's sugar from sugar beet refining operations. The predominance of services in London and the South East is reflected by these two regions having the highest and second highest shares, respectively, of capacity installed within the Transport Commerce and Administration sector.

Table 4: Distribution of CHP capacity across the regions and economic sectors in 2017

Region	Sector									
	Iron and Steel and Non-ferrous Metals	Chemicals	Oil Refineries and Oil and Gas Terminals	Paper, Publishing and Printing	Food, Beverages and Tobacco	Metal Products, Machinery and Equipment	Mineral Products	Other Industrial Branches	Transport, Commerce and Administration	Other
England	60.1%	88.6%	86.6%	72.9%	84.5%	81.5%	100.0%	70.7%	80.7%	89.1%
East Midlands	0.0%	1.3%	0.0%	0.0%	6.2%	4.1%	7.2%	7.7%	5.5%	7.0%
Eastern	14.6%	1.4%	0.0%	0.0%	42.3%	0.0%	0.0%	8.6%	5.1%	8.4%
London	7.3%	0.0%	0.0%	0.0%	5.7%	13.7%	0.0%	10.9%	15.2%	12.5%
North East	0.0%	23.9%	0.0%	0.0%	0.0%	0.0%	19.7%	4.2%	7.0%	5.4%
North West	0.0%	24.6%	5.0%	29.5%	16.4%	5.4%	51.3%	6.8%	9.9%	6.9%
South East	0.0%	0.2%	19.5%	35.0%	4.4%	6.2%	0.0%	12.8%	11.9%	22.9%
South West	0.0%	0.7%	0.0%	0.0%	1.7%	6.3%	21.9%	5.6%	8.9%	5.5%
West Midlands	0.0%	0.2%	0.0%	2.5%	0.0%	45.8%	0.0%	8.7%	8.0%	4.8%
Yorkshire and Humber	38.1%	36.3%	62.2%	5.9%	7.9%	0.0%	0.0%	5.5%	9.1%	15.7%
Scotland	0.0%	7.1%	11.2%	18.3%	8.1%	0.7%	0.0%	9.8%	9.7%	5.8%
Wales	36.4%	3.2%	2.2%	8.8%	1.9%	8.8%	0.0%	19.4%	3.4%	2.4%
Northern Ireland	3.5%	1.1%	0.0%	0.0%	5.4%	9.0%	0.0%	0.1%	6.2%	2.7%
UK Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chart 2: Map of CHP density in terms of heat capacity and gross value added



Technology type and size

Tables 5 and 6 show the regional split of installed electrical capacity (which qualifies as Good Quality CHP capacity) by prime mover (Table 5) and by size range (Table 6). In a number of regions, disaggregation of the data by prime mover or size could result in the disclosure of confidential information and so, for these areas, only totals are shown. The following conclusions can be drawn from the tables:

- Gas turbines, whether on their own or as part of Combined Cycle Gas Turbines (CCGT), continue to dominate the CHP market. In 2017, gas turbine based schemes accounted for 65 per cent of total CHP capacity but only 6 per cent of the total number of CHP schemes. However, the dominance of gas turbine based CHP has reduced over the years. In 2010 it accounted for 81 per cent of capacity. The reduction in this share has taken place at the same time that the share of capacity taken up by reciprocating engines has increased from 13 per cent to 26 per cent.

- The North West remains the region with the largest steam turbine based capacity. All of this capacity is at industrial sites. Scotland is the region with the second largest steam turbine based capacity, followed by the Yorkshire and the Humber.

- Reciprocating Engines constitute the vast majority of all CHP schemes (92 per cent of all schemes). The region with the largest number of reciprocating engine schemes is London, followed by the South East and the North West. This is a well established pattern and is a reflection of the high number of leisure centres, hotels and retail outlets found in these regions, for which reciprocating engines are well suited.

Table 5: CHP electrical capacity (MWe) by area and prime mover in 2017

	Gas Turbines*	Steam Turbines	Organic Rankine Cycle	Gas, Steam Turbine and ORC Subtotal	Reciprocating Engines	Total
England	**3,326**	**350**	**6**	**3,681**	**1,267**	**4,948**
East Midlands	-	-	-	60	91	151
East of England	-	-	-	193	147	340
London	-	-	-	42	194	236
North East	-	-	-	271	89	360
North West	388	179	1	567	154	721
South East	595	3	-	598	253	851
South West	18	25	-	44	88	132
West Midlands	-	-	0.3	17	118	135
Yorkshire and The Humber	1,816	75	-	1,891	131	2,022
Scotland	365	95	3	463	93	**557**
Wales	-	-	3	148	87	**235**
Northern Ireland	-	-	-	33	63	**96**
Grand Total	**-**	**-**	**-**	**4,325**	**1,510**	**5,835**

*Includes Combined Cycle Gas Turbines (CCGT)

The CHP market continues to be dominated by large-scale (>10MWe) plants, with 72 per cent of all installed capacity being in this size range. However, this proportion has been in steady decline over a number of years as larger (usually) industrial based CHP has closed and smaller (often) non-industrial based schemes have opened. For example in 2010, the proportion of installed capacity that was taken up by schemes > 10 MWe capacity was 83 per cent.

The regional distribution of CHP by capacity tranche is given in Table 6. Over 44 per cent of all capacity greater than 10 MWe is to be found in the Yorkshire and Humber region. The region with the second largest share of CHP capacity greater than 10 MWe is the South East (14 per cent), followed by the North West (12 per cent) and Scotland (10 per cent). Again, this is consistent with

the tendency for heat intensive industries such as oil refineries, chemicals and paper, for which CHP is suitable, to be located in these regions.

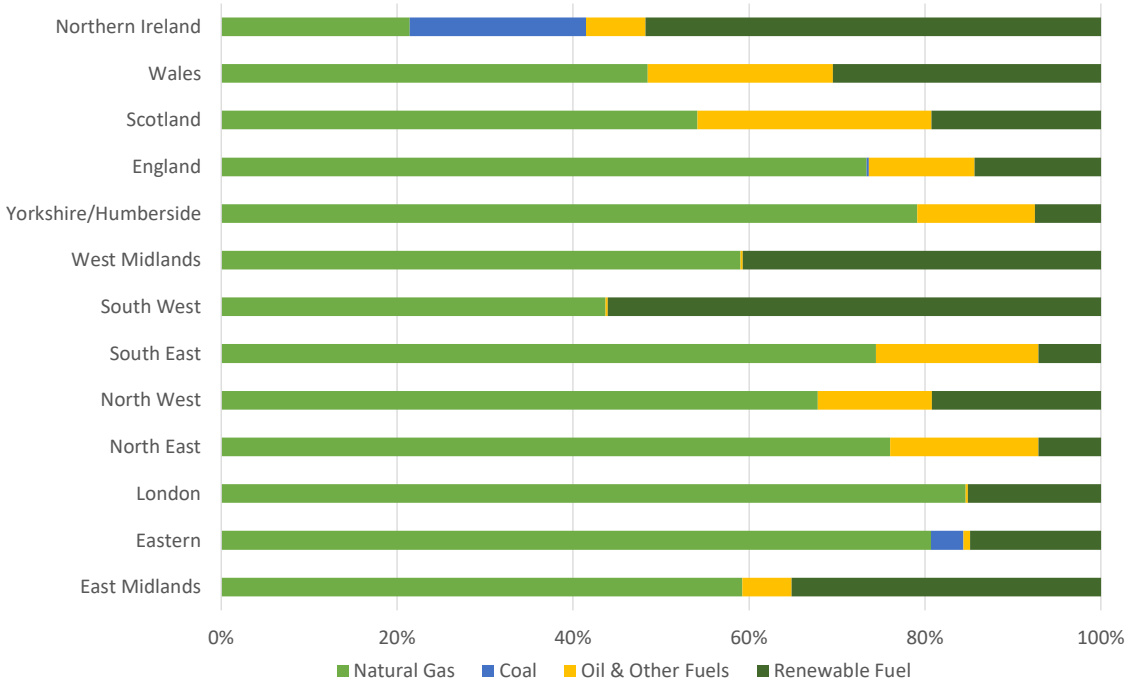
Table 6: CHP electrical capacity (MWe) by area and size in 2017

	<= 100 kWe	> 100 kWe to 1 MWe	>1 MWe to 2 MWe	> 2 MWe to 10 MWe	> 10 MWe +	Total
England	**37**	**278**	**228**	**847**	**3,558**	**4,948**
East Midlands	2	17	27	-	-	151
East of England	3	28	22	-	-	340
London	7	49	24	-	-	236
North East	3	11	11	83	252	360
North West	5	44	43	115	514	721
South East	5	44	35	165	602	851
South West	3	29	16	-	-	132
West Midlands	3	30	23	-	-	135
Yorkshire and The Humber	4	26	27	97	1,868	2,022
Scotland	2	20	29	84	421	557
Wales	3	19	9	47	157	235
Northern Ireland	1	20	5	-	-	96
Grand Total	**43**	**337**	**271**	**1,003**	**4,181**	**5,835**

The fuel mix

The proportion of coal, gas, renewable fuels and 'oil and other fuels' (comprising oil products, refinery gases, blast furnace gas and other industrial wastes) in the fuel mix for each region is shown in Chart 3.

Chart 3: Proportion of different fuels in the fuel mix for CHP in 2016 for each region



Special feature - CHP

Natural gas represented 69 per cent of all fuel burned in CHP in 2017, which is lower than in 2016 when the share was 71 per cent (revised). Since 2010, the share of all fuel burned that was natural gas has been within the range 69-73 per cent.

With the exception of Northern Ireland and the South West, natural gas accounts for the largest share of fuel burned in each of the English regions and Devolved Administrations. In Northern Ireland and the South West, renewable fuels account for the largest share of fuel burned, at 52 per cent and 56 per cent, respectively. In Northern Ireland the burning of biomass contributes significantly to the renewable fuel consumption in that region, while in the South West domestic refuse is a significant contributer. In 2017, the share of total fuel burned that was renewable was 16 per cent, which is an increase on the share for 2016 (13 per cent). The increase in the renewable fuel share is substantially due to the inclusion of a number of CHP schemes fuelled by biogas generated by anaerobic digestion fed with food waste for the first time.

In 2017 coal was only burned in Northern Ireland and the Eastern region and was confined to a very small number of schemes.

Summary

The well established patterns concerning the regional and sectoral distribution of CHP in the UK remain. However, over time these have become less pronounced. The subtle changes that have occurred are mainly driven by the closure of above average sized industrial CHP and the opening of below average sized non-industrial CHP, often based upon reciprocating engines.

Over the period 2015 to 2017, the number of CHP schemes increased in all regions of the UK. However, over the same period, the installed capacity decreased in three regions (South East, North East and North West) and these decreases were all driven by closure of industrial CHP capacity, specifically closures in the paper, Iron and Steel and Chemical sectors, respectively.

The use of renewable fuels in CHP has increased again. With the exception of London, all regions showed an increase in renewable fuel consumption between 2016 and 2017. Over the period 2015 to 2016 all regions have shown an increase in renewable fuel consumption. Natural gas continues to be the main fuel used in CHP, and makes up more than half of all CHP fuel consumed in all but three of the twelve region. Overall 69 per cent of all CHP fuel was natural gas.

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Diversity of supply for oil and oil products in OECD countries in 2017

Introduction and summary

Countries meet their oil needs through a combination of indigenous production and trade. This article is a comparative assessment of how OECD countries manage their crude oil and transport fuel demand, using data from the IEA database[1]. The aim is to determine how the UK compares with other OECD countries in terms of how it secures oil supplies.

Within the OECD, only three countries were net exporters of crude oil in 2017: Norway (producing over 6 times its indigenous demand), Canada, and Mexico. All other OECD countries had to meet their demand through imports with 11 countries not producing any crude oil indigenously.

Half of OECD countries met their motor gasoline (petrol) demand through indigenous production, with much of Western Europe being net exporters. Despite motor gasoline having the second lowest average diversity index, it achieved the highest average security of supply score of the four products due to high levels of indigenous production in the OECD.

For jet fuel, the position is markedly different with only a third of OECD countries self-sufficient. France and the United Kingdom were the top two scorers for diversity of imports within the OECD.

More than a third of OECD countries were self-sufficient in diesel production, with Greece, Finland, and Korea scoring highest. Greece produced nearly four times the amount it consumed.

The UK could have met more than 80 per cent of its demand for crude oil through indigenous production and ranked in the top 10 for security of supply with regards to crude oil. The UK was able to meet its demand for motor gasoline through indigenous production and was second only to the United States for diversity of imports. For jet fuel, the UK was in the lower third of the OECD in terms of indigenous production scores, but scored the second highest on diversity of imports after France. In terms of diesel, the UK produced only just over half its demand, below the median for the OECD, but scored sixth highest of all OECD countries for diversity of supply.

