Department for
Business, Energy
& Industrial Strategy

ENERGY TRENDS SEPTEMBER 2017

September 2017

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- meet identified user needs
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- are produced according to sound methods, and
- are managed impartially and objectively in the public interest

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed

Any enquiries regarding this publication should be sent to us at energy.stats@beis.gov.uk.

This publication is available for download at www.gov.uk/government/statistics/energy-trends-september-2017.

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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 2017 edition of the Digest was published on 27 July 2017 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, via the electronic versions of these tables. The electronic versions 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 2017:

- Total energy production was 2.5 per cent higher than in the second quarter of 2016.
- Oil production fell by 1.9 per cent when compared with the second quarter of 2016, despite increased production of Natural Gas Liquids (NGLs).
- Natural gas production was 6.5 per cent higher than the second quarter of 2016, boosted by the start-up of two new fields in 2016. Gas imports fell by 17 per cent as a result of lower demand, whilst exports rose by 49 per cent.
- Coal production in the second quarter of 2017 was at a record low, 28 per cent lower than the second quarter of 2016, due to falling demand. Coal imports were 18 per cent higher. Generators' demand for coal fell by 65 per cent to a record low. The rise in net imports did not fully mitigate the drop in coal production.
- Total primary energy consumption for energy uses fell by 3.6 per cent. However, when adjusted to take account of weather differences between the second quarter of 2016 and the second quarter of 2017, total primary energy consumption fell by 1.9 per cent to a new record low.
- Temperatures in the quarter were on average 1.1 degrees warmer than a year earlier, with all months in the quarter warmer than in 2016.
- Final energy consumption (excluding non-energy use) was 4.1 per cent lower than in the second quarter of 2016. Domestic consumption fell by 12.7 per cent, other final users consumption fell by 6.5 per cent, industrial consumption fell by 1.0 per cent, whilst transport consumption rose by 0.2 per cent. On a temperature adjusted basis, final energy consumption fell by 0.7 per cent.
- Gas demand was 7.6 per cent lower than the second quarter of 2016 driven by a fall in use by electricity generators and the warmer weather in the period, whilst electricity consumption was 3.9 per cent lower than in the second quarter of 2016.
- Total deliveries of the key transport fuels were up 0.7 per cent when compared to the same period last year. Motor spirit deliveries were down 1.3 per cent, whilst DERV deliveries were up 1.5 per cent and aviation turbine fuel deliveries were up 1.0 per cent.
- Electricity generated in the second quarter of 2017 fell by 3.3 per cent to 75.5 TWh compared to a year earlier.
- Of electricity generated in the second quarter of 2017, gas accounted for 41.3 per cent, whilst coal accounted for a record low of only 2.1 per cent. Nuclear generation accounted for 23.6 per cent of total electricity generated in the second quarter of 2017.
- Low carbon electricity's share of electricity generation reached a record high of 53.4 per cent in the second quarter of 2017, compared to 46.7 per cent in the second quarter of 2016.
- Renewables' share of electricity generation was a record 29.8 per cent in 2017 Q2, up 4.4 percentage points on the share in 2016 Q2, reflecting both increased wind capacity and wind speeds, as well as lower overall electricity generation.
- Renewable electricity generation was 22.5 TWh in 2017 Q2, an increase of 13.6 per cent on the 19.8 TWh in 2016 Q2. Renewable electricity capacity was 38.0 GW at the end of 2017 Q2, a 13.2 per cent increase (4.4 GW) on a year earlier, with over half of the annual increase coming from onshore wind.

Section 1 - Total Energy

Key results show:

Total energy production was 2.5 per cent higher than in the second quarter of 2016. (**Charts 1.1 & 1.2**)

Total primary energy consumption for energy uses fell by 3.6 per cent. However, when adjusted to take account of weather differences between the second quarter of 2016 and the second quarter of 2017, primary energy consumption fell by 1.9 per cent to a new record low. (**Chart 1.3**)

Final energy consumption (excluding non-energy use) fell by 4.1 per cent compared to the second quarter of 2016. Domestic consumption fell by 12.7 per cent, other final users (mainly from the service sector) consumption fell by 6.5 per cent, industrial consumption fell by 1.0 per cent, whilst transport consumption rose by 0.2 per cent. (**Charts 1.4 & 1.5**)

On a temperature adjusted basis, final energy consumption fell by 0.7 per cent, with falls in the domestic and other final users sectors, but rises in the industrial and transport sectors. (**Chart 1.5**)

Net import dependency was 30.6 per cent, down 6.4 percentage points from the second quarter of 2016. (**Chart 1.6**)

Fossil fuel dependency fell to 79.0 per cent, a record low, in the second quarter of 2017. (**Chart 1.7**)

Relevant tables

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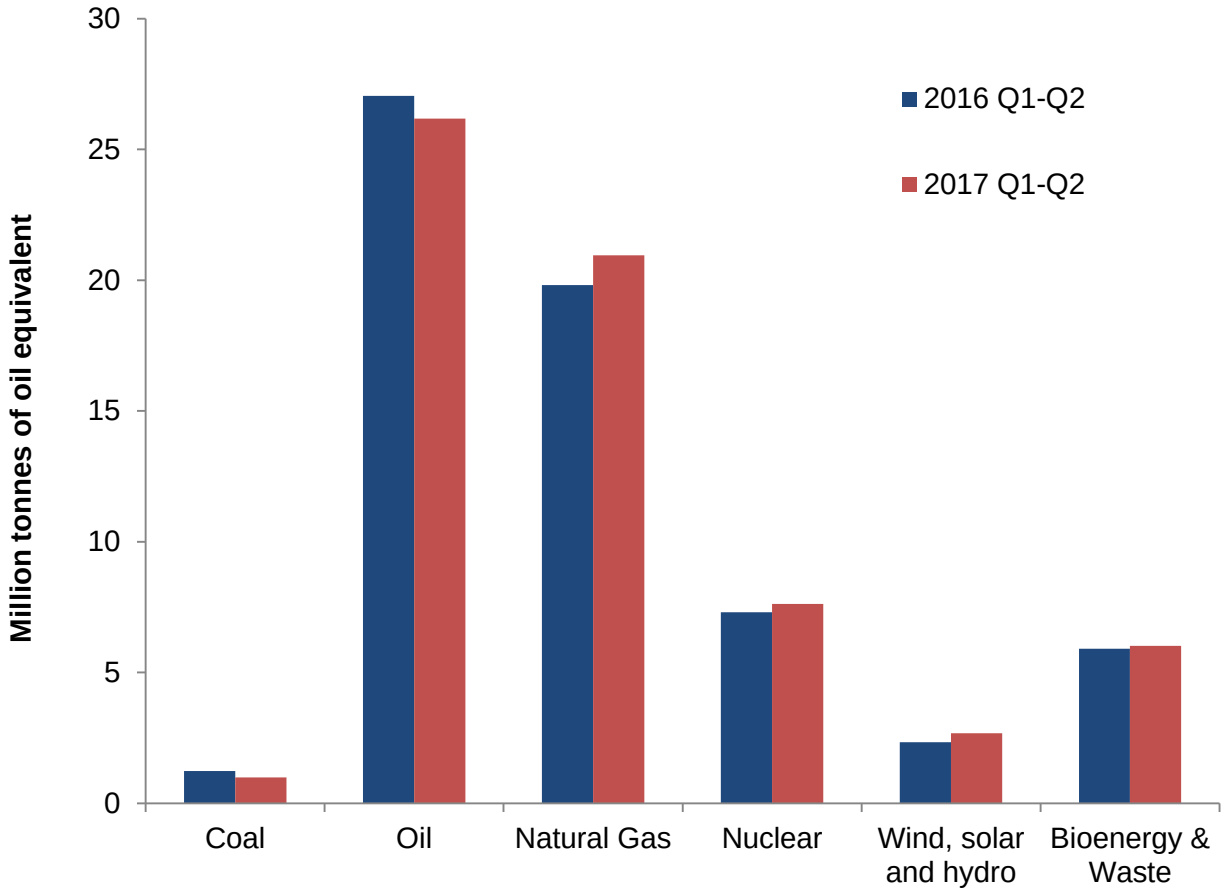
Chart 1.1 Production of indigenous primary fuels (Table 1.1)



Total production in the second quarter of 2017 stood at 31.2 million tonnes of oil equivalent, 2.5 per cent higher than in the second quarter of 2016.

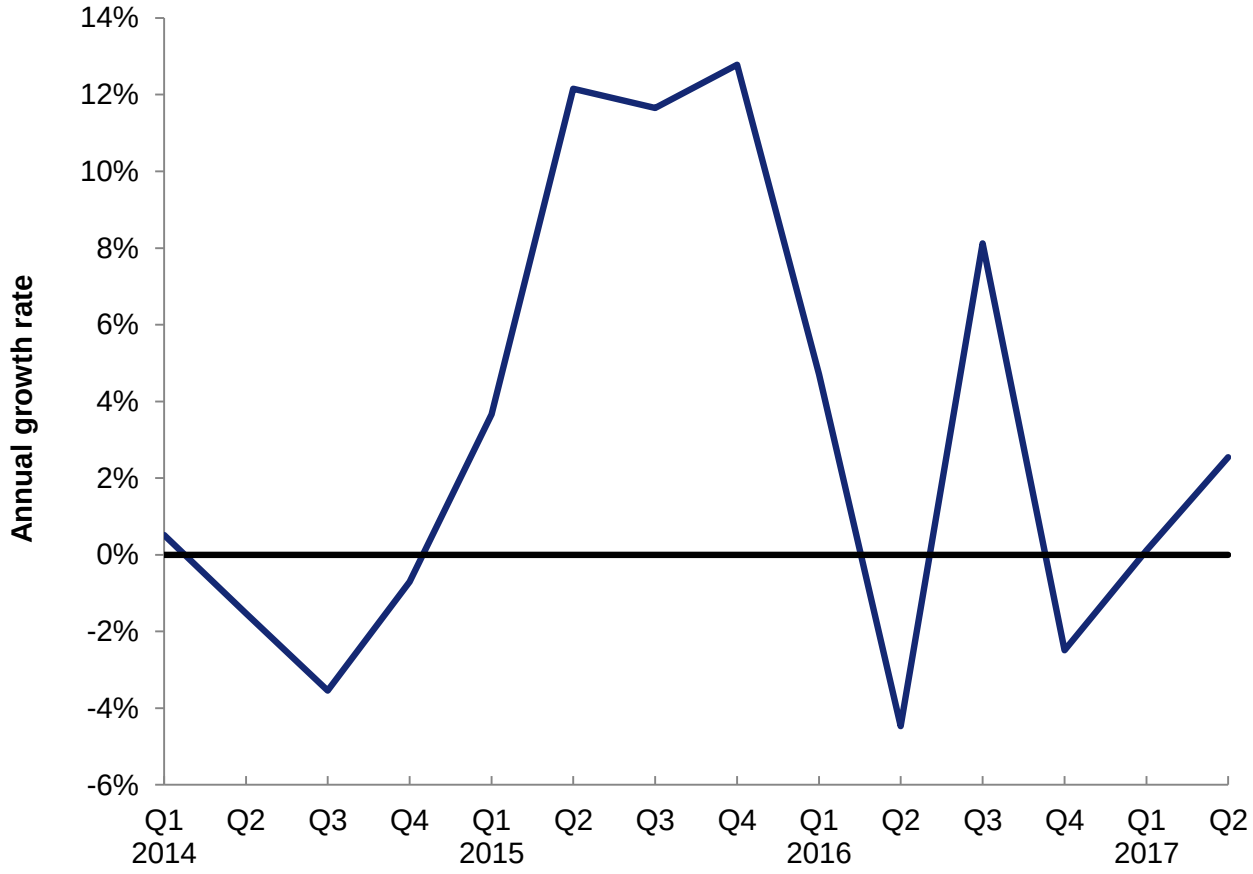
Production of oil fell by 1.8 per cent, despite strong growth in the production of Natural Gas Liquids (NGLs), whilst production of natural gas rose by 6.5 per cent following the start-up of the Laggan gas field in mid-2016 and the Cygnus gas field in December 2016.

Primary electricity output in the second quarter of 2017 was 10.6 per cent higher than in the second quarter of 2016. Nuclear electricity output was 7.1 per cent higher due to fewer outages, whilst output from wind, hydro and solar pv was 23 per cent higher, due to a combination of increased wind speeds and sun hours and increased wind and solar capacity.

Production of bioenergy and waste was 3.0 per cent higher compared to the second quarter in 2016.

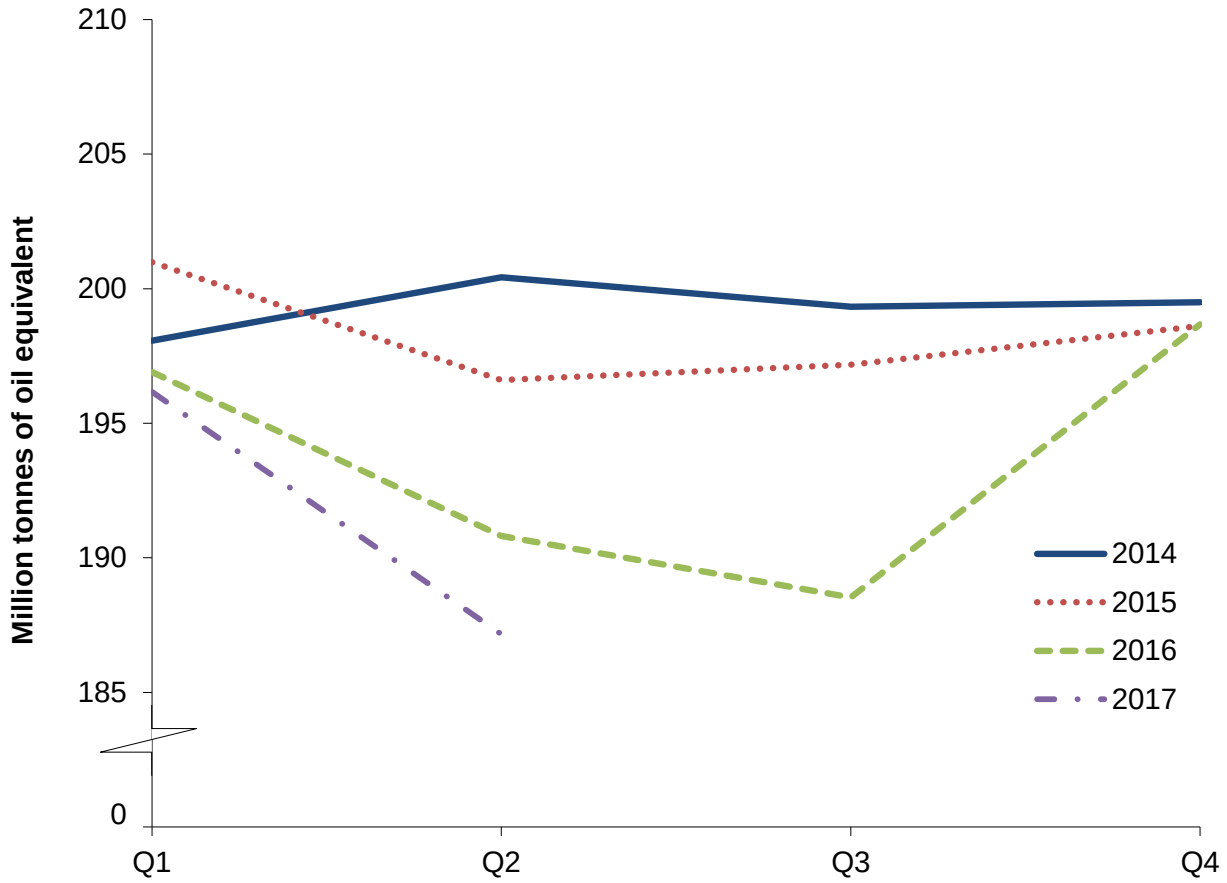
In the second quarter of 2017 production of coal and other solid fuels was 28 per cent lower than the corresponding period of 2016, and at a record low level. The majority of this decrease came from the contraction in surface mine output which also fell to a new record low, due to low demand from electricity generators.

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



In the second quarter of 2017, the annual growth rate of UK quarterly production was +2.5 per cent on the same quarter last year with increases in gas, bioenergy and primary electricity output offset by decreases in oil and coal 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 187.2 million tonnes of oil equivalent, a record low, in the second quarter of 2017, 1.9 per cent lower than in the second quarter of 2016. The main driver for the low level is the switch by electricity generators from using fossil fuels to low carbon sources (nuclear and renewables), along with the switch from coal to gas, as well as improvements in energy efficiency.

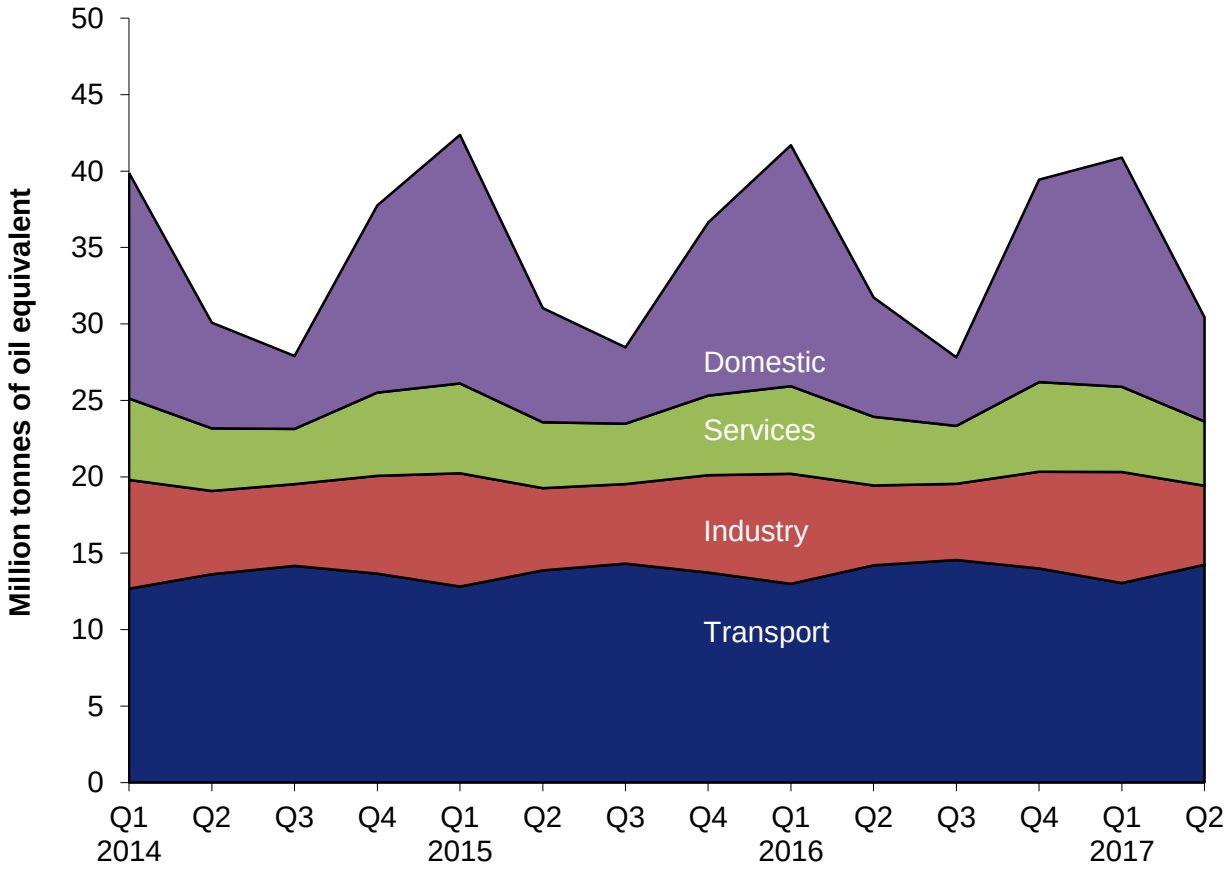
The average temperature in the second quarter of 2017 was 1.1 degree Celsius warmer than the same period a year earlier, with all months in the quarter warmer than in 2016.

Between the second quarter of 2016 and the second quarter of 2017 (on a seasonally adjusted and temperature corrected basis) coal and other solid fuel consumption fell by 30 per cent, driven by decreased coal use in electricity generation.

On the same basis, natural gas consumption fell by 3.1 per cent between the second quarter of 2016 and the second quarter of 2017, due in the main to other fuel sources being used for electricity generation, particularly in June 2017 where nuclear and wind output was high. Oil consumption in the second quarter of 2017 was 0.4 per cent higher than in the second quarter of 2016.

Also on a seasonally adjusted and temperature corrected basis there was a rise of 7.1 per cent in nuclear consumption, a rise of 28 per cent from wind, hydro and solar pv, but a fall of 1.1 per cent in bioenergy & waste consumption.

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



Total final energy consumption fell by 4.0 per cent between the second quarter of 2016 and the second quarter of 2017.

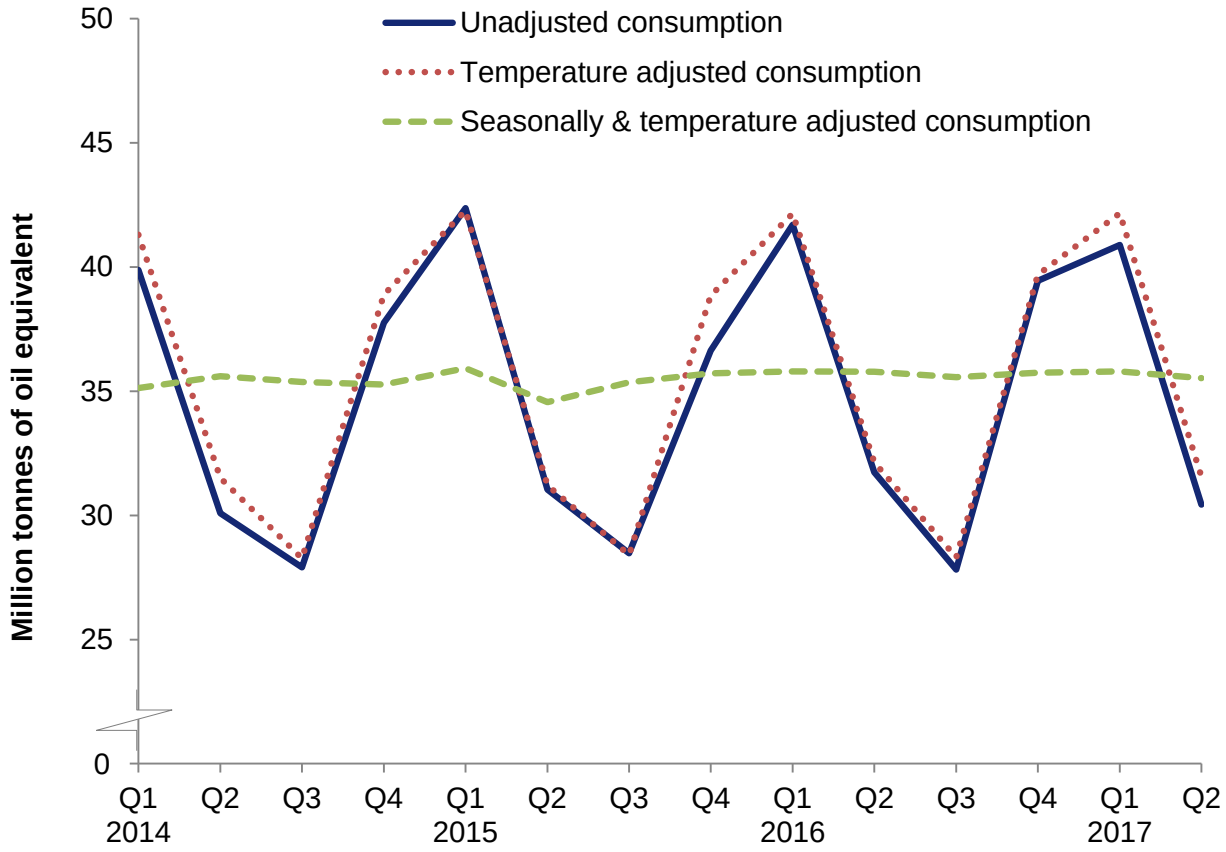
Domestic sector energy consumption fell by 12.7 per cent. Average temperatures in the second quarter of 2017 were 1.1 degree Celsius warmer than a year earlier, with all months in the quarter warmer than in 2016.