Charting oil self-sufficiency and diversity of supply

Bubble Charts

The bubble charts demonstrate the relationship between a country's demand, its indigenous production, diversity of its gross imports and the political stability of the countries of import. The profiles show:

- Self-sufficiency: the proportion of a country's demand that could be met through indigenous production is shown on the vertical axis. A score of 1 indicates a country produces as much oil as it uses.
- A diversity score: the diversity and political stability – defined via the World Bank's governance indicators - of a country's gross imports is shown on the horizontal axis (see Appendix 2 for a methodological note).
- Consumption: is represented by the circle or bubble, the area of which indicates the level of consumption for 2017 for each OECD country.

[1] http://data.iea.org/

Bar Charts

The bars charts provide a means of comparing OECD countries by self-sufficiency and diversity of imports. These profiles combine the proportion of demand that could be met through indigenous production (shown in the coloured part of the chart) with the diversity and political stability of import origins (shown in white). The sum of these two components is used as a simplified metric for security of supply, and thus does not represent a full description of security of supply beyond import diversity, stability and self-sufficiency. Appendix 1 shows the underlying data.

Choropleth Map

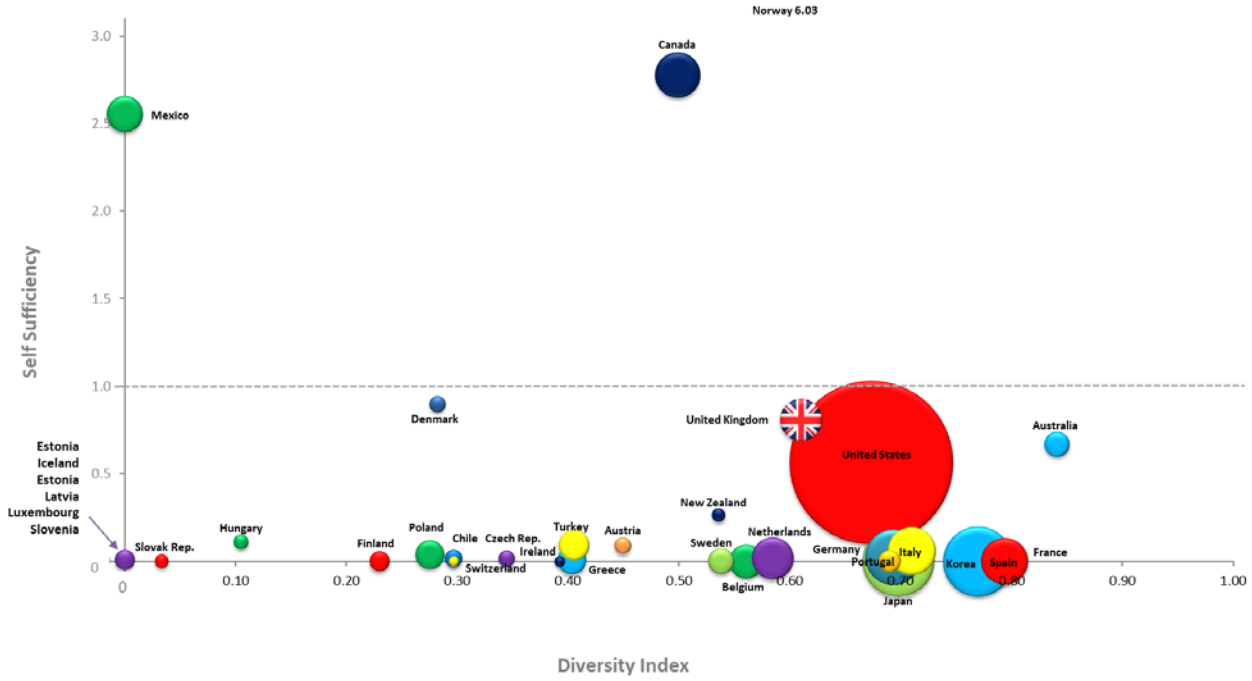
These maps indicate a visual representation of the source countries and quantities of each product's exports. A darker shade represents that a high proportion of the world's exports originated from that particular country, whereas lighter shades indicate that fewer exports originated in that country. Appendix 1 shows the underlying data.

Results

Crude

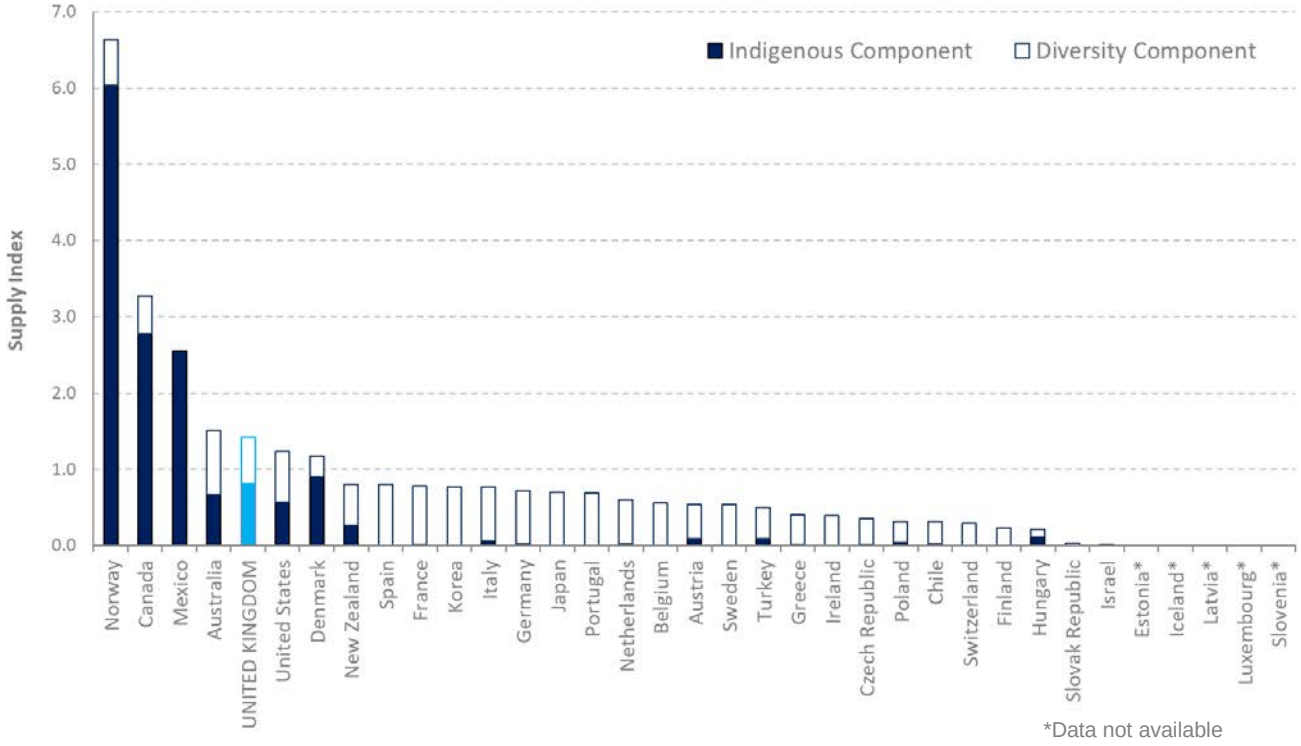
Only three OECD countries were self-sufficient for crude oil in 2017 (Chart 1). Norway had by far the highest self-sufficiency score, producing more than six times its own consumption of crude oil. With a self-sufficiency score of 0.81, the UK was above the OECD average of 0.43. Similarly, the UK's diversity score of 0.61 was above the average score of 0.40.

Chart 1: Diversity and self-sufficiency of crude oil for OECD countries, 2017



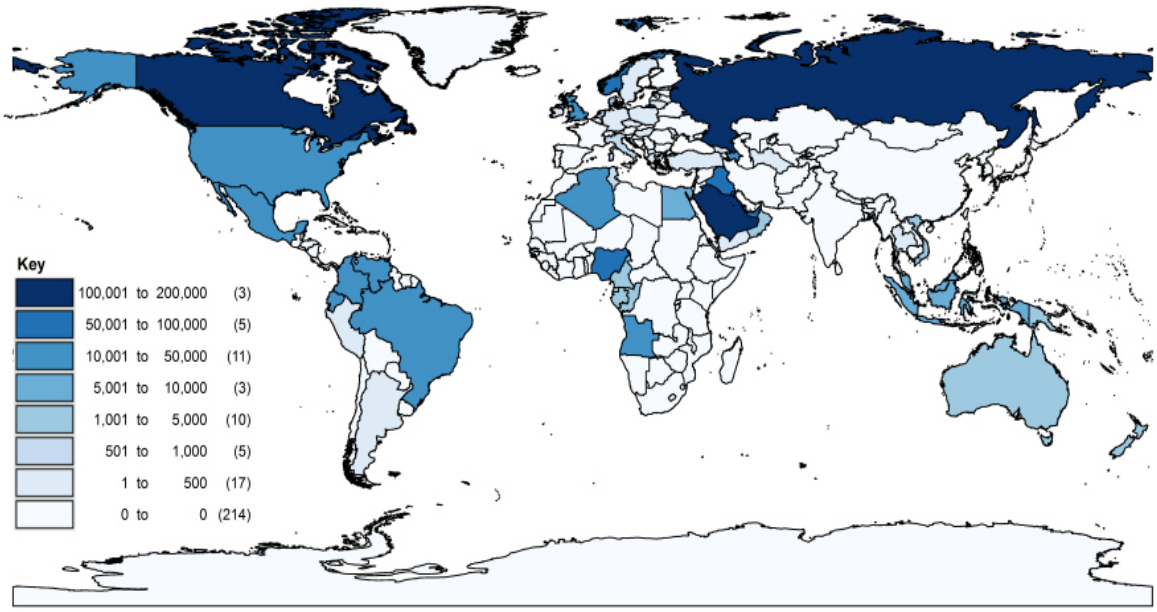
The majority of OECD countries showed diversity and political stability scores that reflect a strong trading element, with a relatively small contribution from indigenous production (Chart 2). Chart 2 shows that the UK placed highly in the ranking of OECD countries being one of only a few countries with significant oil production.

Chart 2: Security of supply of crude oil for OECD countries, 2017



Map 1 is an illustration of where crude oil exports originated in 2017. Currently Saudi Arabia, Canada and Russia are by far the biggest exporters of crude in the world. The UK was the 5th biggest OECD exporter and placed 15th overall. Although the United States produce almost three times as much as any other OECD country they have historically exported relatively little, even after the 40 year ban on almost all crude exports nationwide was lifted in December 2015. However this looks to be changing because 2018 saw the highest quantity of crude exported from the US on EIA records[2].