Service sector energy consumption fell by 6.5 per cent.

Industrial sector energy consumption fell by 1.0 per cent.

Transport sector energy consumption rose by 0.2 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 4.1 per cent between the second quarter of 2016 and the second quarter of 2017.

On a seasonally and temperature adjusted basis final energy consumption (excluding non-energy use) fell by 0.7 per cent between the second quarter of 2016 and the second quarter of 2017.

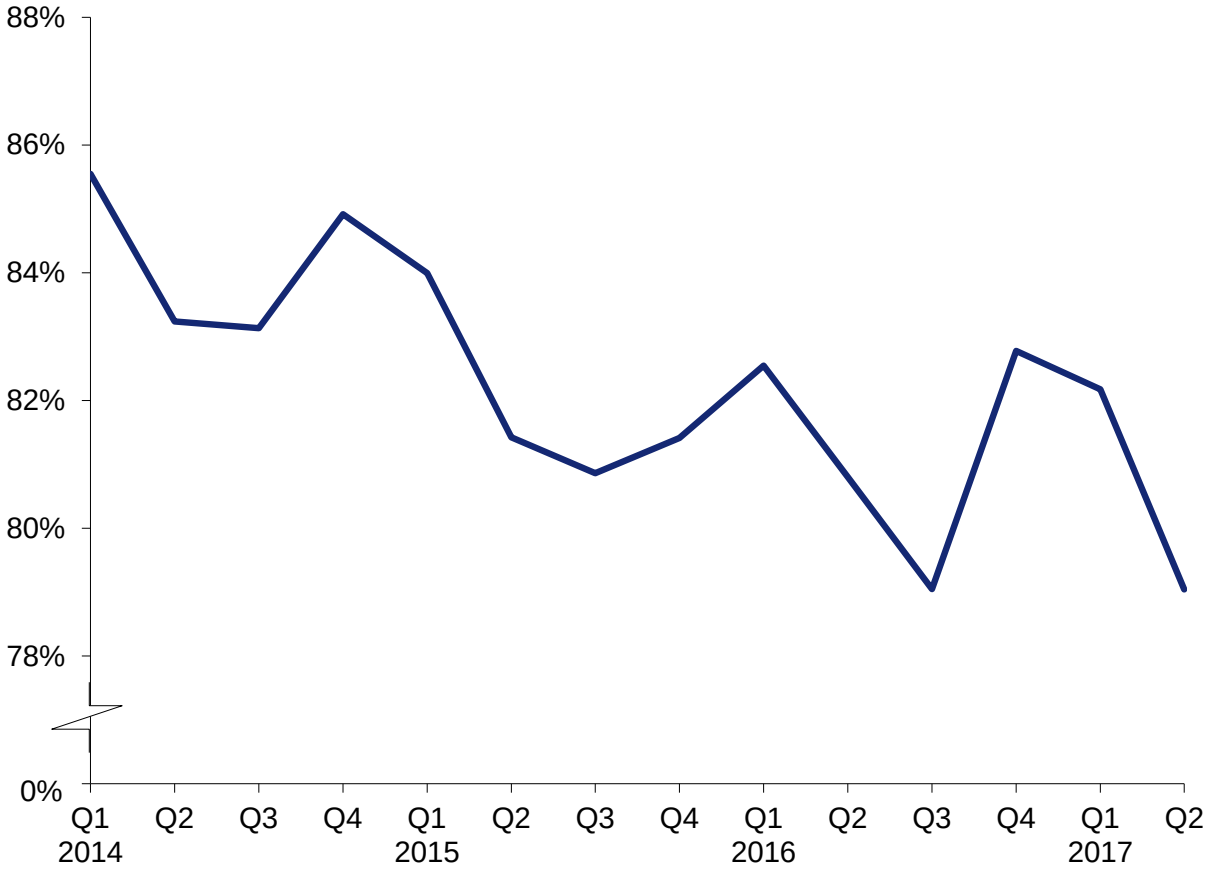
Unadjusted domestic consumption fell by 12.7 per cent over this same period, and was down 2.6 per cent on a seasonally and temperature adjusted basis.

Consumption data by fuel and sector, in table ET 1.3c, is now included within this publication as well as on the BEIS section of the GOV.UK website at: www.gov.uk/government/statistics/total-energy-section-1-energy-trends

Chart 1.6 Net import dependency (Table 1.3a)

In the second quarter of 2017 net import dependency was 30.6 per cent, down 6.4 percentage points from the second quarter of 2016 and down 6.8 percentage points from the first quarter of 2017, reflecting the increase in UK gas production, and reduced gas pipeline and LNG imports.

Chart 1.7 Fossil fuel dependency (Table 1.3a)



In the second quarter of 2017 fossil fuel dependency was 79.0 per cent, a new record low, down 1.8 percentage points from the second quarter of 2016 and down 3.1 percentage points from the first quarter of 2017.

1 TOTAL ENERGY

TABLE 1.1. Indigenous production of primary fuels

Million tonnes of oil equivalent

		Total	Coal[1]	Petroleum[2]	Natural gas[3]	Bioenergy & waste[4,5]	Primary electricity	
							Nuclear	Wind, solar and hydro[6]
2012		121.3	10.6	48.8	37.4	7.0	15.2	2.28
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		123.7	5.4	49.5	38.8	9.8	15.5	4.66
2016		125.1	2.6	52.0	39.8	10.8	15.4	4.57
Per cent change		*+1.2*	*-51.1*	*+4.9*	*+2.4*	*+10.4*	*-0.4*	*-1.8*
2016	Quarter 2	30.4	0.6	13.3	9.6	2.4	3.6	1.04
	Quarter 3	29.5	0.6	12.3	9.5	1.8	4.1	1.13
	Quarter 4	32.0	0.7	12.6	10.5	3.1	4.1	1.11
2017	Quarter 1	33.2r	0.6	13.2r	10.7r	3.6r	3.8	1.41r
	Quarter 2 p	31.2r	0.4	13.0r	10.2r	2.4r	3.8	1.27r
Per cent change[7]		*+2.5*	*-28.2*	*-1.8*	*+6.5*	*+3.0*	*+7.1*	*+22.6*

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)*							
2012		208.1	40.9	67.0	73.3	8.4	15.2	2.28	1.02	208.2	41.0	67.0	73.3	8.4	15.2	2.28	1.02
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	199.3	33.1	66.0	69.9	11.2	13.9	3.61	1.76
2015		195.5	25.1	67.3	68.1	13.1	15.5	4.66	1.80	198.3	25.6	67.3	70.5	13.1	15.5	4.66	1.80
2016		192.8	12.4	68.0	76.7	14.2	15.4	4.57	1.51	193.7	12.6	68.0	77.4	14.2	15.4	4.57	1.51
Per cent change		*-1.4*	*-50.5*	*+1.1*	*+12.6*	*+8.2*	*-0.4*	*-1.8*	*-16.2*	*-2.3*	*-50.7*	*+1.1*	*+9.9*	*+8.2*	*-0.4*	*-1.8*	*-16.2*
2016	Quarter 2	43.8	2.3	16.9	16.1	3.3	3.6	1.04	0.46	190.8	12.2	67.7	76.6	13.3	14.6	4.56	1.84
	Quarter 3	39.5	1.9	17.2	12.1	2.7	4.1	1.13	0.40	188.5	10.7	68.9	74.8	10.7	16.3	5.43	1.61
	Quarter 4	53.2	3.3	17.3	23.4	3.9	4.1	1.11	0.13	198.7	11.7	69.4	81.6	15.5	16.1	3.90	0.52
2017	Quarter 1	54.9r	3.7r	16.5r	24.9r	4.3r	3.8	1.41r	0.25	196.2r	12.4r	66.0r	79.5r	17.4r	15.0	4.89r	1.00
	Quarter 2 p	42.3r	1.6r	17.0r	14.8r	3.3r	3.8	1.27r	0.45	187.2r	8.6r	68.0r	74.2r	13.2r	15.6	5.83r	1.80
Per cent change[10]		*-3.6*	*-33.0*	*+0.4*	*-8.1*	*-1.1*	*+7.1*	*+22.6*	*-1.9*	*-1.9*	*-30.0*	*+0.4*	*-3.1*	*-1.1*	*+7.1*	*+27.7*	*-1.9*

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

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*per cent change*[1]
SUPPLY													
Indigenous production	123,673	125,135	*+1.2*	31,858	27,244	32,859	33,204	30,435	29,456	32,039	33,243r	31,211	*+2.5*
Imports	155,134	149,687	*-3.5*	35,472	36,326	40,183	39,606	35,487	33,359	41,236	40,158r	34,874	*-1.7*
Exports	-76,644	-75,763	*-1.1*	-19,520	-20,225	-19,924	-19,510	-18,174	-20,473	-17,606	-18,647r	-21,092	*+16.1*
Marine bunkers	-2,684	-2,840	*+5.8*	-747	-734	-611	-574	-777	-816	-674	-544r	-654	*-15.9*
Stock change[2]	+3,907	+4,907	*+25.6*	-757	+534	+819	+5,649	-1,028	+37	+250	+2,710r	-19	*(+)*
Primary supply	203,387	201,125	*-1.1*	46,305	43,146	53,327	58,375	45,943	41,563	55,244	56,920r	44,320	*-3.5*
Statistical difference[3]	113	32		43	-66	43	128	-28	-47	-21	-76r	20	
Primary demand	203,274	201,093	*-1.1*	46,262	43,212	53,283	58,248	45,971	41,611	55,265	56,996r	44,299	*-3.6*
Transfers[4]	32	-14		2	35	-4	-5	-1	-2	-7	-9r	35	
TRANSFORMATION	-41,329	-37,404	*-9.5*	-9,604	-9,117	-10,492	-10,531	-8,497	-8,242	-10,134	-10,191r	-8,131	*-4.3*
Electricity generation	-37,543	-34,214	*-8.9*	-8,609	-8,326	-9,648	-9,687	-7,736	-7,483	-9,309	-9,311r	-7,402	*-4.3*
Heat generation	-1,088	-1,152	*+5.9*	-240	-209	-287	-357	-256	-215	-324	-357	-256	*+0.0*
Petroleum refineries	-152	-155	*+2.2*	-33	-29	-20	-27	-39	-70	-20	-52r	-4	*-88.6*
Coke manufacture	-156	-81	*-48.0*	-46	-38	-24	-20	-20	-21	-20	-23	-20	*-0.2*
Blast furnaces	-2,277	-1,692	*-25.7*	-647	-485	-480	-407	-425	-432	-428	-418	-419	*-1.4*
Patent fuel manufacture	-68	-64	*-6.8*	-19	-18	-21	-21	-11	-10	-22	-19r	-19	*+78.8*
Other[5]	-44	-46	*+3.5*	-9	-12	-12	-12	-11	-11	-11	-11	-11	*-3.8*
Energy industry use	12,485	11,881	*-4.8*	3,096	3,030	3,179	3,131	2,947	2,853	2,950	3,087r	3,059	*+3.8*
Losses	3,133	2,823	*-9.9*	647	656	852	870	666	595	692	834r	641	*-3.7*
FINAL CONSUMPTION	146,360	148,971	*+1.8*	32,917	30,441	38,755	43,714	33,861	29,914	41,482	42,877r	32,502	*-4.0*
Iron & steel	1,262	946	*-25.0*	344	294	261	246	238	229	234	252r	229	*-3.6*
Other industries	23,099	22,784	*-1.4*	5,038	4,907	6,107	6,952	4,984	4,754	6,094	7,010r	4,943	*-0.8*
Transport	54,749	55,767	*+1.9*	13,875	14,321	13,734	12,998	14,210	14,558	14,002	13,050r	14,244	*+0.2*
Domestic	40,046	41,295	*+3.1*	7,470	4,996	11,321	15,765	7,804	4,483	13,242	14,991r	6,817	*-12.7*
Other Final Users	19,344	19,875	*+2.7*	4,310	3,950	5,207	5,729	4,493	3,789	5,864	5,577r	4,201	*-6.5*
Non energy use	7,859	8,303	*+5.7*	1,880	1,973	2,125	2,024	2,132	2,102	2,045	1,997r	2,069	*-3.0*
DEPENDENCY[6]													
Net import dependency	38.1%	36.2%		33.9%	36.7%	37.6%	34.1%	37.1%	30.4%	42.3%	37.4%r	30.6%	
Fossil fuel dependency	82.1%	81.5%		81.4%	80.9%	81.4%	82.5%	80.8%	79.1%	82.8%	82.2%r	79.0%	
Low carbon share	16.5%	17.0%		16.9%	17.3%	17.3%	16.0%	17.4%	19.1%	16.4%	16.8%r	19.1%	

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

	2016 Quarter 2									2017 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	607	-	13,252	-	9,601	2,358	4,618	-	-	435	-	13,014	-	10,226	2,430	5,105	-	-
Imports	947	202	12,912	9,989	9,880	1,073	-	483	-	1,130	166	15,331	8,642	8,168	971	-	466	-
Exports	-58	-3	-8,737	-6,851	-2,406	-97	-	-24	-	-75	0	-10,903	-6,406	-3,591	-102	-	-15	-
Marine bunkers	-	-	-	-777	-	-	-	-	-	-	-	-	-654	-	-	-	-	-
Stock change[1]	+629	+15	-532	-319	-821	-	-	-	-	-95	+12	-230	+147	+146	-	-	-	-
Primary supply	2,125	214	16,896	2,043	16,254	3,334	4,618	460	-	1,396	177	17,212	1,730	14,950	3,298	5,105	451	-
Statistical difference[2]	-21	+1	-98	+1	+74	+0	-	+16	-	-8	+0	-12	-24	+31	-	-	+33	-
Primary demand	2,147	213	16,994	2,041	16,180	3,334	4,618	444	-	1,404	177	17,224	1,755	14,918	3,298	5,105	417	-
Transfers[3]	-	8	-464	+464	+30	-39	-1,038	+1,038	-	-	+1	-652	+688	54	-56	-1,273	+1,273	-
TRANSFORMATION	-1,787	49	-16,529	16,322	-6,631	-2,267	-3,580	5,613	313	-1,081	75	-16,572	16,413	-6,306	-2,297	-3,832	5,156	313
Electricity generation	-1,129	-132	-	-124	-6,130	-2,254	-3,580	5,613	-	-395	-129	-	-113	-5,805	-2,284	-3,832	5,156	-
Heat generation	-27	-13	-	-15	-502	-13	-	-	313	-27	-13	-	-15	-502	-13	-	-	313
Petroleum refineries	-	-	-16,645	16,606	-	-	-	-	-	-	-	-16,685	16,681	-	-	-	-	-
Coke manufacture	-333	313	-	-	-	-	-	-	-	-357	337	-	-	-	-	-	-	-
Blast furnaces	-263	-162	-	-	-	-	-	-	-	-269	-150	-	-	-	-	-	-	-
Patent fuel manufacture	-36	44	-	-18	-	-	-	-	-	-34	30	-	-16	-	-	-	-	-
Other[7]	-	-	115	-127	-	-	-	-	-	-	-	113	-124	-	-	-	-	-
Energy industry use	-	106	-	1,078	1,212	-	-	482	68	-	102	-	1,090	1,326	-	-	473	68
Losses	-	29	-	-	120	-	-	517	-	-	26	-	-	98	-	-	517	-
FINAL CONSUMPTION	360	136	-	17,750	8,246	1,028	-	6,095	245	323	126	-	17,765	7,242	945	-	5,856	245
Iron & steel	7	84	-	1	85	-	-	60	-	6	74	-	0	88	-	-	60	-
Other industries	252	-	-	902	1,549	259	-	1,868	153	227	-	-	983	1,498	252	-	1,830	153
Transport	3	-	-	13,817	-	289	-	100	-	3	-	-	13,874	-	268	-	100	-
Domestic	92	41	-	497	4,733	367	-	2,065	9	82	40	-	458	3,990	310	-	1,928	9
Other final users	5	-	-	522	1,770	112	-	2,001	84	4	-	-	503	1,557	116	-	1,937	84
Non energy use	-	11	-	2,012	110	-	-	-	-	-	13	-	1,946	110	-	-	-	-

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

	2015	2016	per cent change	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	per cent change[2]
By consuming sector													
Final Consumption (unadjusted)													
Industry	24,362	23,730	-2.6	5,382	5,202	6,368	7,198	5,221	4,982	6,329	7,262r	5,172	-1.0
Transport	54,749	55,767	+1.9	13,875	14,321	13,734	12,998	14,210	14,558	14,002	13,050r	14,244	+0.2
Domestic	40,046	41,295	+3.1	7,470	4,996	11,321	15,765	7,804	4,483	13,242	14,991r	6,817	-12.7
Other final users	19,344	19,875	+2.7	4,310	3,950	5,207	5,729	4,493	3,789	5,864	5,577r	4,201	-6.5
Total	138,501	140,668	+1.6	31,037	28,468	36,630	41,690	31,729	27,812	39,437	40,880r	30,434	-4.1
Final Consumption (Seasonally and temperature adjusted) [3]													
Industry	24,597	23,972	-2.5	6,062	6,012	6,223	6,079	5,945	5,954	5,994	6,136	6,040	+1.6
Transport	54,787	55,664	+1.6	13,629	13,737	13,664	13,887	13,942	13,907	13,929	13,840	13,982	+0.3
Domestic	42,233	42,813	+1.4	10,025	10,605	10,793	10,772	10,773	10,559	10,709	10,734	10,488	-2.6
Other final users	19,954	20,408	+2.3	4,844	5,007	5,042	5,051	5,117	5,136	5,104	5,085	5,015	-2.0
Total	141,571	142,857	+0.9	34,560	35,361	35,723	35,788	35,777	35,556	35,736	35,796	35,526	-0.7
By fuel													
Final Consumption (unadjusted)													
Gas	42,023	43,379	+3.2	7,719	5,131	11,813	16,717	8,137	4,464	14,061	16,043r	7,132	-12.3
Electricity	26,092	26,122	+0.1	6,161	6,052	6,705	7,108	6,095	5,966	6,952	6,947r	5,856	-3.9
Other	70,385	71,167	+1.1	17,157	17,285	18,112	17,864	17,497	17,383	18,423	17,890r	17,445	-0.3
Total	138,501	140,668	+1.6	31,037	28,468	36,630	41,690	31,729	27,812	39,437	40,880r	30,434	-4.1
Final Consumption (Seasonally and temperature adjusted) [3]													
Gas	44,320	45,128	+1.8	10,435	11,175	11,247	11,291	11,299	11,180	11,358	11,343	11,113	-1.6
Electricity	26,377	26,323	-0.2	6,626	6,574	6,554	6,599	6,579	6,590	6,555	6,524	6,394	-2.8
Other	70,874	71,406	+0.8	17,498	17,612	17,921	17,898	17,899	17,786	17,823	17,929	18,018	+0.7
Total	141,571	142,857	+0.9	34,560	35,361	35,723	35,788	35,777	35,556	35,736	35,796	35,526	-0.7

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. Seasonal and temperature adjusted series revised back to 2014 Q1 in September 2017.

Section 2 – Solid Fuels and Derived Gases

Key results show:

Overall coal production in the second quarter of 2017 fell to a new record low, down 28 per cent compared with the second quarter of 2016. The decrease is due to low demand for coal-fired electricity generation. **(Chart 2.1)**

Coal imports rose 18 per cent on levels shown in the second quarter of 2016. Imports of coking coal (used in coke manufacture) overtook imports of steam coal (used for power generation) for only the second time. **(Charts 2.1 and 2.2)**

The demand for coal by electricity generators in the second quarter of 2017 fell to a new record low of 0.6 million tonnes and was 65 per cent lower than demand in the second quarter of 2016. This decline is in line with previous quarters where gas and other fuels have displaced coal due to the higher costs for coal-fired generation. The seasonal drop in demand due to warmer weather also contributed to the fall in coal-fired electricity generation. **(Chart 2.3)**

Total stock levels were down 33 per cent (-3.0 million tonnes) to 6.3 million tonnes compared to a year earlier. This was due to generators using more coal stocks for electricity generation. **(Chart 2.4)**

Relevant tables

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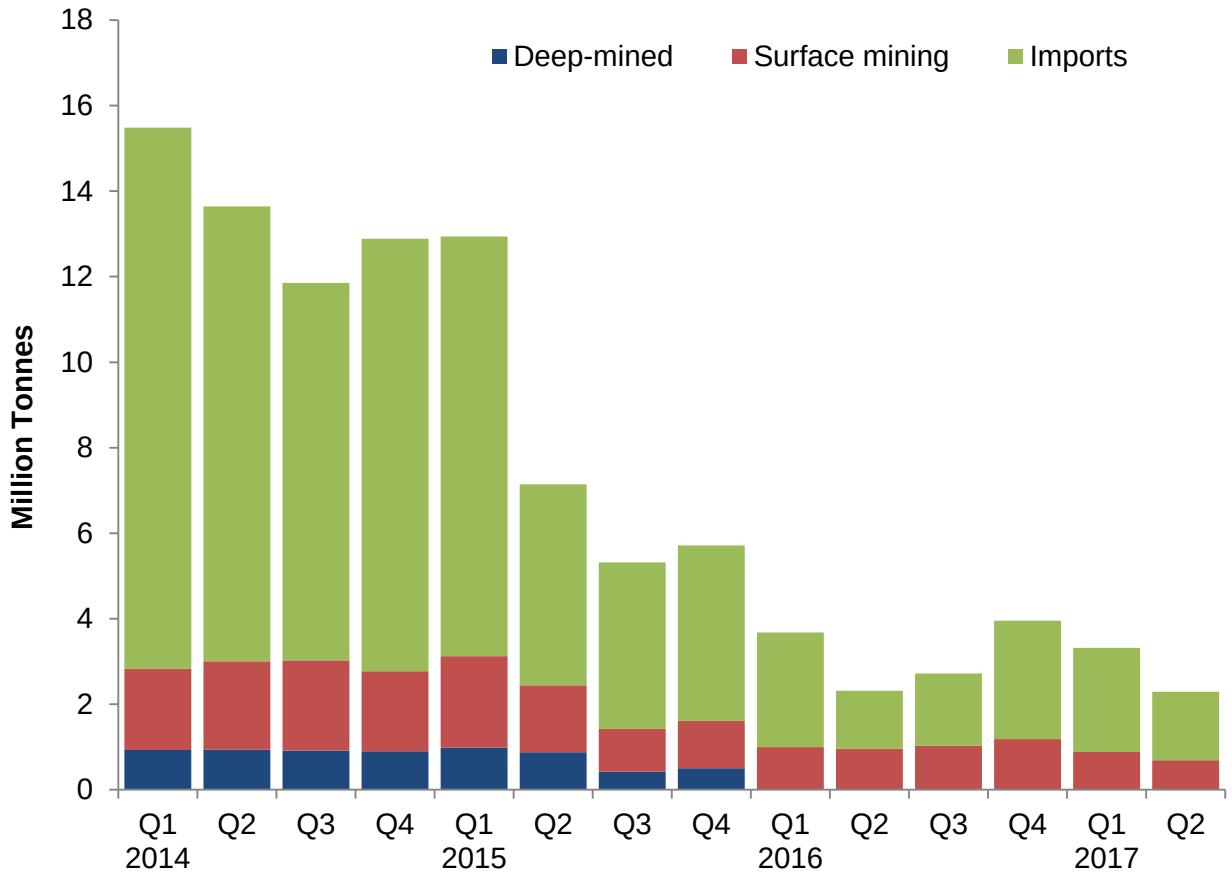
Chart 2.1 Coal supply (Table 2.1)



Coal production in the second quarter of 2017 reached a record low of 0.7 million tonnes, 28 per cent down compared to the second quarter of 2016. The falls were due to decreased demand, particularly for electricity generation.