Map 1: Worldwide Crude Oil Exports (kt), 2017

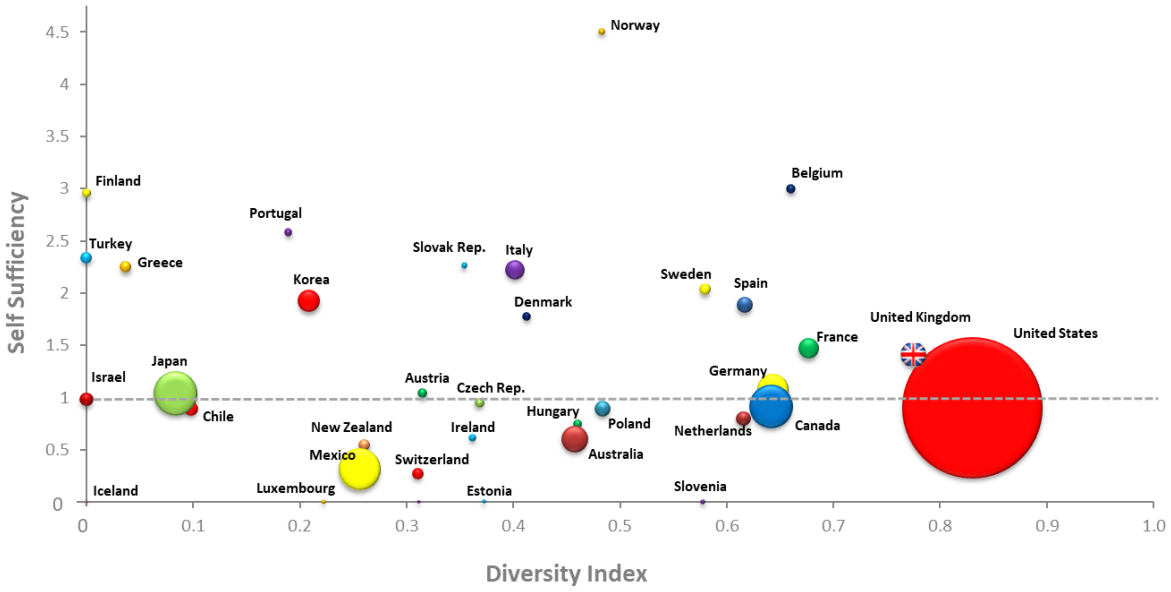


[2] www.eia.gov/dnav/pet/pet_move_expc_a_EPC0_EEX_mbbl_a.htm

Motor Gasoline

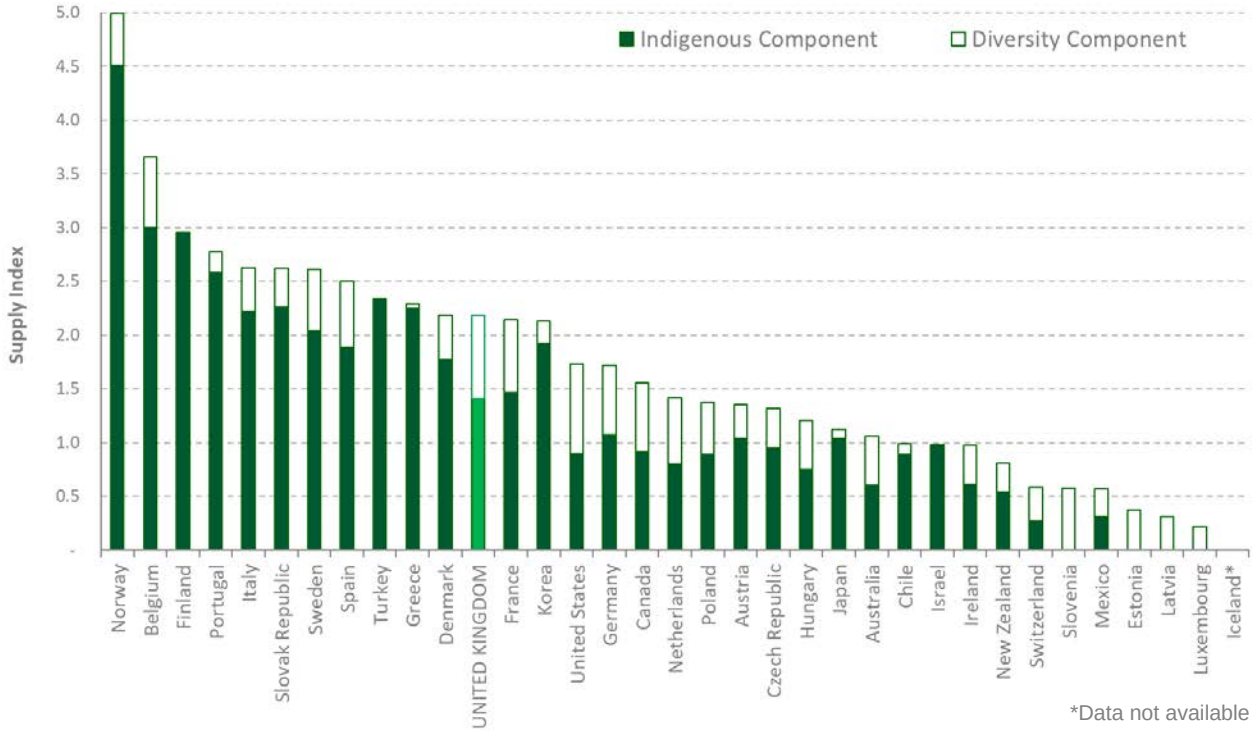
The profiles for motor gasoline are different to that of crude. Half of the 35 OECD countries were self-sufficient in 2017 (Chart 3). Consumption in the US dwarfs that of other OECD countries, equal to nearly two-thirds of the OECD total. The UK had a self-sufficiency score of 1.41, which was above the 1.29 average across all OECD countries. The UK's diversity score of 0.78 was also more than double the OECD average of 0.37.

Chart 3: Diversity and self-sufficiency of motor gasoline for OECD countries, 2017



Our simplified security of supply index (Chart 4) shows how the majority of countries produce enough motor gasoline to meet their needs and how much trade there is in motor gasoline amongst the OECD countries. The UK ranks 12th out of the 35 OECD countries for security of supply of motor gasoline.

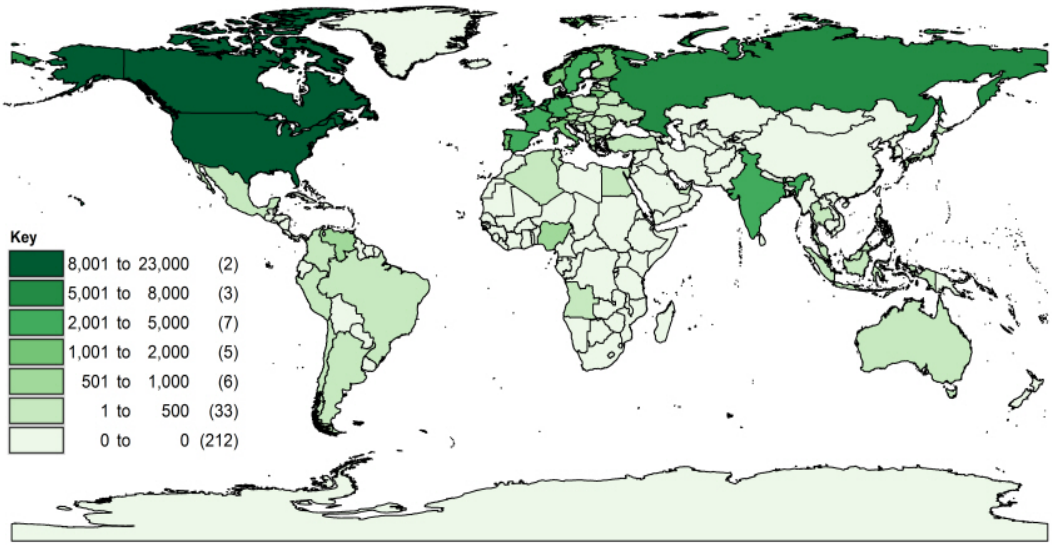
Chart 4: Security of supply of motor gasoline for OECD countries, 2017



*Data not available

The main exporter of motor gasoline around the world is North America, with the United States the largest exporter in the world and exporting more than twice the amount of Canada, the next biggest exporter. Europe is also shown on the map to be a very significant exporter of motor gasoline to the rest of the world with the United Kingdom, the Netherlands and Belgium of particular note. However many large economies such as Australia, Japan and China export very low quantities of motor gasoline.

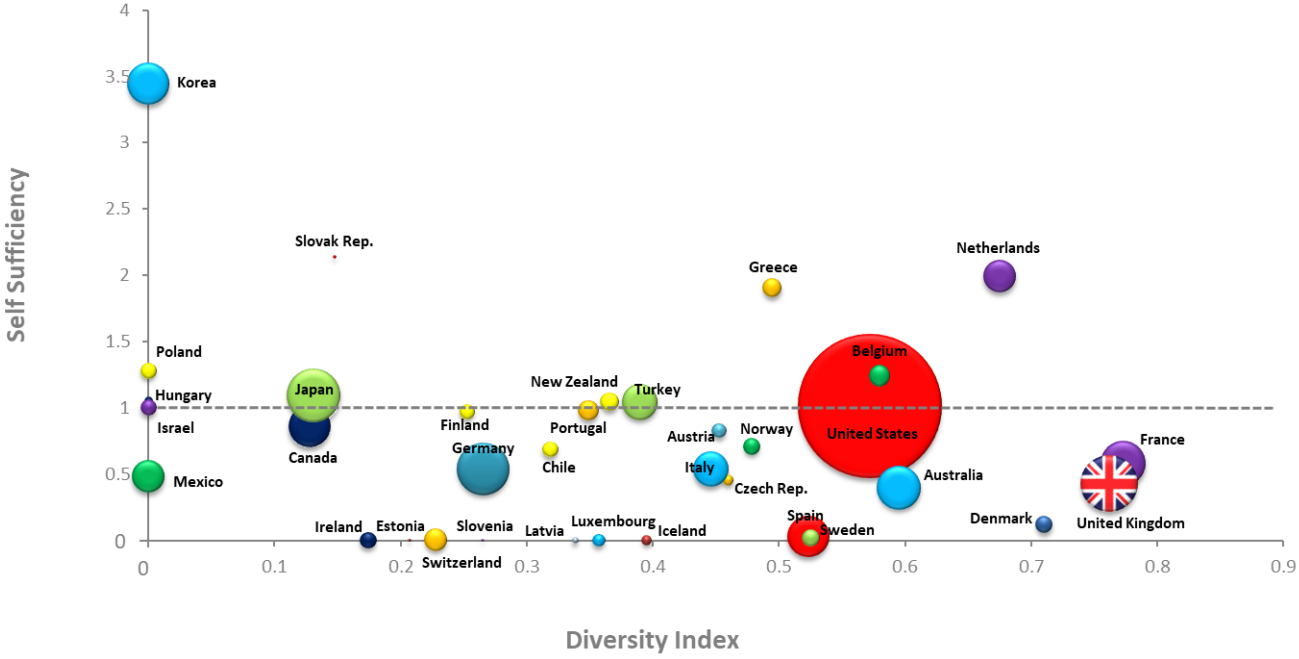
Map 2: Worldwide Motor Gasoline Exports (kt), 2017



Jet Fuel

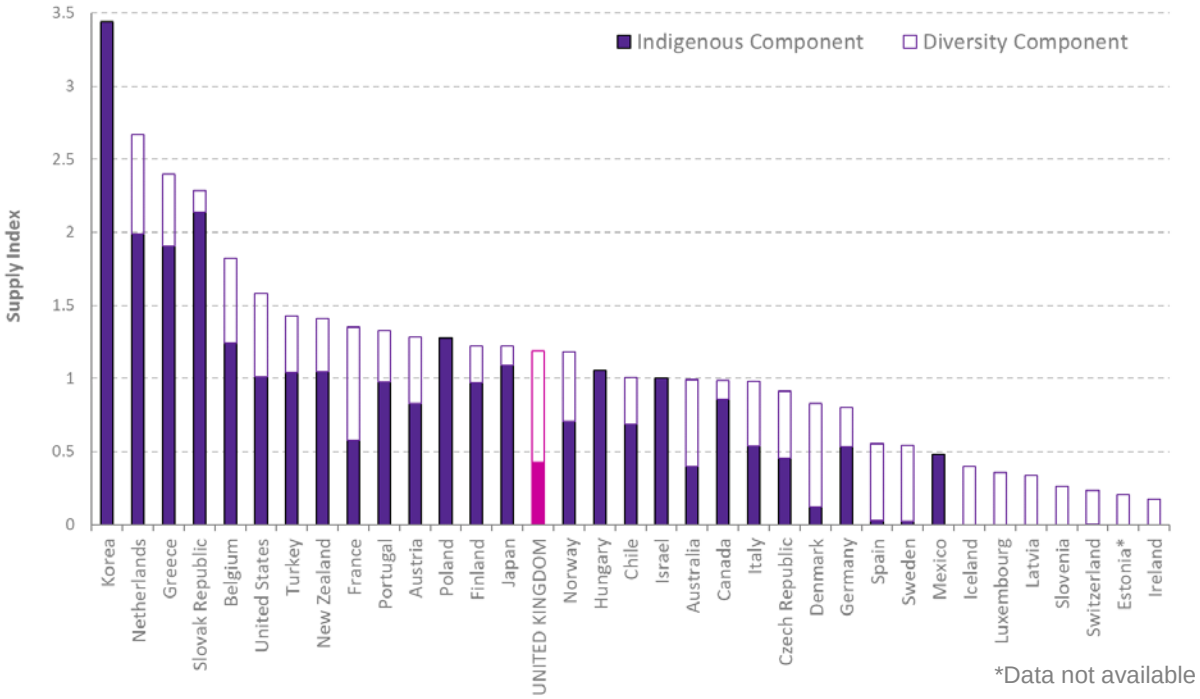
Chart 5 shows that, with a score of 0.43, the UK was below both the self-sufficient threshold of 1 and the OECD average 0.76 for jet fuel. However the UK's import diversity score of 0.76 was more than double the average for all OECD countries (of 0.35) and was the second highest of all OECD countries.