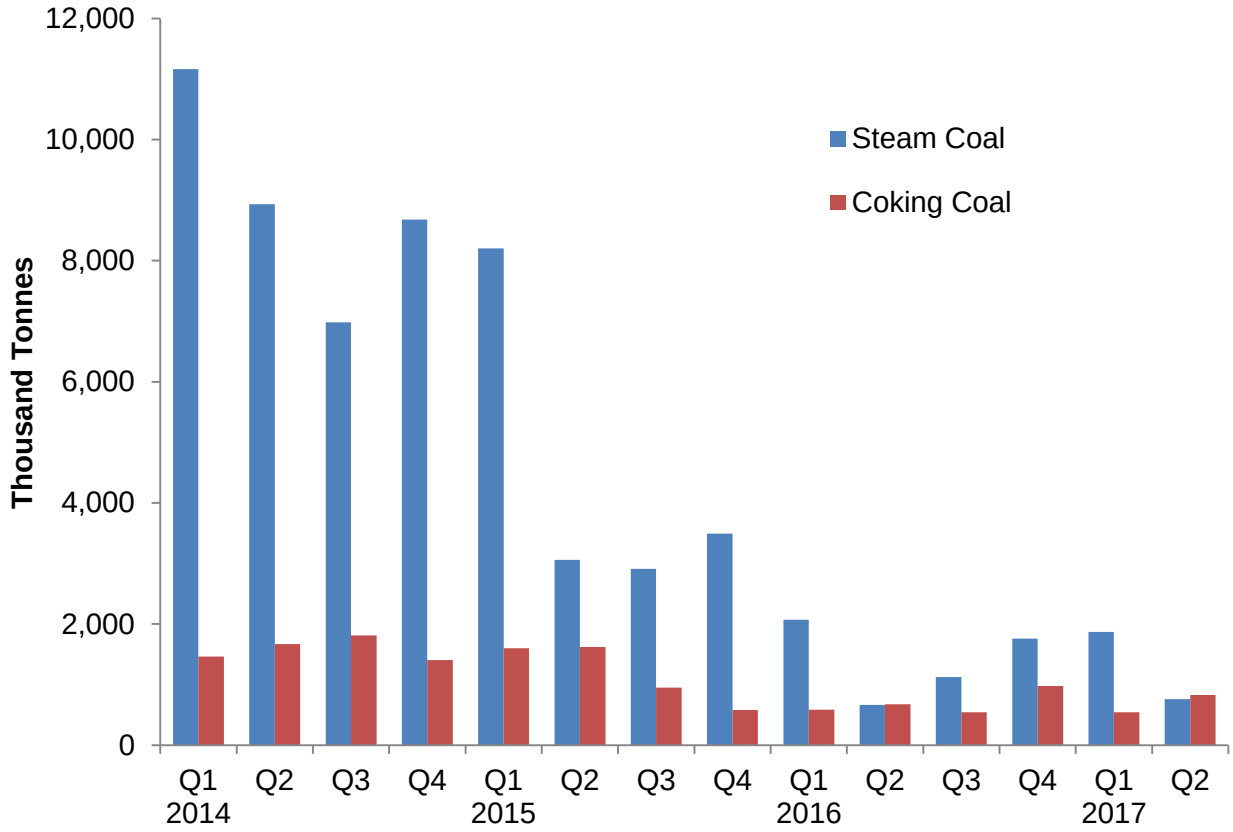
Table 2A Coal imports by origin

Thousand Tonnes

	2015	2016	2016 Q2	2017 Q2p
European Union	614	439	96	81
Russia	8,380	2,292	287	633
Colombia	6,553	2,667	172	38
USA	5,018	1,420	234	454
Australia	910	778	166	203
Other Countries	1,042	898	401	194
Total Imports	**22,518**	**8,494**	**1,356**	**1,601**

Imports of coal in the second quarter of 2017 were 18 per cent higher than in the second quarter of 2016 at 1.6 million tonnes.

Chart 2.2 Steam coal and coking coal imports (Table 2.4)

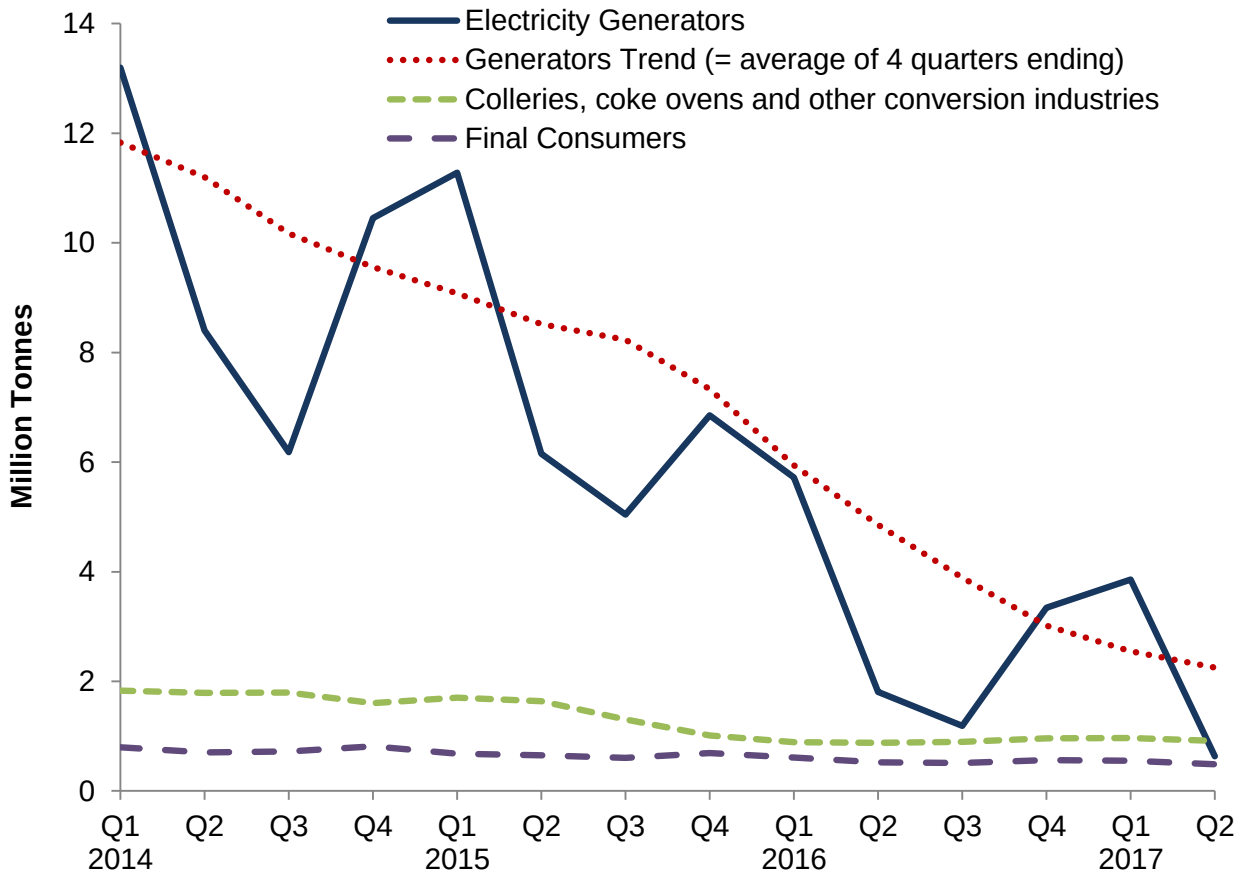


Coking coal imports overtook steam imports in the second quarter of 2017 as steam coal imports fell due to a drop in demand for electricity generation. Steam coal comprised 47 per cent of coal imports and coking coal comprised 52 per cent. Coking coal imports had also been higher than steam coal imports in the second quarter of 2016. Imports of both were higher compared to the second quarter of 2016, with steam coal imports up 15 per cent to 0.8 million tonnes and coking coal imports up 23 per cent to 0.8 million tonnes.

Russia was the highest supplier of steam coal imports with 42 per cent share. The second highest supplier was the USA with 24 per cent. Kazakhstan was now the third highest suppler of steam coal imports with a 6.9 per cent share (52 thousand tonnes). Kazakhstan had been a major source of steam coal imports in the first two quarters of 2016, but provided no steam coal to the UK in the first quarter of 2017.

For coking coal, the USA was the leading supplier with 38 per cent share, followed by Australia with 28 per cent and Russia with 26 per cent.

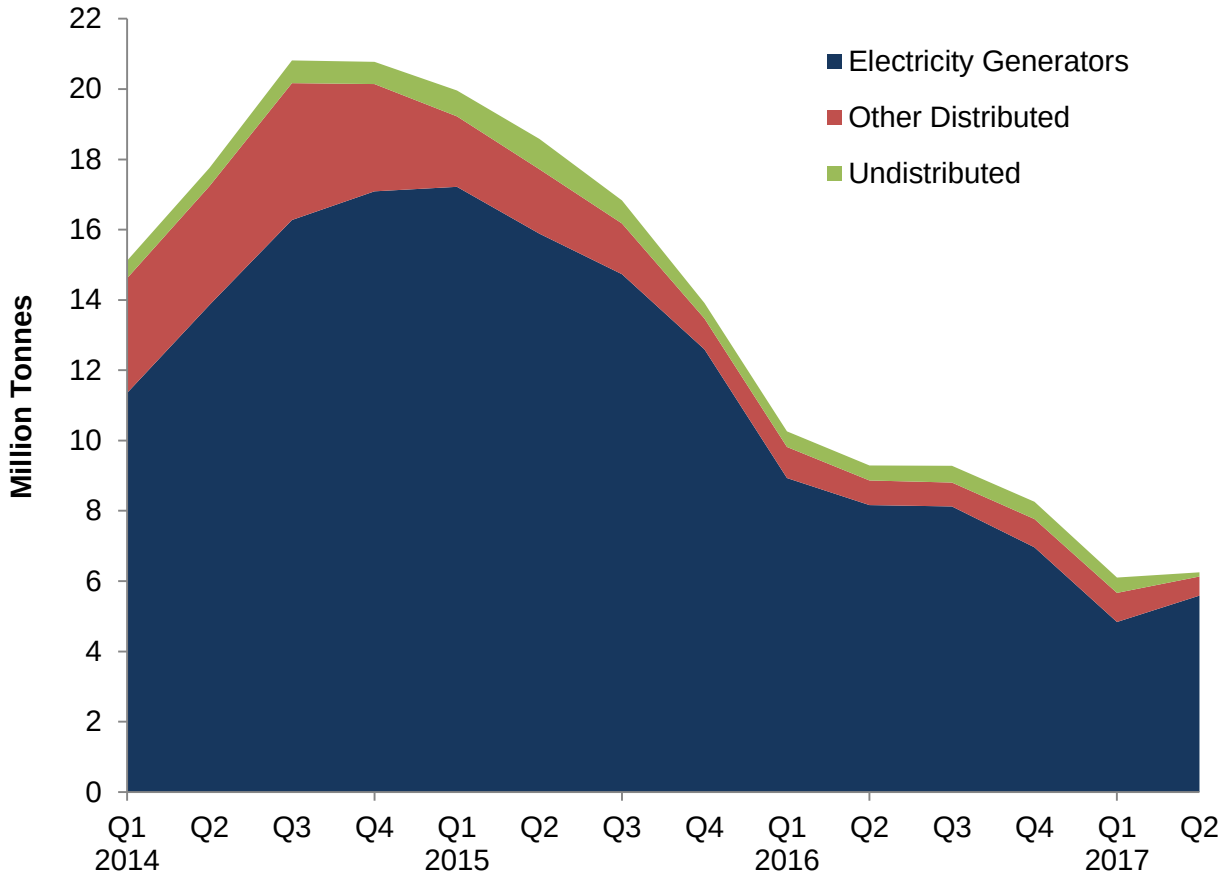
Chart 2.3 Coal consumption (Table 2.1)



Total demand for coal in the second quarter of 2017, at 2.0 million tonnes, was 37 per cent lower than in the second quarter of 2016. Consumption by electricity generators was down by 65 per cent to 0.6 million tonnes. Electricity generators accounted for 31 per cent of total coal use in the second quarter of 2017 compared with 56 per cent a year earlier.

In the second quarter of 2017, sales to industrial users fell by 6.2 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 up 2.6 per cent compared to the second quarter of 2016, to 0.4 million tonnes.

Chart 2.4 Coal stocks (Table 2.1)



Coal stocks rose seasonally by 0.1 million tonnes during the second quarter of 2017 and at the end of June stood at 6.3 million tonnes. This was 3.0 million tonnes lower than at the end of June 2016.

The level of coal stocks at power stations at the end of the second quarter of 2017 was 5.6 million tonnes, 2.6 million tonnes lower than at the end of June 2016, reflecting higher use of coal stocks.

Stocks held by coke ovens were 0.5 million tonnes at the end of the second quarter of 2017, this was 24 thousand tonnes lower than stock levels at the end of June 2016.

Stocks held by producers (undistributed stocks) at the end of the second quarter of 2017 were 0.1 million tonnes, 0.3 million tonnes lower than at the end of June 2016.

2 SOLID FUEL AND DERIVED GASES

Table 2.1 Supply and consumption of coal

Thousand tonnes

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*per cent change* [1]
SUPPLY													
Indigenous production	8,598	4,178	*-51.4*	2,441	1,424	1,612	1,001	962	1,027	1,188	883	691	*-28.2*
Deep mined	2,784	22	*-99.2*	880	420	504	7	6	5	5	5	5	*-4.8*
Surface mining[2]	5,814	4,156	*-28.5*	1,561	1,004	1,108	994	957	1,022	1,183	878	685	*-28.4*
Imports[4]	22,518	8,494	*-62.3*	4,707	3,891	4,103	2,675	1,356	1,694	2,768	2,434r	1,601	*+18.0*
Exports[5]	385	443	*+15.1*	75	104	96	103	76	137	128	119	100	*+30.6*
Stock change[6]	+6,862	+5,655	*-17.6*	+1,378	+1,749	+2,920	+3,651	+971	+9	+1,023	+2,152r	-148	
Total supply	37,593	17,883	*-52.4*	8,451	6,960	8,539	7,225	3,213	2,594	4,851	5,350r	2,044	*-36.4*
Statistical difference	-18	-6		+11	+6	-16	+2	+4	-1	-11	-27r	+9	
Total demand	37,612	17,889	*-52.4*	8,440	6,954	8,555	7,223	3,209	2,595	4,863	5,377r	2,034	*-36.6*
TRANSFORMATION	34,988	15,678	*-55.2*	7,791	6,349	7,865	6,611	2,685	2,081	4,301	4,824r	1,546	*-42.4*
Electricity generation	29,330	12,058	*-58.9*	6,154	5,041	6,851	5,722	1,808	1,187	3,341	3,856r	632	*-65.1*
Heat generation[7]	213	213	-	42	32	58	76	43	29	65	76	43	-
Coke manufacture	3,673	1,821	*-50.4*	1,083	880	545	443	438	464	475	482	469	*+7.3*
Blast furnaces	1,544	1,364	*-11.7*	447	330	344	316	345	346	357	350	354	*+2.6*
Patent fuel manufacture	228	223	*-2.5*	64	65	66	55	51	55	62	59r	48	*-6.3*
Energy industry use	-	-		-	-	-	-	-	-	-	-	-	
FINAL CONSUMPTION	2,624	2,211	*-15.7*	649	605	691	612	524	514	562	553r	488	*-6.9*
Iron & steel	44	35	*-21.7*	12	11	10	10	10	7	7	9	9	*-17.4*
Other industries	1,999	1,580	*-20.9*	504	474	519	431	381	393	376	375r	358	*-5.8*
Domestic	552	550	*-0.4*	127	113	154	156	123	101	171	155r	112	*-9.0*
Other final users	29	47	*+60.5*	6	7	8	15	11	12	9	14	10	*-9.1*
Stocks at end of period													
Distributed stocks	13,471	7,766	*-42.4*	17,718	16,176	13,471	9,817	8,863	8,805	7,766	5,665r	6,131	*-30.8*
Of which:													
Major power producers[8]	12,595	6,962	*-44.7*	15,885	14,733	12,595	8,933	8,163	8,125	6,962	4,837r	5,588	*-31.5*
Coke ovens	547	605	*+10.6*	955	742	547	457	488	322	605	445	464	*-4.9*
Undistributed stocks	441	492	*+11.4*	863	656	441	444	427	476	492	436r	119	*-72.1*
Total stocks[9]	13,913	8,258	*-40.6*	18,581	16,832	13,913	10,261	9,291	9,281	8,258	6,101r	6,250	*-32.7*

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 2017 heat generation figures currently shown are the 2016 figures carried forward - these will be updated in June 2018.

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

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*per cent change* [3]
SUPPLY													
Indigenous production	2,965	1,593	*-46.3*	868	727	474	376	385	409	424	408	384	*-0.2*
Coke Oven Coke	2,716	1,332	*-51.0*	800	658	404	320	319	344	348	346	337	*+5.6*
Coke Breeze	18	16	*-10.6*	5	4	5	4	4	4	4	4	4	*+5.5*
Other MSF	231	245	*+6.2*	64	65	66	51	61	61	71	57	42	*-31.0*
Imports	1,132	1,251	*+10.5*	290	215	325	287	284	284	397	187	233	*-18.0*
Exports	111	22	*-79.9*	74	7	8	6	4	6	6	7	1	*-87.9*
Stock change[1]	64	-126	*(-)*	+37	-50	+4	-2	+21	-15	-130	+65	+17	*-19.8*
Transfers	-3	-4		-1	-	-	-1	-1	-0	-2	-1	-1	
Total supply	4,047	2,691	*-33.5*	1,121	885	796	654	685	671	682	652	632	*-7.7*
Statistical difference	0	0		-	0	-0	-0	-	0	-0	-0	-	
Total demand	4,047	2,691	*-33.5*	1,121	885	796	654	685	671	682	652	632	*-7.7*
TRANSFORMATION	3,257	2,140	*-34.3*	908	705	635	525	548	533	535	508	507	*-7.5*
Coke manufacture	-	-		-	-	-	-	-	-	-	-	-	
Blast furnaces	3,257	2,140	*-34.3*	908	705	635	525	548	533	535	508	507	*-7.5*
Energy industry use	-	-		-	-	-	-	-	-	-	-	-	
FINAL CONSUMPTION	790	551	*-30.2*	213	179	161	130	137	138	146	144	126	*-8.4*
Iron & steel	539	316	*-41.4*	151	125	98	75	79	84	78	76	70	*-11.5*
Other industries	17	-	*-100.0*	6	-	-	-	-	-	-	0	0	
Domestic	235	236	*+0.4*	56	54	63	55	58	55	68	68	56	*-4.1*
Stocks at end of period[2]	1,124	1,249	*+11.2*	1,028	1,038	1,124	1,126	1,108	1,142	1,249	1,187	1,170	*+5.6*

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

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*per cent change* [1]
SUPPLY													
Indigenous production	22,156	14,089	*-36.4*	6,315	4,972	3,874	3,406	3,603	3,424	3,656	3,541	3,543	*-1.7*
Coke oven gas	6,890	3,468	*-49.7*	2,030	1,595	1,000	870	836	855	907	960	946	*+13.2*
Blast furnace gas	14,131	10,090	*-28.6*	3,941	3,117	2,713	2,403	2,645	2,439	2,603	2,444	2,451	*-7.3*
Benzole & tars	1,136	531	*-53.2*	344	260	161	134	123	129	145	138	146	*+19.1*
Transfers	420	344	*-18.2*	96	99	132	127	106	64	47	56	24	*-77.0*
Total supply	22,576	14,433	*-36.1*	6,411	5,071	4,006	3,534	3,709	3,487	3,703	3,597	3,568	*-3.8*
Statistical difference	+41	+9		-14	+5	+17	-6	+10	+10	-5	+5	+3	
Total demand	22,535	14,424	*-36.0*	6,425	5,066	3,989	3,540	3,699	3,477	3,708	3,592	3,565	*-3.6*
TRANSFORMATION	9,704	6,875	*-29.2*	2,580	2,053	1,880	1,669	1,682	1,653	1,871	1,716	1,651	*-1.9*
Electricity generation	9,107	6,278	*-31.1*	2,430	1,904	1,731	1,520	1,533	1,504	1,721	1,566	1,502	*-2.0*
Heat generation[2]	598	598	-	149	149	149	149	149	149	149	149	149	-
Energy industry use	8,330	4,846	*-41.8*	2,358	1,894	1,497	1,236	1,235	1,150	1,226	1,200	1,185	*-4.0*
Losses	2,646	1,116	*-57.8*	912	737	323	248	337	318	213	272	301	*-10.6*
FINAL CONSUMPTION	1,855	1,587	*-14.5*	576	383	289	387	445	356	399	404	428	*-3.8*
Iron & steel	719	1,056	*+46.8*	231	123	128	254	322	227	254	267	282	*-12.6*
Other industries[3]	-	-		-	-	-	-	-	-	-	-	-	
Non-Energy Use[4]	1,136	531	*-53.2*	344	260	161	134	123	129	145	138	146	*+19.1*

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 2017 heat generation figures currently shown are the 2016 figures carried forward - these will be updated in June 2018.

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 2017 was 1.9 per cent lower than a year ago, with crude oil production decreasing and NGL production increasing. **(Chart 3.1)**

Net imports of primary oils (crude oil, NGLs and process oils) in Q2 2017 increased to 4.0 million tonnes, up 6.2 per cent on 2016. These met about 14 per cent of UK's refinery demand. **(Chart 3.3)**

Indigenous production of petroleum products was stable on last year, up just 0.2 per cent, although within this there was variability in terms of products because of maintenance patterns last year. (**Chart 3.2**)

Exports decreased by 6.9 per cent compared with the second quarter of 2016 and imports decreased by 13.4 per cent. The UK was a net importer of petroleum products in Q2 2017 by 2.1 million tonnes. **(Chart 3.2)**

In Q2 2017 total deliveries of key transport fuels were stable, up just 0.7 per cent compared with Q2 2016. Excluding the bio component, demand for petrol was down 1.3 per cent while demand for road diesel increased by 1.5 per cent. Deliveries of jet fuel increased by 1.0 per cent. (**Chart 3.5)**

Overall stocks of crude oil and petroleum products were down by 4.2 per cent at end of Q2 2017. **(Chart 3.7)**

Relevant tables

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

Indigenous crude oil production was lower by 3.6 per cent in Q2 2017 compared with the same quarter a year ago. Production levels have begun to settle since the boost from new fields coming online through 2015.

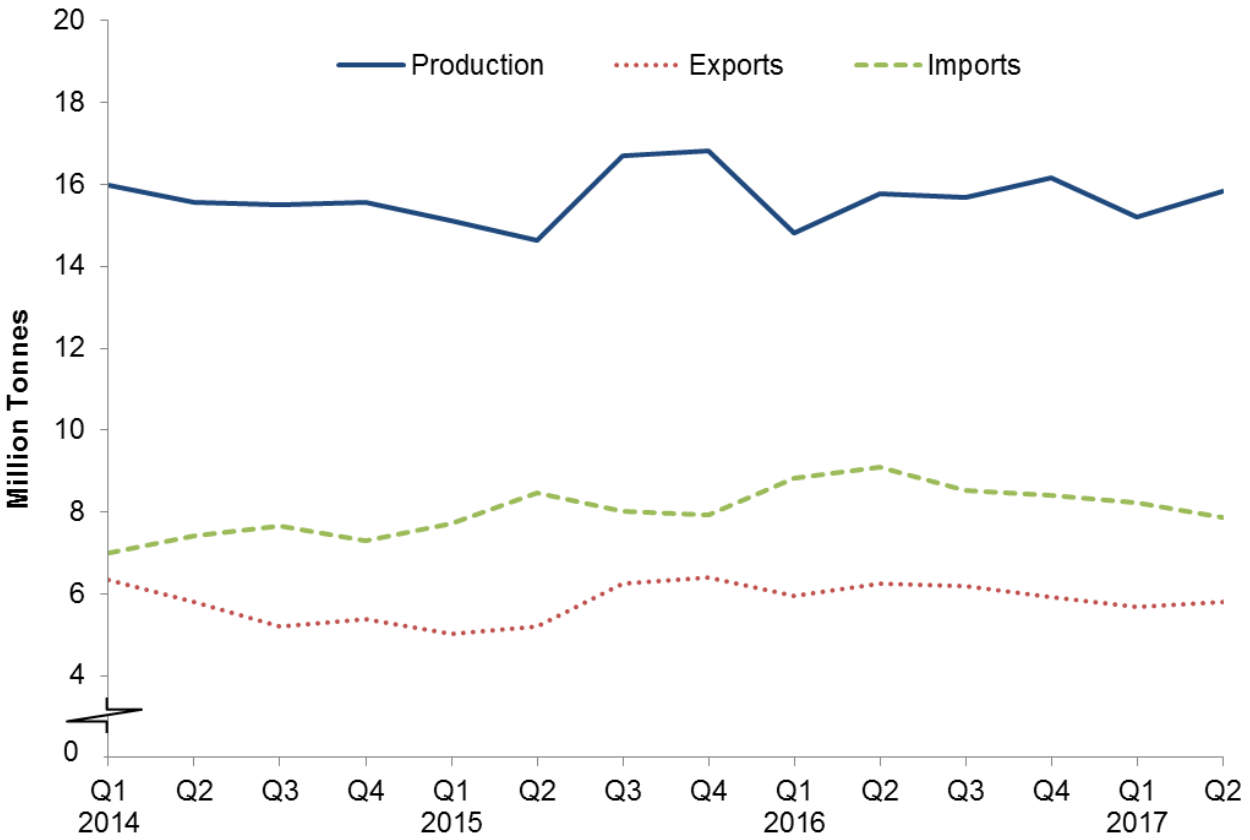
The high proportion of Natural Gas Liquids (NGLs) in the new fields led to a 24 per cent increase in production on the second quarter of 2016. Taken together, indigenous production of crude and NGLs was 1.9 per cent lower.