Chart 5: Diversity and self-sufficiency of jet fuel for OECD countries, 2017



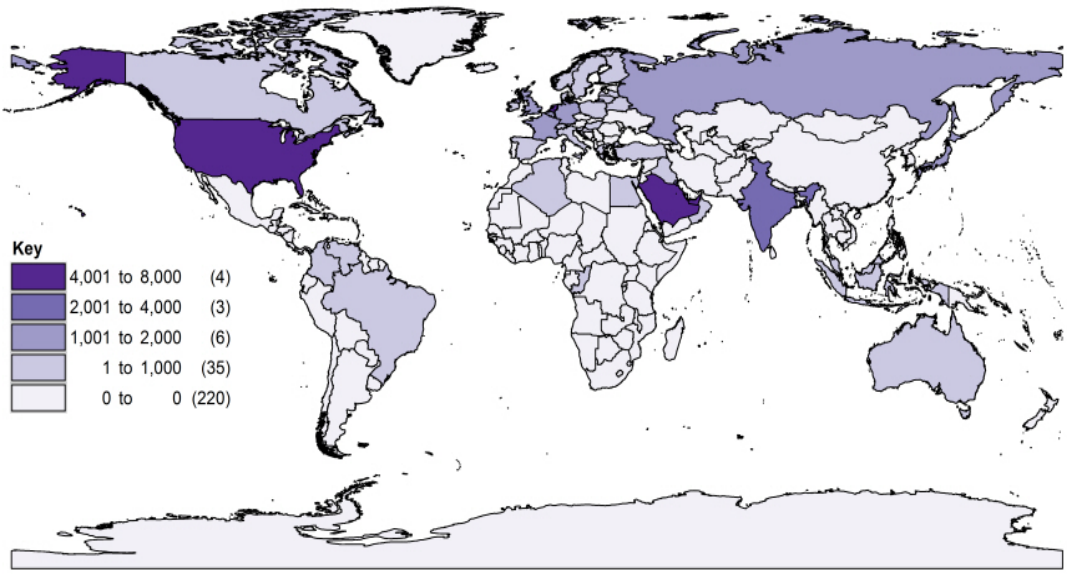
Many OECD countries have significant production capacity of jet fuel. For instance Korea produces more than three times its demand and doesn't require any imports. The UK's capacity to meet its demand through indigenous production is low; in 2017 the UK met less than half of its demand, one of the largest deficits in the OECD. However Heathrow (being the busiest airport in Europe), contributed to the UK having the second highest demand for jet fuel, behind only the United States. Despite only having the ability to meet 43 per cent of demand, the UK was 7th out of the 35 countries for total production of jet fuel and in addition the low self-sufficiency score was compensated by having the second most diverse and stable import sources within the OECD - as seen in Chart 6.

Chart 6: Security of supply of jet fuel for OECD countries, 2017



Jet fuel is only exported in significant quantities from a few countries around the world with Korea, the Netherlands, the United Arab Emirates, the United States and Saudi Arabia exporting the most. The Netherlands is a trading hub for many oil products, with large amounts of imports 're-exported' and not used for the country's own consumption. Europe exports relatively small amounts of jet fuel (excluding the Netherlands), as does Canada and North Africa.

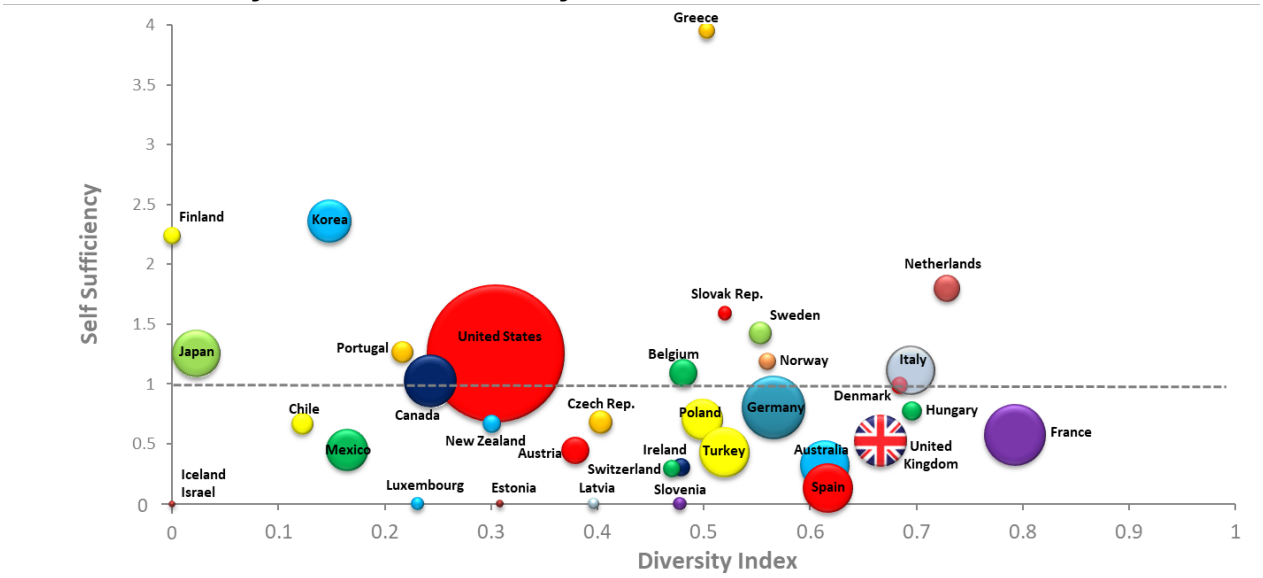
Map 3: Worldwide Jet Fuel Exports (kt), 2017



Diesel Road Fuel

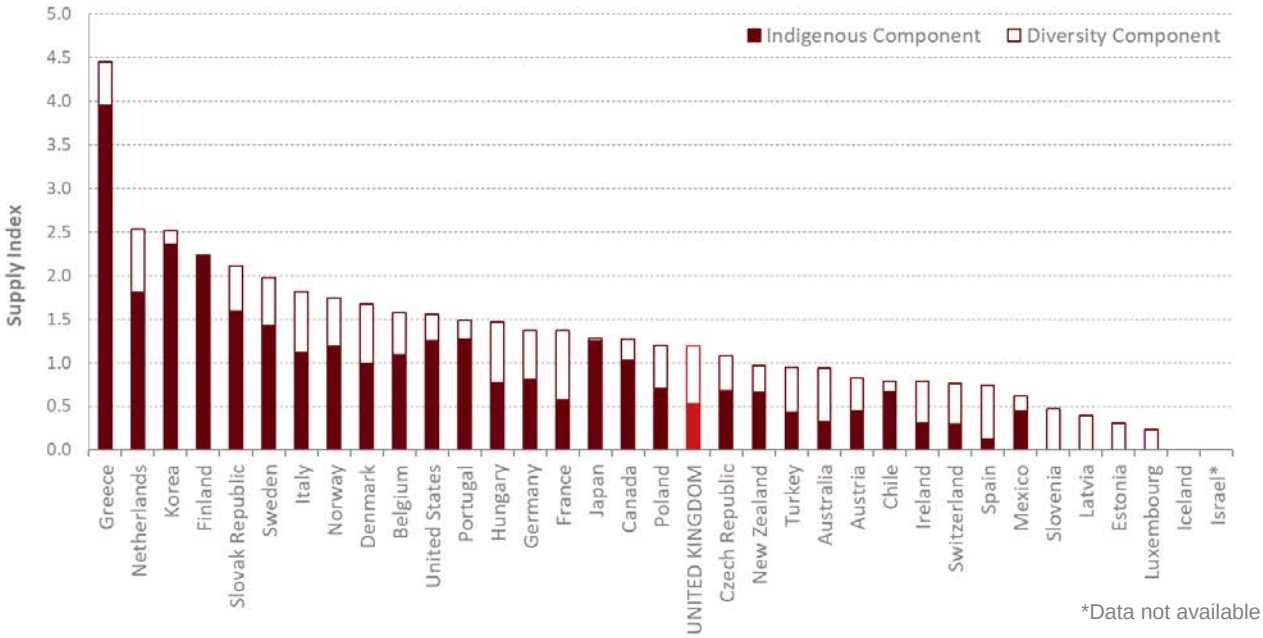
At 0.53 on the self-sufficiency axis the UK was below the average OECD self-sufficiency score of 0.87 in 2017, producing just over half of the diesel it consumed. However the UK is in a favourable position in terms of diversity and political stability of imports; the UK's diversity score of 0.67 was higher than the OECD average of 0.41 (Chart 7) and was the sixth highest out of all 35 OECD countries.

Chart 7: Diversity and self-sufficiency of diesel for OECD countries, 2017



The majority of countries either met demand through indigenous production or by a combination of production and diverse imports. The profile depicts how the UK's security of supply score was around the middle value of all of the OECD countries' scores (Chart 8).

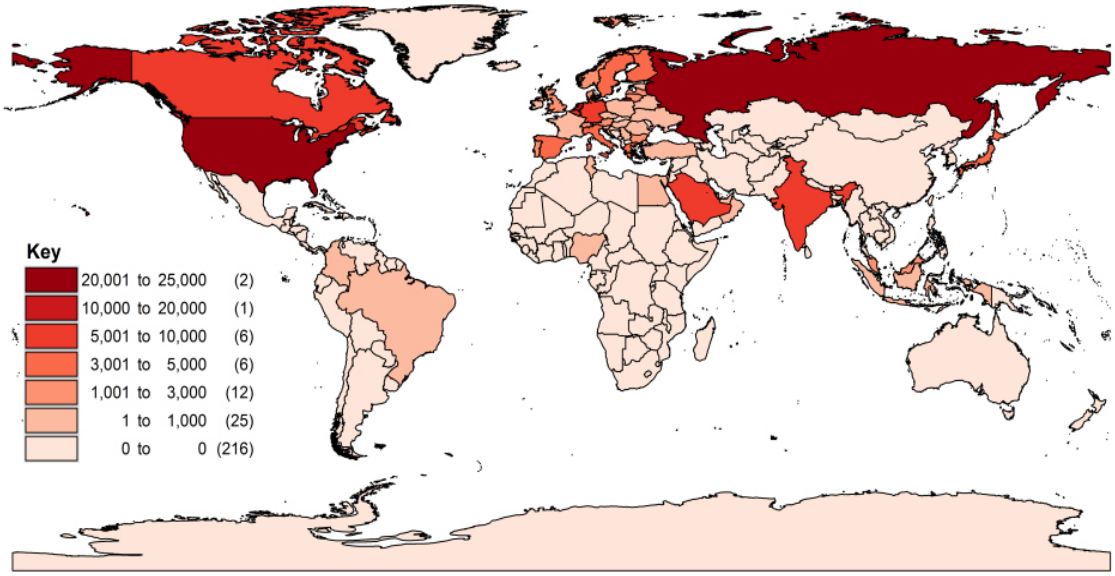
Chart 8: Security of supply of diesel for OECD countries, 2017



*Data not available

Map 4 shows that the United States and Russia are the most significant exporters of diesel. There are limited quantities of exports from Asia and South America, with Europe and Canada exporting diesel in moderate quantities. The UK was the 13th largest exporter out of all 35 OECD countries.

Map 4: Worldwide Diesel Exports (kt), 2017



Summary

Self-Sufficiency and Import Diversity of OECD Countries in 2017

The overall picture of diversity of supply for oil and oil products reflects a higher security of supply for oil products than for crude oil, primarily driven by higher levels of indigenous production for oil products than for crude itself. With an average self-sufficiency score of 0.43, OECD countries are very much dependent on imports of crude oil to meet refinery demand, compared to average scores of 1.29, 0.76 and 0.87 for motor gasoline, jet fuel and diesel respectively. This is reflected in the fact that crude oil has the second highest average diversity score out of all products for imports into OECD countries. This is possibly also due to the wide variety of crude products that are available on the market, creating a need to import from a diverse range of sources. Although average self-sufficiency scores for transport fuels were much higher, these scores are dependent on refining crude oil, and as such indigenous production of these products cannot be decoupled easily from crude oil security of supply.

Total motor gasoline production was 4 per cent lower than consumption in OECD countries. However, 17 of these 35 countries were self-sufficient; particularly notable were Norway, Belgium and Finland, producing much higher quantities than the amounts they consumed. With an average self-sufficiency score of 1.29 and an import diversity score of 0.37, motor gasoline production in the OECD as a whole did not meet demand due to a small quantity of countries with little to no production. Despite this, motor gasoline was still the highest scoring oil product in our simplified security of supply index due to the contribution of indigenous production.

Diesel consumption across the OECD is around 3 per cent higher than production, with an average self-sufficiency score of 0.87. Just over a third of OECD countries were self-sufficient in 2017, with Greece producing nearly four times the amount it consumed. These comparatively robust self-sufficiency scores along with a diversity and political stability score of 0.41, makes diesel the oil product with the second highest security of supply score, according to our simplified index.

Jet fuel imports had an average diversity score of 0.35 amongst OECD countries. This being the lowest diversity score out of the four products, combined with a comparatively low self-sufficiency

score of 0.76, put jet fuel as the second lowest scoring oil product in our simplified security of supply index, only ahead of crude oil. However the UK, along with a number of north-western European countries, scored much higher than average on the diversity index suggesting that a number of countries have taken steps to maximise the diversity and political stability of jet fuel imports.

Self-Sufficiency and Import Diversity of the UK in 2017

The UK compares well with other OECD countries for both self-sufficiency and diversity, scoring slightly better for diversity by ranking second for jet fuel and motor gasoline, sixth for diesel, and in the top third for crude oil. The UK could meet around 80 per cent of its crude oil consumption via indigenous production and ranks fifth out of all OECD countries for self-sufficiency. The UK more than meets its needs for motor gasoline from indigenous production, being dependant on its offshore fields and the production profiles of its refineries to meet motor gasoline demand. Conversely, the UK relies on imports to meets its requirements for jet fuel and road diesel because its refineries do not produce sufficient volumes to meet increasing demand.

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Appendix 1 – Provisional Data for 2017

	Crude Oil			Motor Spirit			Jet Fuel			Diesel Road Fuel		
	Diversity plus Political Stability	Self sufficiency	Demand (KT)	Diversity plus Political Stability	Self sufficiency	Demand (KT)	Diversity plus Political Stability	Self sufficiency	Demand (KT)	Diversity plus Political Stability	Self sufficiency	Demand (KT)
Australia	0.84	0.67	19,289	0.46	0.60	13,475	0.60	0.40	7,036	0.61	0.32	22,779
Austria	0.45	0.09	8,102	0.32	**1.04**	1,606	0.45	0.83	738	0.38	0.44	6,940
Belgium	0.56	0.00	34,090	0.66	3.00	1,537	0.58	**1.24**	1,564	0.48	**1.09**	6,983
Canada	0.50	**2.78**	61,406	0.64	0.91	36,114	0.13	0.86	6,448	0.24	**1.02**	25,768
Chile	0.30	0.02	8,901	0.10	0.89	3,442	0.32	0.69	857	0.12	0.67	4,171
Czech Republic	0.34	0.01	7,877	0.37	0.95	1,600	0.46	0.45	396	0.40	0.68	4,822
Denmark	0.28	0.90	7,509	0.41	**1.78**	1,264	0.71	0.12	1,021	0.68	0.99	2,508
Estonia	0.00	0.00	0	0.37	0.00	264	0.21	0.00	28	0.31	-	482
Finland	0.23	0.00	12,035	0.00	**2.96**	1,491	0.25	0.97	773	-	**2.24**	2,625
France	0.77	0.01	57,142	0.68	**1.47**	7,852	0.77	0.58	7,348	0.79	0.58	35,294
Germany	0.69	0.02	93,154	0.64	**1.07**	18,447	0.27	0.54	9,968	0.57	0.80	37,322
Greece	0.40	0.01	24,032	0.04	**2.25**	2,350	0.49	**1.91**	1,275	0.50	**3.95**	2,324
Hungary	0.11	0.11	6,532	0.46	0.75	1,365	0.00	**1.05**	224	0.70	0.77	3,361
Iceland	0.00	0.00	0	0.00	0.00	143	0.40	0.00	335	-	-	362
Ireland	0.39	0.00	3,183	0.36	0.61	896	0.17	0.00	969	0.48	0.30	2,956
Israel	0.00	0.01	11,700	0.00	0.98	3,234	0.00	**1.00**	856	-	-	-
Italy	0.71	0.06	69,318	0.40	**2.22**	6,773	0.45	0.54	4,539	0.69	**1.12**	22,593
Japan	0.70	0.00	154,991	0.08	**1.04**	37,755	0.13	**1.09**	10,556	0.02	**1.25**	21,003
Korea	0.77	0.00	150,605	0.21	**1.92**	9,360	0.00	**3.44**	6,360	0.15	**2.36**	17,691
Latvia	0.00	0.00	0	0.31	0.00	192	0.34	0.00	133	0.40	-	1,132
Luxembourg	0.00	0.00	0	0.22	0.00	314	0.36	0.00	560	0.23	-	1,624
Mexico	0.00	**2.55**	39,491	0.26	0.31	34,311	0.00	0.48	3,905	0.16	0.45	16,181
Netherlands	0.58	0.02	53,371	0.62	0.80	4,034	0.68	**1.99**	3,885	0.73	**1.80**	6,588
New Zealand	0.54	0.26	5,367	0.26	0.55	2,401	0.37	**1.04**	1,169	0.30	0.66	2,927
Norway	0.60	**6.03**	13,039	0.48	**4.50**	836	0.48	0.71	958	0.56	**1.19**	2,581
Poland	0.28	0.04	25,138	0.48	0.89	4,382	0.00	**1.28**	853	0.50	0.70	15,820
Portugal	0.69	0.00	14,246	0.19	**2.58**	1,054	0.35	0.98	1,415	0.22	**1.27**	4,327
Slovak Republic	0.03	0.00	5,558	0.35	**2.27**	626	0.15	**2.14**	36	0.52	**1.59**	1,715
Slovenia	-	0.00	0	0.58	0.00	413	0.27	0.00	24	0.48	-	1,458
Spain	0.79	0.00	65,978	0.62	**1.88**	4,831	0.52	0.03	6,413	0.62	0.13	23,054
Sweden	0.54	0.00	19,495	0.58	**2.04**	2,296	0.53	0.02	1,044	0.55	**1.42**	4,843
Switzerland	0.30	0.00	2,851	0.31	0.27	2,375	0.23	0.00	1,754	0.47	0.29	2,803
Turkey	0.41	0.09	27,271	0.00	**2.34**	2,292	0.39	**1.04**	4,648	0.52	0.43	23,507
UK	0.61	0.81	53,261	0.78	**1.41**	12,353	0.76	0.43	11,782	0.67	0.53	25,537
US	0.67	0.56	818,460	0.83	0.90	394,718	0.57	**1.01**	77,435	0.30	**1.25**	178,948
OECD Average	0.40	0.43	53,525	0.37	**1.29**	17,611	0.35	0.76	5,066	0.41	0.87	14,777

Source: IEA (http://data.iea.org/)

Items in **bold** highlight those countries where indigenous capacity exceeded domestic consumption.

Appendix 2 – Methodology

Data for crude oil and transport fuel self-sufficiency

Data for crude oil, motor gasoline and jet fuel were extracted from the IEA database. For diesel, data were provided on request from the IEA. Self-sufficiency was determined from data on indigenous production and consumption (production (kt) ÷ consumption (kt)).

Crude oil and transport fuel diversity indices

The diversity index used here is a product of a standard diversity index and an index for political stability. As a basic index for measuring diversity, we used the Shannon-Wiener diversity index. The Shannon-Wiener index is of the form:

$$\sum_{i=1}^{n} -x_i \ln(x_i)$$

Where x is the proportion of total fuel supply represented by the i^{th} source country and n represents the final source country. A value below 1 signifies a country that is dependent on a small range of import sources, a value above 2 represents a country with a wide range of import sources. The minimum value of zero denotes a country that has one imported fuel source or relies entirely on indigenous production.

A previous comparative study on import diversities in Energy Trends March 2011 used the Herfindahl Index as the basic diversity index. Although both of these indices have their advantages, the Shannon-Wiener was chosen here as this represents the data with less skew, as well as placing more weight on the diversity of contributions from smaller countries and lessening the impact of larger nations.

Political stability was determined using data from the World Bank worldwide governance indicators. Specifically, the index reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. These data were standardised between 0 and 1.
Source: **World Bank** (http://info.worldbank.org/governance/wgi/index.aspx#home)

Once Shannon-Wiener and political stability indices were determined, these were multiplied and summed:

$$\sum_{i=1}^{n} -x_i \ln(x_i)\, b_i$$

Where b is an index of political stability of producing country. This is called the SWNI (Shannon-Weiner-Neumann index), in line with previous work.

Each SWNI index was normalised for each petroleum product between 0 and 1, in order to have a standardised index. This was done by working out a maximum diversity score, by assuming maximum diversity was equivalent to importing products in line with proportional contributions of exporting countries (e.g. if a single country were responsible for exporting 50 per cent of all product, and five other countries were responsible for 10 per cent each, we assumed maximum import diversity at a ratio of 5:1:1:1:1:1). This maximum diversity score then acted as our upper score of 1, with all other scores divided by this maximum to standardise the data.

Competition in gas supply

Introduction

This article describes the number of companies operating, the market concentrations of the domestic, commercial and industrial markets, and data on the size of the companies operating.

Key points

- The total number of companies supplying over 1,750 GWh has increased from 17 in 2009 to 30 in 2017, with the number supplying the domestic market increasing to 15.
- The market concentration of the domestic market has decreased, driven by smaller companies taking an increasing percentage of the market share. In contrast the commercial and industrial sectors saw an increase in concentration, with the largest companies taking a larger market share.
- Overall the total market share of the largest companies has continued to decrease, with the market share of the top 9 suppliers decreasing from 82.5 per cent in 2013 to 74.4 per cent in 2017.

Background to changes in the gas market

Three-quarters of the non-domestic market for gas (customers with demand above 25,000 therms per year) was effectively opened up to competition at the end of 1986. Most of the remainder (between 2,500 and 25,000 therms a year) was opened up in August 1992. The domestic market was opened for competition in between April 1996 and May 1998, with large increases in the number of gas suppliers up to 2000.

There are effectively four competitive sectors - sales to the electricity generators, the industrial sector, the commercial sector and the domestic sector.

Competition for electricity generation cannot be calculated accurately due to complexities associated with this sector. BEIS collect data on final sales from gas companies; companies who generate electricity from gas are often the same companies who trade gas, therefore at the point of sale, sellers do not know the proportion of gas sold which will be used for generation and that which will be traded on. As such data for electricity generation competition are not presented here.

Number of companies supplying gas at least 1,750 GWh of gas

The table below shows the number of companies supplying gas to final consumption in the domestic, commercial and industrial sectors. The table shows only those companies supplying at least 1,750 GWh of gas to each respective sectors. [1]

Table 1: Number of companies supplying gas

	2000	2002	2004	2006	2008	2010	2012	2013	2014	2015	2016	2017
Domestic sector	14	12	7	6	6	7	7	8	9	12	12	15
Commercial sector	10	10	10	7	6	8	8	9	8	9	12	11
Industrial sector	15	15	10	9	8	8	7	10	11	12	12	12

(1) Companies can supply into more than one market and are counted in each market they supply. Companies who supply less than 1,750 GWh within each sector are excluded. In August 2017 Ofgem data indicate that 179 suppliers were licensed to supply gas to domestic customers but some suppliers have more than one supply licence and own or part own more than one supply company.

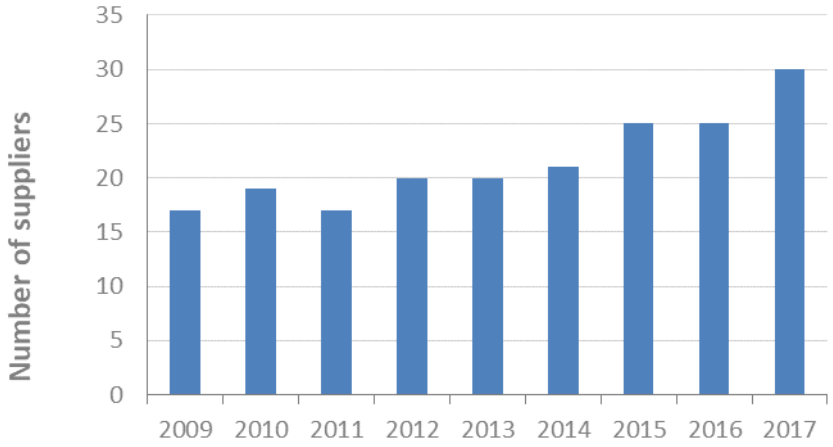
The data indicate that the number of companies supplying gas above the threshold of 1,750 GWh has increased in the domestic sector in 2017, with the Industrial sectors remaining the same and the commercial sector seeing a decrease.