The key story this quarter is around trade of crude oil; despite the levelling in production, exports of crude and NGLs were up more than a quarter (28 per cent) on last year. Although exports were relatively low in Q2 2016, partially explaining the growth, the Q2 2017 export volume led to a record low for use of indigenous crude at UK refineries. The growth was likely attributable to global economic factors including the OPEC production cuts, which have made it comparatively cheaper for Asian refineries to use UKCS crude oil.

These strong exports resulted in a 19 per cent increase in imports of crude and NGLs to cover UK refinery demand, with feedstock imports also up by one-fifth (and exports down by a quarter).

Overall, net imports of primary oils (crude, NGLs and feedstocks) were 4.1 million tonnes in Q2 2017 compared with 3.8 million tonnes in the same quarter of 2016.

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

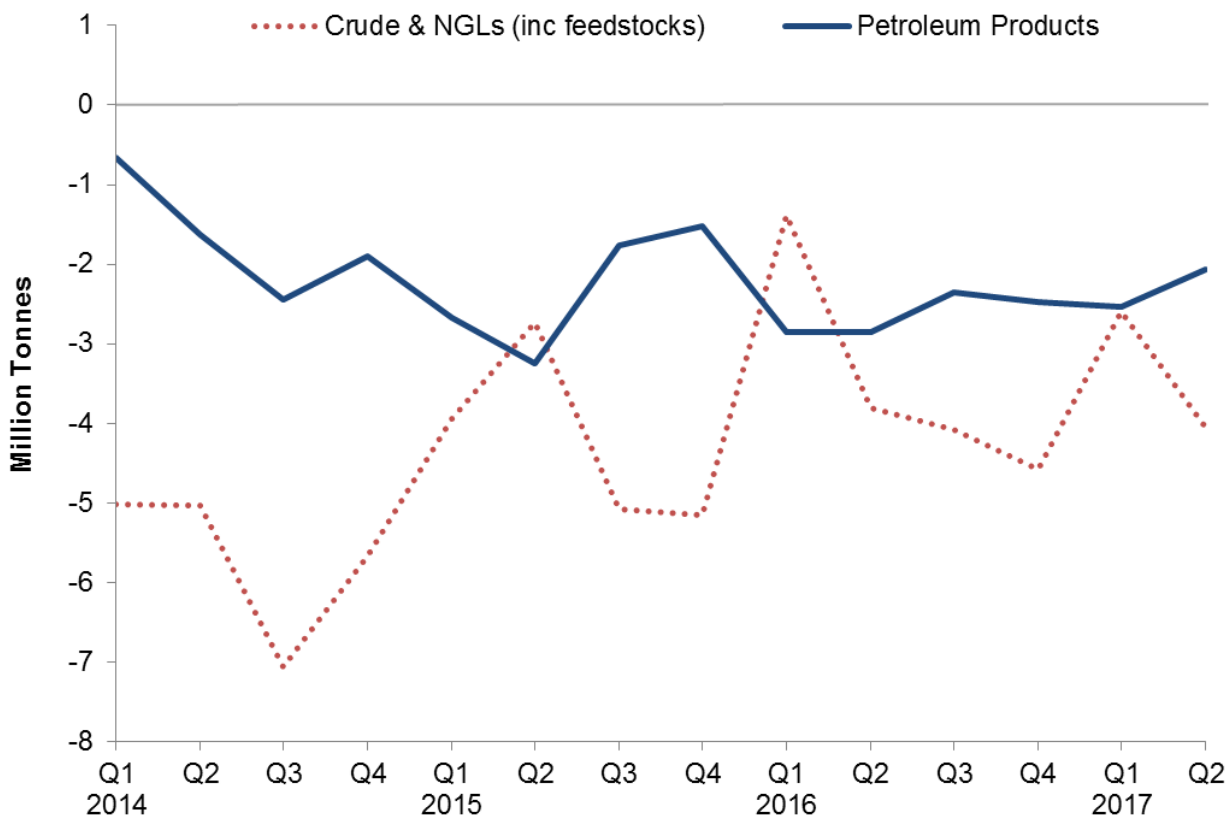


Indigenous production of petroleum products in Q2 2017 was stable (up just 0.2 per cent) compared with the same quarter in 2016.

Imports of petroleum fell by 13 per cent in the second quarter of 2017. This was partially because imports were at a record high in Q2 2016 when we saw high stock levels being built under favourable market conditions. In addition, whereas production and demand remained stable on last year exports fell by 6.9 per cent (particularly of road diesel which was down 0.3 million tonnes), meaning that lower import volumes were needed to meet demand. Exports of kerosene type jet fuel and gas oil were down around 0.25 million tonnes.

The UK was a net importer (2.1 million tonnes) of petroleum products in Q2 2017.

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

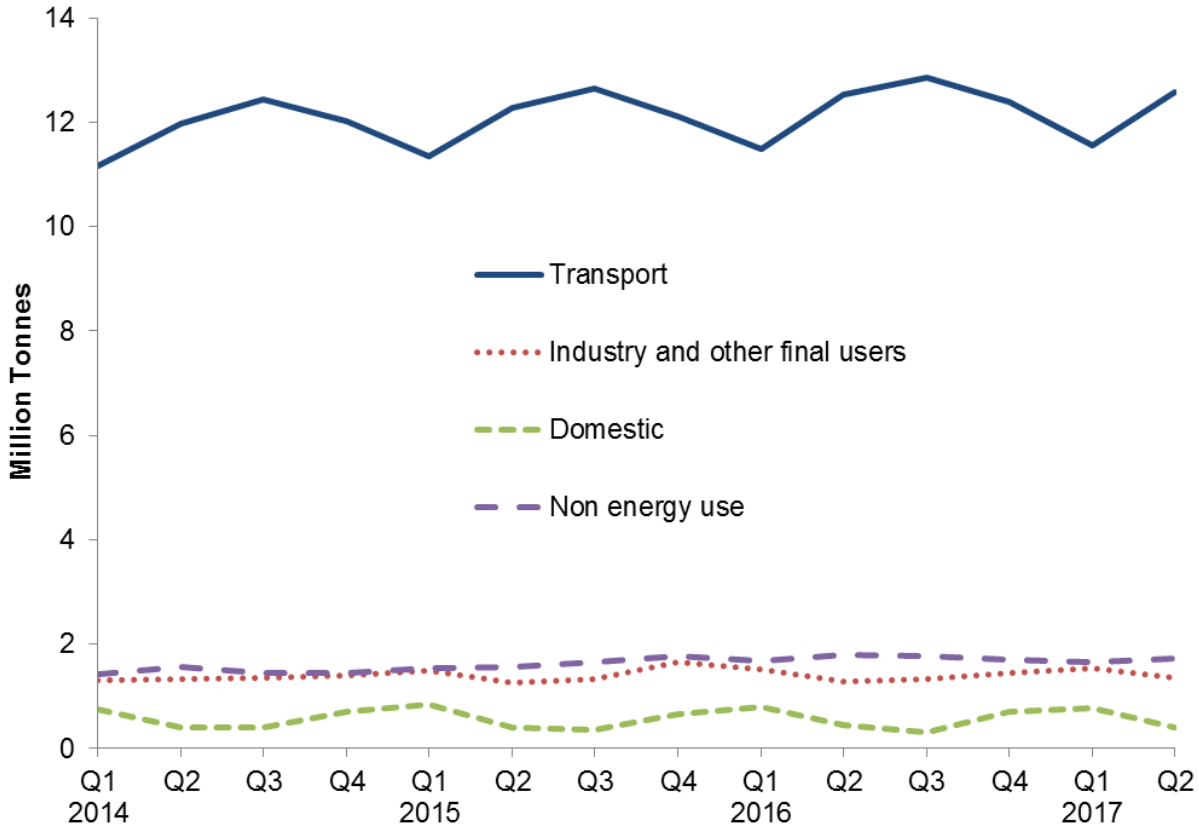


In Q2 2017 net imports of primary oils (crude, NGLs and feedstocks) increased to 4.0 million tonnes compared with 3.8 million tonnes in Q2 2016, an increase of 6.2 per cent.

The UK's overall net import dependence for primary oils was 14 per cent in Q2 2017, the same as this time last year.

In Q2 2017 the UK was a net importer of petroleum products, by 2.1 million tonnes, down from 2.9 million tonnes in the same quarter of 2016.

Chart 3.4 Final consumption of oil (Table 3.4)

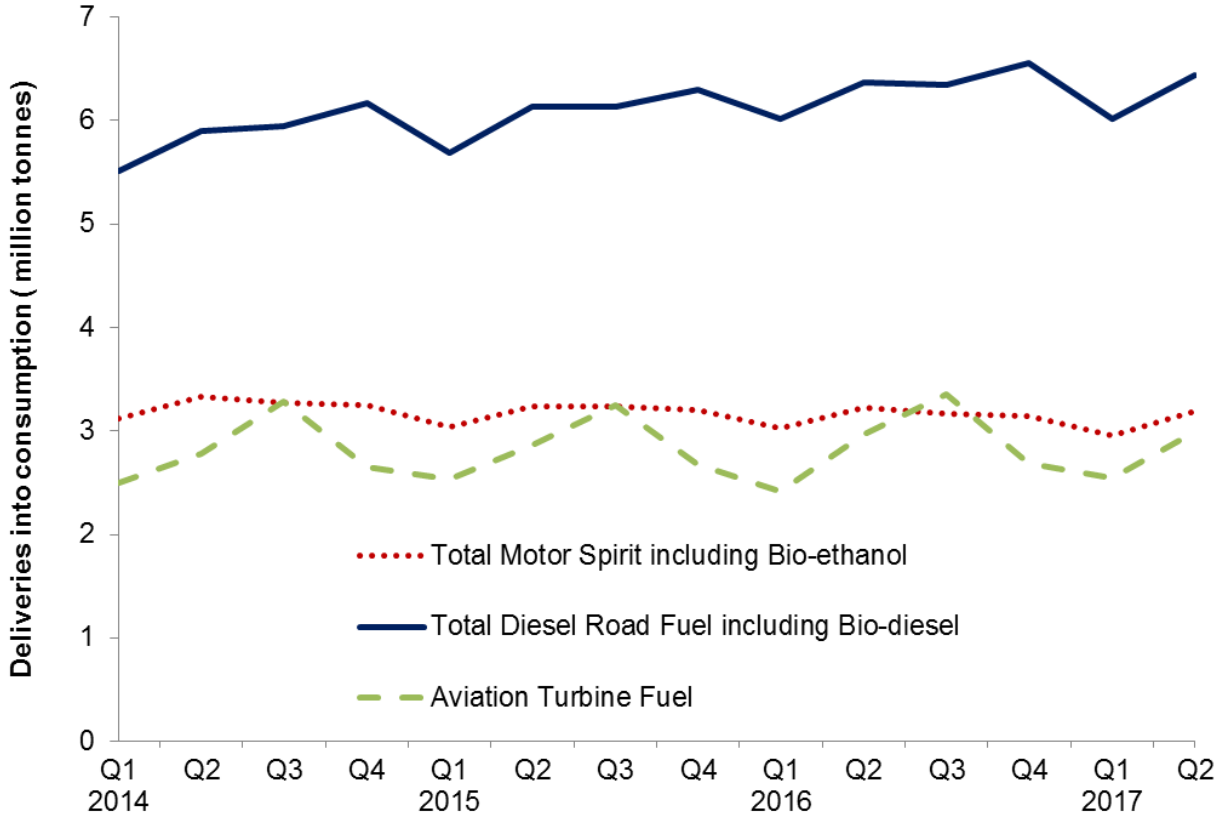


In Q2 2017 final consumption of petroleum products was stable on last year, up just 0.1 per cent.