[1] This represents a methodological change from previous data shown in Energy Sector Indicators where the cut-off was previously 0.25 per cent of the market share for each market. The methodological change brings the table in line with the collection methodology used by BEIS.

Number of large and small suppliers in the market

New suppliers are continuing to enter the market at an increasing rate. Ofgem data indicates that 15 new licensed suppliers became active in the domestic segment during 2017. Chart 1 shows the number of companies supplying more than 1,750GWh a year of gas, (excluding gas to electricity generation) and indicates a generally sustained pattern of increase from 17 in 2009 to 30 in 2017.

Chart 1: Total number of companies supplying over 1,750GWh of gas, 2009 to 2017



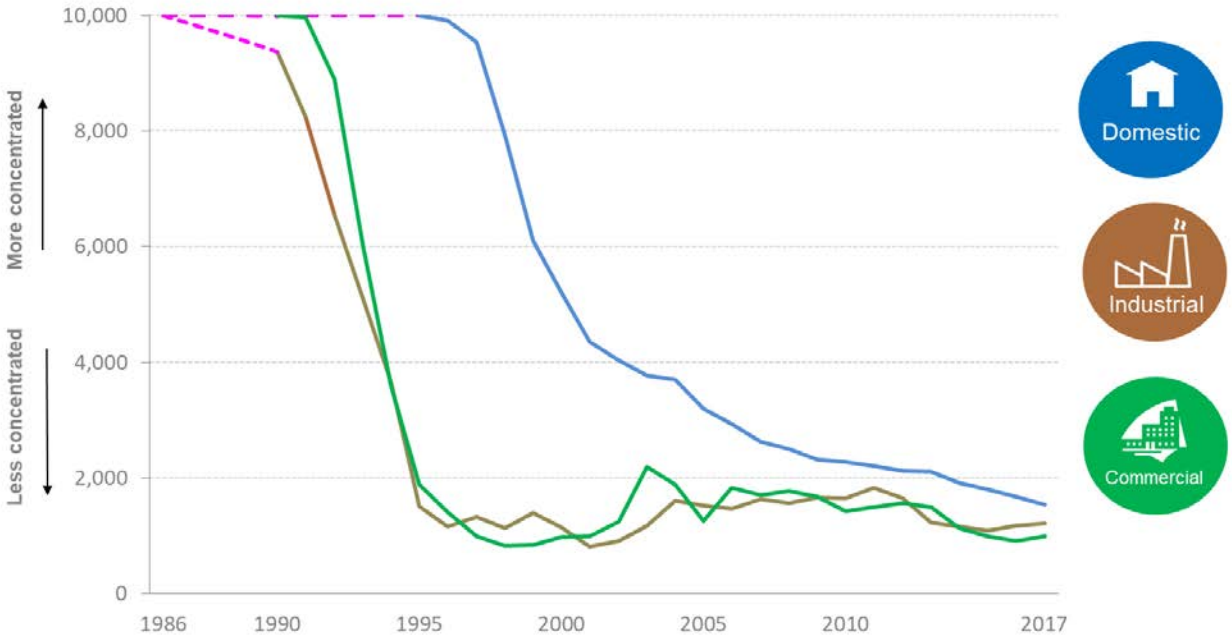
In addition, smaller suppliers continue to enter the market. BEIS collects information from companies licenced to supply gas through two surveys, one a mandatory return for companies supplying more than 1,750 GWh a year of gas (~ 0.5 per cent of final consumption), the other a voluntary return for companies supplying less than that threshold. Return rates for the survey of companies over the 1,750 GWh threshold is 100 per cent, whilst the return rate for smaller companies under than threshold was 43 per cent in 2017. In 2017 there were 65 small gas suppliers who returned data compared with 8 returns in 2009. The increase has been broadly steady over that period but differences in survey completion rates will affect this.

Competition in gas sales to the domestic, commercial and industrial sectors, 1986 to 2017

Continuing the trend of recent years, the domestic market has seen the market concentrations decrease in comparison to 2016. This is due to the increasing number of small suppliers joining the market, and taking a larger part of the market share. In contrast the industrial and commercial market concentration has increased over the last 12 months.

Chart 2 shows the market concentration as expressed through the Herfindahl-Hirschman index, one of the standard metrics for analysing concentration. In the chart higher numbers show more concentration and lower numbers indicate a more diverse market.

Chart 2: Herfindahl-Hirschman Index for market concentration, 1986 to 2017



Since 2011 the market concentration has consistently decreased in all three sectors, as smaller companies joined the markets. In 2017 this pattern continued for the domestic market, but the industrial and commercial markets saw small increases in concentration, the first increase for the commercial sector since 2012.

The domestic market has become less concentrated due to increasing number of small suppliers taking an increasing percentage of the market share. In 2017 the total number of companies supplying gas to the market was 43, up from 36 in 2016. Table 1 shows that the number of companies who supplied more than 1,750 GWh has increased to 15 in 2017; this figure has been generally increasing since 2008 as new companies take an increasing market share.

The commercial market has seen the number of companies supplying more than 1,750 GWh fall to 11, from 12 in 2016 (see Table 1). This, coupled with the fact that the number of smaller companies in the commercial market has remained the same (35 companies in total supplying the market in 2016 and 2017), has led to the market becoming slightly more concentrated.

Similarly the industrial market has become more concentrated in 2017, the second year on year rise, despite the fact that the number of suppliers over the threshold (12) has remained stable on last year. The largest companies have continued to take a larger market share as the total number of companies supplying gas to the market has fallen slightly to 26 in 2017 from 27 in 2016.

Gas supplied to all consumers by aggregated shares.

Table 2 shows how the market shares of the largest companies have changed over the last 5 years, with the largest losing market share to the medium sized and smaller companies. In 2013 the top 9 accounted for 82.5 per cent of the market, which is down to 74.4 per cent in 2017. Figures are based on total gas supplied excluding gas for electricity generation.

Table 2: Gas supplied to all consumers by aggregated shares.

	Market share (%)				
Gas suppliers	2013	2014	2015	2016	2017
Aggregated share of top 3 suppliers	46.2	44.4	42.9	40.8	37.5
Aggregated share of next 3 suppliers	21.4	21.1	20.9	20.5	21.1
Aggregated share of next 3 suppliers	14.9	14.9	14.0	15.4	15.8
Aggregated share of top 9 suppliers	**82.5**	**80.4**	**77.9**	**76.7**	**74.4**
Other suppliers	17.5	19.6	22.1	23.3	25.6

Herfindahl-Hirschman

The Herfindahl-Hirschman measure attempts to measure market concentration. It places extra emphasis on the contributions of participants with the largest shares. The measure is commonly used to assess whether mergers should go ahead and whether they will significantly affect the balance of the market in a particular sector.

It is expressed by the following equation:
Herfindahl-Hirschman measure = the square of each participant's market share added together across all participants in the market

Values vary between zero, which signifies a perfectly competitive industry, and ten thousand, for a pure monopoly.

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Competition in UK electricity markets

Introduction

This article includes information relating to competition in the UK electricity market, formerly published as part of UK Energy Sector Indicators. The article examines the two parts of the industry where there is competition for provision: generation and sales. For both markets, the article describes the number of companies operating, and the market concentrations. The Herfindahl-Hirschman measure (see explanation at the end of this article) is used to provide the market concentration as it provides extra emphasis on the contribution of participants with the largest shares. For electricity sales, this article covers the major suppliers surveyed by BEIS comprising approximately 95% of the market.

Key points

- Major electricity suppliers[(1)] increased in number from 16 in 1989 before privatisation to 47 in 2017. In 2017, BEIS surveyed 12 new small suppliers to maintain coverage of the fragmented market, with one company discontinuing supply.
- Since 2010, electricity market concentration has slowly declined year-on-year across the domestic, commercial and industrial sectors, as more companies entered the market.
- The market share of smaller suppliers (outside the top nine) rose from 4.0 per cent in 2010 to 15.3 per cent in 2017, as new and smaller suppliers took market share from the large companies.
- Major power producers (MPPs) increased in number from 6 in 1989 to 54 in 2017.
- The top nine MPPs' share of generation decreased from 87 per cent in 2012 to 76 per cent in 2017. Their share of capacity decreased from 82 per cent in 2012 to 69 per cent in 2017 as new smaller generators entered the market.

Background to changes in the electricity market

Electricity generation

Following the restructuring of the electricity supply industry in 1990, the former nationalised companies were classified as major generating companies to distinguish them from autogenerators and the new companies set up to generate electricity. However, over the next few years, some new independent companies were beginning to make significant contribution to the electricity supply and therefore a new terminology "Major Power Producers" (MPPs) was introduced to signify those companies whose prime purpose is the generation of electricity. The breakup of the nationalised power suppliers into smaller privatised companies immediately increased market competitiveness, with new companies beginning to build their own Combined Cycle Gas Turbine (CCGT) stations from 1992. Major wind farm companies and major solar photovoltaic (PV) operators are now also included in the MPP definition.

Electricity supply

Competition was introduced to the electricity markets in three phases. First the upper tier of the non-domestic market (customers with a maximum demand of over 1 MW, comprising 30 per cent of the market) was opened to competition in March 1990. Next, the 100 kW to 1 MW tier (15 per cent of the market) was opened to competition in April 1994. Full competition for the remaining 55 per cent of the market (below 100 kW peak load) was introduced in stages between September 1998 and June 1999. This final phase covered domestic consumers who account for over a third of electricity consumed in the UK.

Competition in electricity sales

The number of electricity suppliers[(1)] rapidly increased, from 16 before privatisation in 1989 to an early peak of 32 in 2004. The number of companies reduced from 2004 to 2010 (23 companies), as despite new market entrants, other companies were either taken over or bought additional power stations to add to their portfolios. After 2010, the number of companies increased again, reaching their highest levels in 2017 of 47 companies. This was a net increase of 11 companies

(1) In this article electricity supplier refers to major suppliers surveyed by BEIS, covering approximately 95% of all UK electricity sales in 2017. Please see the BEIS Electricity statistics data sources and methodologies for more details.

from 2017, and reflects new market entrants and that BEIS engaged with new and smaller companies, to maintain coverage as the sales market fragments.

The number of companies supplying electricity to each sector is given for selected years between 1996 and 2017 in Table 1 (see overleaf).

Table 1: Number of companies supplying electricity (1)

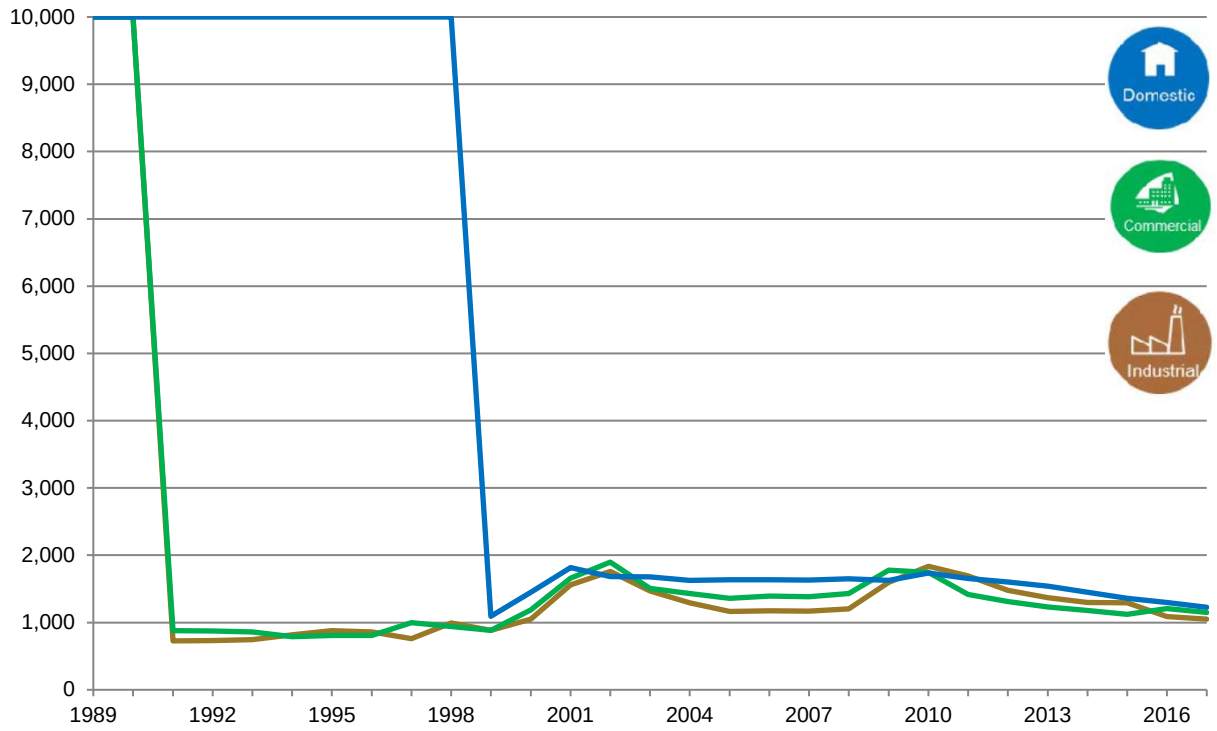
	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016	2017
Domestic Sector	1	1	11	7	11	10	11	13	17	23	20	32
Commercial Sector	17	16	14	14	18	15	15	15	21	28	27r	32
Industrial Sector	18	22	20	18	30	22	20	20	24	27	27r	26
Total	18	22	22	21	32	26	23	23	29	34	36	47

(1) Companies can supply into more than one market and are counted in each market they supply to.
Source: BEIS
(r) shows a revision to the data

In 2017, the 12 new electricity suppliers surveyed by BEIS all sold to the domestic sector, increasing the domestic total to 32. Six of these companies also supplied the commercial sector, increasing the net total to 32. None of the newly surveyed 2017 suppliers served the industrial sector. Across all sectors, there were 47 companies selling electricity in 2017; this is an increase of 24 compared to 2010. Although individually these new companies do not supply large amounts, the growth in the number and size of these new companies over the last 10 years is resulting in a decrease to market concentration.

Chart 1 below shows the market concentration as expressed through the Herfindahl-Hirschman Index. In the chart, higher numbers show more concentration while lower numbers indicate a more diverse market.

Chart 1: Herfindahl-Hirschman Index for electricity sales market concentration, 1989 to 2017



There was an initial sharp decrease in market concentration following privatisation, then a rise between 1998 and 2002, mainly due to a spate of mergers. The market concentration subsequently fell and stabilised between 2003 and 2008, as the number of industrial and commercial suppliers increased. In 2009 and 2010, market concentration increased again, as several closures reduced the number of market participants. Since 2010, electricity market concentration has declined annually across all sectors, as the market became more competitive; the largest concentration decreases occurred in 2012 and 2016. In 2017, the index fell further across all sectors and for each was at similar level to in 2000. This downward trend in market concentration resulted from increasing numbers of smaller suppliers entering the market and reducing the market share of bigger companies.

The domestic market was a regional monopoly before 1998, dominated by the Regional Electricity Company (REC). Following a decrease in market concentration in 1999 as domestic sales became more competitive, concentration rose until 2002 due to mergers between former RECs, and with other suppliers/generators. Similarly, market concentration rose for industrial and commercial sales over the same period. Between 2002 and 2009, the Herfindahl-Hirschman Index for the domestic sector was broadly stable. In 2010 the index increased, though subsequently the index has decreased annually. In 2017, the index fell to 1,226 – the lowest level since 1999 – reflecting the share of new entrants to the market.

The commercial market had 19 electricity suppliers in 2004/05 but this fell to 15 in 2010, causing an increase in market concentration. Since 2010, there has been a downwards trend in market concentration, as the number of commercial electricity suppliers grew. With 26 industrial electricity suppliers in 2017, the industrial market was less concentrated than in 2010, when there were 20 industrial electricity suppliers.

Electricity supplied to all consumers by aggregated shares.

Table 2 shows how the market share of the largest companies have changed since 2010. The market share of the top nine suppliers peaked in 2009 and 2010, but since has steadily fallen to 84.7 per cent in 2017. Between 2016 and 2017, the aggregated share of the top six suppliers fell a further 1.8 percentage points from 74.8 per cent to 73.0 per cent. When compared to 2010, the aggregated top six share for 2017 is 14.3 percentage points lower.

As the number of companies supplying electricity has increased, as evidenced in Table 1, the share of these suppliers outside the top nine has grown. The share of those outside of the top nine rose from 4.0 per cent in 2010 to 15.3 per cent in 2017. This reflects the fragmentation of the market from new entrants taking market share from the larger companies. This increase in share of suppliers outside the top nine further reflects the reduced market concentration as evidenced by the Herfindahl-Hirschman Index in Chart 1.

Table 2: Percentage of total electricity supplied to all consumers

	Market Share (%)							
Electricity Suppliers	2010	2011	2012	2013	2014r	2015	2016r	2017
Aggregated share of top 3 suppliers	50.9%	48.9%	47.2%	46.3%	47.4%r	45.1%	42.5%r	41.9%
Aggregated share of next 3 suppliers	36.4%	35.2%	36.7%	35.4%	33.5%r	32.7%	32.3%r	31.1%
Aggregated share of next 3 suppliers	8.8%	8.5%	8.0%	8.1%	8.9%r	10.1%	10.8%r	11.7%
Aggregated share of top 9 suppliers	**96.0%**	**92.6%**	**91.8%**	**89.8%**	**89.8%r**	**87.8%**	**85.6%r**	**84.7%**
Other suppliers	4.0%	7.4%	8.2%	10.2%	10.2%r	12.2%	14.4%r	15.3%

Source: BEIS
(r) shows a revision to the data

Electricity generation competition

Table 3 shows the number of companies that are counted as MPPs. The number of companies increased rapidly, from six before privatisation up to an early peak of 36 in 2001, before mergers caused numbers to fall back to 29 in 2006. Starting in 2007, several renewable generators were reclassified as MPPs, which led to an increase in the number of MPPs to 34, which remained stable to 2009. Since 2010, the number of MPPs has steadily increased as new generators began operations and reached a new peak in 2017 of 54.

Table 3: Number of Major Power Producers

Year	Number	Year	Number	Number producing at least 5% of total generation
1989	6	2001	36	6
1990	6	2002	36	7
1991	11	2003	34	6
1992	14	2004	32	7
1993	20	2005	30	7
1994	23	2006	29	7
1995	25	2007	34	8
1996	26	2008	34	9
1997	27	2009	34	8
1998	29	2010	39	8
1999	30	2011	41	7
2000	34	2012	44	7
		2013	44	7
		2014	47	7
		2015	53	6r
		2016	52r	5r
		2017	54	4

Source: BEIS
(r) shows a revision to the data

Table 4 shows the MPPs aggregated share of generation and aggregated share of capacity for 2012 to 2017. The market share of the top 9 generators in this period peaked in 2013 at 86.7 per cent but subsequently declined to 75.8 per cent in 2017, as new companies entered the market and reduced the share of total generation that the top 9 companies produced. The top 9 generators held a lower share of capacity (69.2 per cent in 2017) compared to generation. This indicates a greater proportion of their generation is from non-renewable sources, which have higher load factors i.e. they operate closer to full capacity.

Table 4: Percentage of total generation and total capacity by Major Power Producers

	Share in Generation (%)						Share in Capacity (%) (1)					
	2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017
Aggregated share of top 3 companies	51.7	50.9	48.5	48.6	48.9r	51.6	46.7	41.9	43.5	32.5	32.4	36.3
Aggregated share of next 3 companies	23.8	24.0	25.6	21.6	15.5	15.0	23.4	24.9	24.2	27.8	18.1	22.2
Aggregated share of next 3 companies	11.1	11.8	10.7	12.7	12.1r	9.1	12.1	12.6	13.1	15.2	14.6	10.7
Aggregated share of top 9 companies	**86.6**	**86.7**	**84.8**	**83.0**	**76.5r**	**75.8**	**82.2**	**79.4**	**80.9**	**75.5**	**65.1**	**69.2**
Other major power producers	13.4	13.3	15.2	17.0	23.5r	24.2	17.8	20.6	19.1	24.5	34.9	30.8

(1) Of the same companies in each band in generation terms
Source: BEIS
(r) shows a revision to the data

User feedback

We welcome all feedback from users; therefore, if you have any comments or queries regarding this analysis, please contact either Helene Clark or Chrissie Frankland using the contact details below.

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Herfindahl-Hirschman

The Herfindahl-Hirschman measure attempts to measure market concentration. It places extra emphasis on the contributions of participants with the largest shares. The measure is commonly used to assess whether mergers should go ahead and whether they will significantly affect the balance of the market in a particular sector.

It is expressed by the following equation: Herfindahl-Hirschman measure = the square of each participant's market share added together across all participants in the market.

Values vary between zero, which signifies a perfectly competitive industry, and ten thousand, for a pure monopoly.

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 2017 (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: 2017 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	1,934	0	50,944	0	40,019	12,924	20,924	0	0	126,745	17,340	13.7%
Imports	5,807	712	58,480	36,722	45,132	3,475	0	1,562	0	151,891	3,728	2.5%
Exports	-369	-14	-42,040	-25,374	-10,802	-431	0	-293	0	-79,323	-525	0.7%
Marine bunkers	0	0	0	-2,596	0	0	0	0	0	-2,596	0	0%
Stock change	2,098	-2	361	-113	1,028	0	0	0	0	3,373	0	0%
Primary supply	9,470	696	67,746	8,639	75,377	15,969	20,924	1,269	0	200,090	20,543	10.3%
Statistical difference	-65	1	-66	-10	337	0	0	-35	0	163		
Primary demand	9,535	694	67,811	8,649	75,040	15,969	20,924	1,304	0	199,927	20,548	10.3%
Transfers	0	10	-2,476	2,483	224	-237	-5,801	5,801	0	4		
TRANSFORMATION	-8,134	379	-65,335	64,539	-27,182	-9,587	-15,124	23,071	1,592	-35,779	-4,929	-
Electricity generation	-5,559	-518	0	-533	-24,594	-9,387	-15,124	23,071	0	-32,645	-4,847	-
Heat generation	-4	-1	0	-52	-2,587	-200	0	0	1,592	-1,252	-81	-
Petroleum refineries	0	0	-65,795	65,691	0	0	0	0	0	-104	0	-
Coke manufacture	-1,435	1,351	0	0	0	0	0	0	0	-84	0	-
Blast furnaces	-989	-596	0	0	0	0	0	0	0	-1,585	0	-
Patent fuel manufacture	-146	143	0	-66	0	0	0	0	0	-69	0	-
Other	0	0	460	-501	0	0	0	0	0	-40	0	-
Energy industry use	0	458	0	4,315	4,903	0	0	2,041	322	12,040	672	-
Losses	0	109	0	0	580	0	0	2,283	0	2,972	712	-
FINAL CONSUMPTION	1,401	516	0	71,356	42,599	6,145	0	25,851	1,270	149,139	14,236	9.5%
Industries	972	296	0	4,308	8,677	1,162	0	7,964	692	24,071	3,620	15.0%
Transport	11	0	0	55,051	0	997	0	411	0	56,470	1,125	2.0%
Domestic	392	172	0	2,472	25,540	2,216	0	9,062	260	40,116	5,124	12.8%
Other Final Users	27	0	0	2,034	7,955	1,770	0	8,413	318	20,518	4,367	21.3%
Non energy use	0	48	0	7,490	426	0	0	0	0	7,964	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.

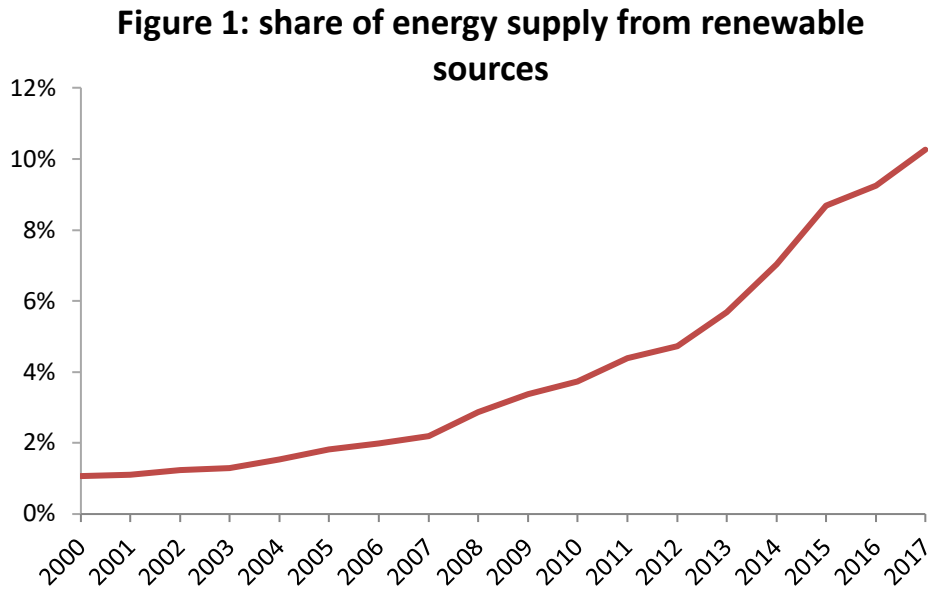
Table 2: Energy balance 2015 to 2017, showing proportion of renewables (ktoe)

	2015			2016			2017		
	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	124,481	14,158	11.4%	126,256	15,087	11.9%	126,745	17,340	13.7%
Imports	155,319	4,010	2.6%	150,077	4,021	2.7%	151,891	3,728	2.5%
Exports	-76,650	-407	0.5%	-75,774	-391	0.5%	-79,323	-525	0.7%
Marine bunkers	-2,684	0	0.0%	-2,840	0	0.0%	-2,596	0	0.0%
Stock change	3,911	0	0.0%	4,837	0	0.0%	3,373	0	0.0%
Primary supply	204,378	17,760	8.7%	202,557	18,717	9.2%	200,090	20,543	10.3%
Statistical difference	0			-127			163		
Primary demand	204,378	17,746	8.7%	202,684	18,711	9.2%	199,927	20,548	10.3%
Transfers	32			-14			4		
TRANSFORMATION	-41,425	-4,589	-	-37,423	-4,653	-	-35,779	-4,929	-
Electricity generation	-37,535	-4,513	-	-34,219	-4,577	-	-32,645	-4,847	-
Heat generation	-1,197	-75	-	-1,218	-76	-	-1,252	-81	-
Petroleum refineries	-152	0	-	-103	0	-	-104	0	-
Coke manufacture	-152	0	-	-81	0	-	-84	0	-
Blast furnaces	-2,277	0	-	-1,692	0	-	-1,585	0	-
Patent fuel manufacture	-68	0	-	-64	0	-	-69	0	-
Other	-44	0	-	-46	0	-	-40	0	-
Energy industry use	12,477	575	-	12,058	569	-	12,040	672	-
Losses	3,291	600	-	2,954	595	-	2,972	712	-
FINAL CONSUMPTION	147,217	11,982	8.1%	150,235	12,895	8.6%	149,139	14,236	9.5%
Industries	24,063	2,893	12.0%	23,700	3,158	13.3%	24,071	3,620	15.0%
Transport	55,013	1,097	2.0%	55,994	1,116	2.0%	56,470	1,125	2.0%
Domestic	40,297	4,484	11.1%	41,661	4,737	11.4%	40,116	5,124	12.8%
Other Final Users	19,987	3,508	17.6%	20,819	3,884	18.7%	20,518	4,367	21.3%
Non energy use	7,858			8,061			7,964		

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 10.3 per cent in 2017

Figure 1: share of energy supply from renewable sources



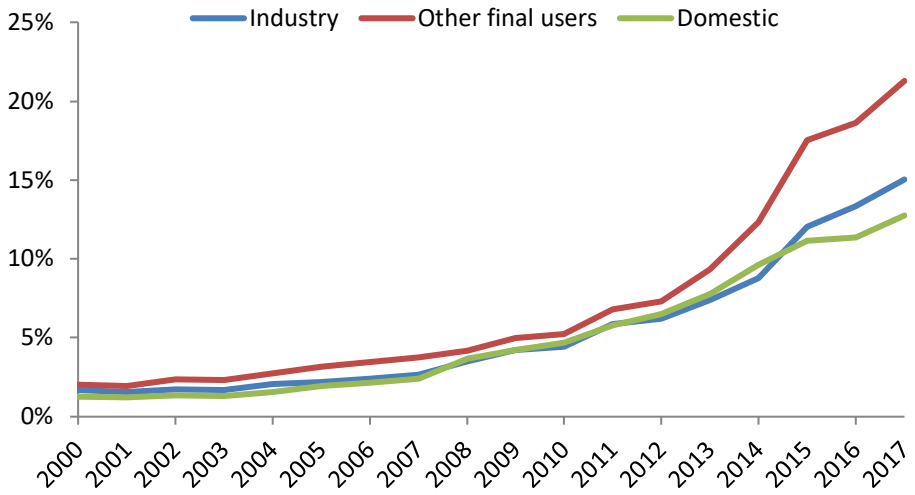
- This is in line with the 10.2 per cent progress against the RED as reported in DUKES 2018. As the two measures are calculated on a different basis, they do not match exactly.

- 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 21 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 three years, the proportion of renewables in the industrial sector has surpassed the domestic sector reaching 15 per cent in 2017. 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. The proportion of renewables in the "other final user" category remains the highest at 21 per cent.

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

	ktoe			Change (ktoe)	Change (%)
	2015	**2016**	**2017**	**2015-2017**	**2015-2017**
Hard Coals	1,380	1,107	972	-409	-30%
Man. Solid Fuels	510	314	296	-214	-42%
Petroleum Products	4,212	4,288	4,308	97	2%
Natural Gas	8,418	8,405	8,677	259	3%
Renewables	2,893	3,158	3,620	727	25%

Development of the statistics

As this is only the second 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:

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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 2017.

Table A.1. worked example (ktoe)

Fuel Source	Fossil	Renewable	Total
Coal	392	0	392
Manufactured Fuel	172	0	172
Petroleum	2,472	0	2,472
Natural Gas	25,459	81	25,540
Bioenergy	0	2,207	2,207
Electricity	6,242	2,820	9,062
Heat	244	17	260
Total	34,981	4,125	40,106
Proportion, of which renewables			**12.8%**

Notes for renewable data

Natural gas: BEIS estimate that 237 ktoe of biomethane was injected into the gas grid. If this biogas was consumed equally by all gas consumers, then 81 ktoe were consumed by the domestic sector.

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

Electricity: BEIS estimate 31.1 per cent of electricity supply was produced from renewables.

Heat: BEIS estimate that 6.5 per cent of heat sold was generated from renewables.

Recent and forthcoming publications of interest to users of energy statistics

Smart Meters quarterly statistics

This quarterly publication provides estimates of the number of Smart Meters installed and operating in homes and businesses in Great Britain. The latest release, covering estimates of the number of Smart Meters deployed up to the end of June 2018, was published on 30 August 2018 at: www.gov.uk/government/collections/smart-meters-statistics

Household Energy Efficiency statistics

This series presents statistics on the Energy Company Obligation (ECO), Green Deal and homes insulated. 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 latest release was published on 20 September 2018 at:
www.gov.uk/government/collections/household-energy-efficiency-national-statistics

Sub-national consumption of other fuels, 2016

This publication presents the findings of the residual fuels sub–national energy consumption analysis in the UK for the period covering 1 January to 31 December 2016. Other fuels are defined as non-gas, non-electricity and non-road transport fuels, and cover consumption of coal, petroleum, manufactured solid fuels and bioenergy and waste not used for electricity generation or road transport. The release was published on 27 September 2018 at:
www.gov.uk/government/collections/sub-national-consumption-of-other-fuels

Sub-national total final energy consumption, 2016

This publication presents the findings of the sub–national energy consumption analysis in the UK for all fuels, for the period covering 1 January to 31 December 2016, with gas consumption covering the period mid-July 2016 to mid-July 2017. The release was published on 27 September 2018 at:
www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level

Sub-national electricity consumption in Northern Ireland

This publication presents estimates of the latest analysis of electricity consumption in Northern Ireland at District Council level, for the period covering 31 January 2016 to 30 September 2017. The release was published on 27 September 2018 at:
www.gov.uk/government/collections/sub-national-electricity-consumption-in-northern-ireland.

Energy Trends and Energy Prices: December 2018

Energy Trends and Energy Prices are normally released concurrently on the last Thursday of March, June, September and December. Given that the last working Thursday of December, the 27 December, will fall between Christmas and New Year it has been decided that the release date for the December 2018 editions will be brought forward to Thursday 20 December 2018.

Sub-national electricity consumption, 2017

This publication looks at electricity consumption by consuming sector for Great Britain, and Regional/devolved administration areas, together with some commentary relating to local authority trends. The data analysed in this publication are based on the aggregation of Meter Point Administration Number (MPAN) readings throughout Great Britain as part of BEIS's annual meter point electricity data exercise. The data cover the electricity year between late January 2017 and late January 2018. These data follow on from the results produced from similar exercises carried out for 2005 to 2016. The latest release will be published on 20 December 2018, at:
www.gov.uk/government/collections/sub-national-electricity-consumption-data.

Sub-national gas consumption, 2017

This publication looks at gas consumption by consuming sector for Great Britain, and Regional/devolved administration areas, together with some commentary relating to local authority trends. The data analysed in this factsheet are based on the aggregation of Meter Point Reference Number (MPRN) readings throughout Great Britain as part of BEIS's annual meter point gas data exercise. The data cover the gas year between Mid June 2017 and Mid June 2018 and are subject to a weather correction factor. In the domestic sector, gas consumption is predominately used for heating purposes and as a result usage is driven by external temperatures and weather conditions. The weather correction factor enables comparisons of gas use over time, controlling for weather changes. These data follow on from the results produced from similar exercises carried out for 2005 to 2016. The latest release will be published on 20 December 2018, at:
www.gov.uk/government/collections/sub-national-gas-consumption-data.

Explanatory notes

General

More detailed notes on the methodology used to compile the figures and data sources are available on the BEIS section of the GOV.UK website.

Symbols used in the tables

.. not available
- nil or not separately available
p provisional
r revised; where a column or row shows 'r' at the beginning, most, but not necessarily all, of the data have been revised.
e estimated; totals of which the figures form a constituent part are therefore partly estimated

Notes to tables

- Figures for the latest periods and the corresponding averages (or totals) are provisional and are liable to subsequent revision.
- The figures have not been adjusted for temperature or seasonal factors except where noted.
- Due to rounding the sum of the constituent items may not equal the totals.
- Percentage changes relate to the corresponding period a year ago. They are calculated from unrounded figures but are shown only as (+) or (-) when the percentage change is very large.
- Quarterly figures relate to calendar quarters.
- All figures relate to the United Kingdom unless otherwise indicated.

- Further information on Oil and Gas is available from The Oil & Gas Authority at: www.ogauthority.co.uk/

Conversion factors

1 tonne of crude oil =	7.55 barrels
1 tonne =	1,000 kilograms
1 gallon (UK) =	4.54609 litres
1 kilowatt (kW) =	1,000 watts
1 megawatt (MW) =	1,000 kilowatts
1 gigawatt (GW) =	1,000 megawatts
1 terawatt (TW) =	1,000 gigawatts

All conversion of fuels from original units to units of energy is carried out on the basis of the gross calorific value of the fuel. More detailed information on conversion factors and calorific values is given in Annex A of the Digest of United Kingdom Energy Statistics.

Conversion matrices

To convert from the units on the left hand side to the units across the top multiply by the values in the table.

To:	**Thousand toe**	**Terajoules**	**GWh**	**Million therms**
From	**Multiply by**			
Thousand toe	1	41.868	11.630	0.39683
Terajoules (TJ)	0.023885	1	0.27778	0.0094778
Gigawatt hours (GWh)	0.085985	3.6000	1	0.034121
Million therms	2.5200	105.51	29.307	1

To:	**Tonnes of oil equivalent**	**Gigajoules**	**kWh**	**Therms**
From	**Multiply by**			
Tonnes of oil equivalent	1	41.868	11,630	396.83
Gigajoules (GJ)	0.023885	1	277.78	9.4778
Kilowatt hours (kWh)	0.000085985	0.003600	1	0.034121
Therms	0.0025200	0.105510	29.307	1

Note that all factors are quoted to 5 significant figures

Abbreviations

ATF	Aviation turbine fuel
CCGT	Combined cycle gas turbine
DERV	Diesel engined road vehicle
LNG	Liquefied natural gas
MSF	Manufactured solid fuels
NGLs	Natural gas liquids
UKCS	United Kingdom continental shelf

Sectoral breakdowns

The categories for final consumption by user are defined by the Standard Industrial Classification 2007, as follows:

Fuel producers	05-07, 09, 19, 24.46, 35
Final consumers	
Iron and steel	24 (excluding 24.4, 24.53 and 24.54)
Other industry	08, 10-18, 20-23, 24.4 (excluding 24.46), 24.53, 24.54, 25-33, 36-39, 41-43
Transport	49-51
Other final users	
Agriculture	01-03
Commercial	45-47, 52-53, 55-56, 58-66, 68-75, 77-82
Public administration	84-88
Other services	90-99
Domestic	Not covered by SIC 2007

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