Transport, which accounts for about three-quarters of UK final consumption, was higher by just 0.4 per cent. Consumption of road diesel was up 1.5 per cent while petrol was down 1.3 per cent. (See Chart 3.5 for more detail).

Demand for products for non-energy use was lower by 3.4 per cent in the latest quarter following a period of strong growth in the petrochemical sector, which is now levelling off.

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

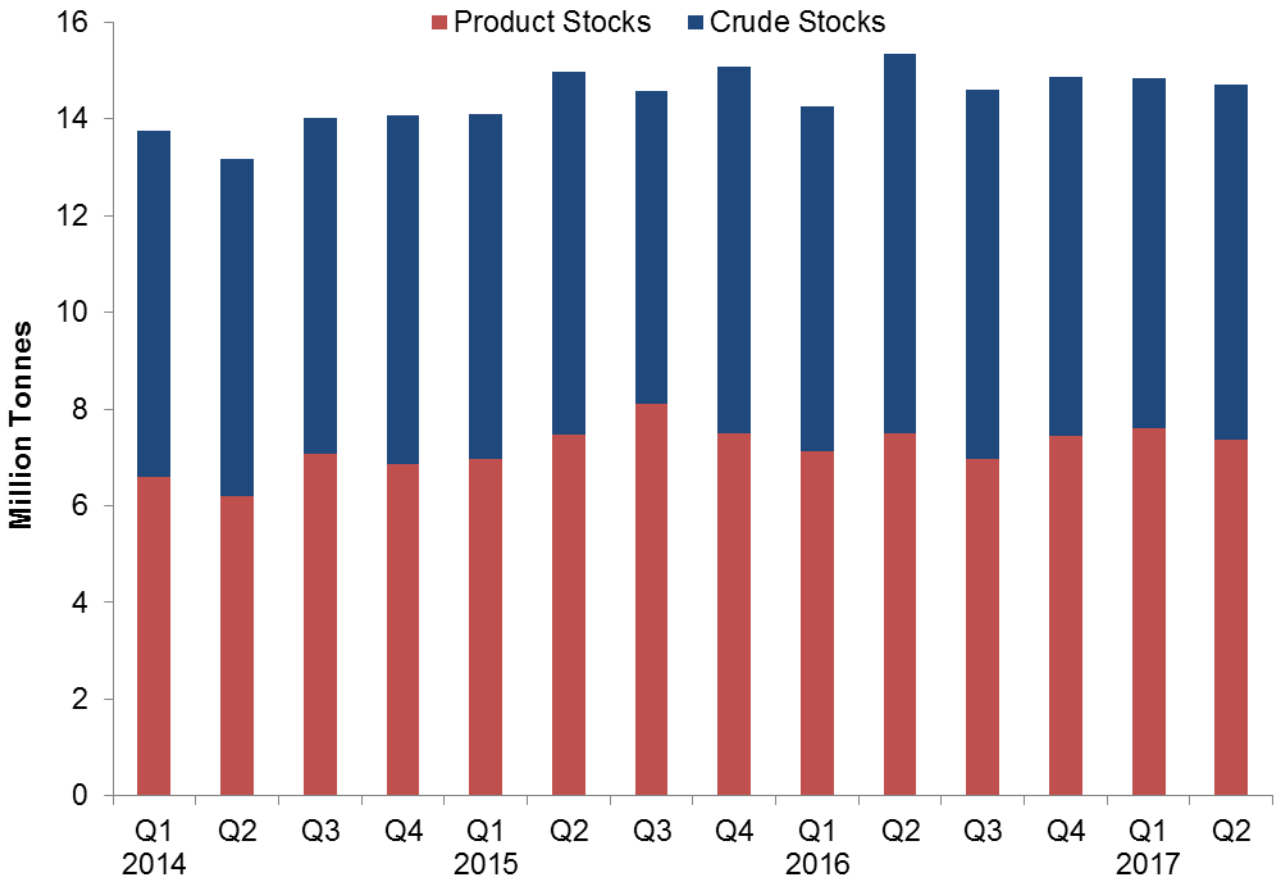


Excluding the bio component, motor spirit (petrol) deliveries were down by 1.3 per cent on the second quarter of 2016. Including biofuel they were down 1.2 per cent on last year.

Diesel (DERV) demand increased by 1.5 per cent compared to Q2 2016. Total DERV consumption, including biodiesel, increased by 1.1 per cent.

Demand for aviation turbine fuel increased by 1.0 per cent compared to Q2 2016. 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 2017, total stocks for all oil were down by 4.2 per cent (0.6 million tonnes) compared to the same point in 2016. Total stocks in Q2 2016 had been at the highest level since Q2 2010.

Stocks of crude were down by 6.6 percent, primarily because of a fall in net volumes held under bilateral agreements (down 0.3 million tonnes) and at refineries (down 0.2 million tonnes).

Product stocks remained fairly stable (down 1.7 per cent), with increases in stocks of gas/diesel oil and kerosene not offsetting decreases in net bilaterals or draws on UK stocks of petrol, fuel oil and other products.

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 2017, 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

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*per cent change*[8]
SUPPLY													
Indigenous production[2]	45,698	47,872	*+4.8r*	12,141	10,515	12,206	12,716	12,210	11,377	11,570	12,132r	11,977	*-1.9*
Crude oil	42,826	44,306	*+3.5r*	11,364	9,895	11,404	11,816	11,347	10,560	10,583	11,105r	10,933	*-3.6*
NGLs[3]	2,462	3,139	*+27.5r*	689	508	688	784	757	717	881	911r	940	*+24.2*
Feedstocks	410	428	*+4.2*	88	112	114	116	105	100	106	116	103	*-1.7*
Imports[4]	50,604	48,708	*-3.7r*	12,035	12,979	13,553	11,480	11,785	12,305	13,138	12,483r	13,995	*+18.8*
Crude oil & NGLs	45,286	42,415	*-6.3r*	10,931	11,396	12,006	9,842	10,171	10,681	11,721	11,034r	12,056	*+18.5*
Feedstocks	5,318	6,293	*+18.3r*	1,104	1,583	1,547	1,638	1,614	1,624	1,417	1,449	1,939	*+20.2*
Exports[4]	33,709	34,856	*+3.4r*	9,309	7,908	8,396	10,090	7,976	8,225	8,565	9,888r	9,949	*+24.7*
Crude Oil & NGLs	31,820	33,247	*+4.5r*	8,846	7,279	8,083	9,460	7,544	7,931	8,312	9,534r	9,623	*+27.6*
Feedstocks	1,890	1,609	*-14.8r*	463	630	313	630	433	294	253	353r	325	*-24.8*
Stock change[5]	-98	-125	*+27.2*	-384	970	-626	355	-492	95	-83	414r	-211	*(-)*
Transfers[6]	-1,152	-1,282	*+11.3r*	-382	-225	-445	-225	-368	-209	-481	-560r	-540	*+46.8*
Total supply	61,343	60,317	*-1.7*	14,101	16,331	16,292	14,236	15,159	15,343	15,579	14,581r	15,273	*+0.8*
Statistical difference[7]	-48	-45		-2	-16	-16	+14	-81	+4	+17	-6.0r	-6	
Total demand	61,391	60,362	*-1.7*	14,103	16,347	16,308	14,221	15,240	15,339	15,562	14,587	15,279	*+0.3*
TRANSFORMATION	61,391	60,362	*-1.7*	14,103	16,347	16,308	14,221	15,240	15,339	15,562	14,587	15,279	*+0.3*
Petroleum refineries	61,391	60,362	*-1.7*	14,103	16,347	16,308	14,221	15,240	15,339	15,562	14,587	15,279	*+0.3*

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

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*per cent change* [1]
SUPPLY													
Indigenous production[2]	63,282	62,455	*-1.3*	14,628	16,713	16,835	14,819	15,790	15,689	16,156	15,209r	15,826	*0.2*
Imports[3]	32,133	34,854	*8.5*	8,457	8,024	7,940	8,814	9,098	8,539	8,403	8,230r	7,876	*-13.4*
Exports[3]	22,926	24,312	*6.0*	5,212	6,260	6,416	5,964	6,245	6,179	5,923	5,688r	5,816	*-6.9*
Marine bunkers	2,509	2,659	*6.0*	698	687	573	538	727	763	632	510r	610	*-16.0*
Stock change[4]	-743	89		-266	-267	-68	148	-278	460	-241	-301r	131	
Transfers[5]	-1,190	-1,268		-249	-227	-184	-474	-300	-281	-212	-189r	-75	
Total supply	68,046	69,158	*1.6*	16,660	17,296	17,534	16,805	17,337	17,465	17,552	16,750r	17,332	*0.0*
Statistical difference[6]	-51	30		-25	-62	-30	32	-2	-7	8	-40r	-20	
Total demand	68,097	69,128	*1.5*	16,685	17,358	17,564	16,773	17,339	17,472	17,544	16,790r	17,352	*0.1*
TRANSFORMATION	1,125	1,094	*-2.7*	256	293	314	302	254	250	288	272	239	*-5.9*
Electricity generation	560	501	*-10.5*	128	142	158	146	110	115	130	118	100	*-9.6*
Heat generation	59	58	*-0.7*	15	15	15	15	14	14	15	15	14	*0.0*
Other Transformation	506	535	*5.7*	113	136	142	142	130	121	143	139	125	*-4.0*
Energy industry use	4,043	3,946	*-2.4*	924	1,089	1,047	988	1,019	949	990	991	1,026	*0.7*
Petroleum Refineries	3,344	3,284	*-1.8*	750	915	872	823	854	783	824	825	861	*0.8*
Blast Furnaces	0	0		0	0	0	0	0	0	0	0	0	
Others	699	662	*-5.3*	175	175	175	166	166	166	166	166	166	*0.0*
FINAL CONSUMPTION	62,929	64,088	*1.8*	15,505	15,976	16,203	15,482	16,066	16,273	16,266	15,528r	16,087	*0.1*
Iron & steel	6	4	*-29.9*	1	2	2	3	1	0	0	3r	0	*-29.8*
Other industries	3,939	3,722	*-5.5*	821	858	1,208	1,095	821	842	964	1,111r	902	*9.9*
Transport	48,374	49,292	*1.9*	12,265	12,638	12,115	11,495	12,531	12,867	12,400	11,551r	12,583	*0.4*
Domestic	2,273	2,275	*0.1*	414	363	652	799	447	313	716	782r	413	*-7.7*
Other final users	1,813	1,840	*1.5*	449	467	454	410	473	485	473	422r	456	*-3.6*
Non energy use	6,525	6,954	*6.6*	1,556	1,648	1,773	1,681	1,794	1,766	1,714	1,659r	1,732	*-3.4*

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

	2016 2nd quarter									2017 2nd quarter p								
	Total Petroleum Products	Motor spirit	DERV [9]	Gas oil[1]	Aviation turbine fuel	Fuel oils	Petroleum gases[2]	Burning oil	Other products[3]	Total Petroleum Products	Motor spirit	DERV [9]	Gas oil[1]	Aviation turbine fuel	Fuel oils	Petroleum gases[2]	Burning oil	Other products[3]
SUPPLY																		
Indigenous Production[4]	15,790r	4,359	3,247	1,782	1,185	1,144	1,860r	437	1,777	15,826	4,313	3,424	1,733	1,489	904	1,825	371	1,768
Imports[5]	9,098	1,112	3,796	695	2,049	396	168	164	719	7,876	923	3,378	436	1,806	260	229	55	790
Exports[5]	6,245	2,744	567	765	288	885	364	14	617	5,816	2,778	317	545	290	709	380	10	787
Marine bunkers	727	-	-	494	-	233	0	-	-	610	-	-	436	-	175	-	-	-
Stock change[6]	-278	-73	-186	-37	+30	-23	-16	+28	-0	+131	+98	-82	-21	+140	+12	-27	+5	+7
Transfers[7]	-300	+427	-107	+61	-8	-181	-	-0	-492	-75	+476	-110	+102	-140	-119	-12	+130	-402
Total supply	17,337r	3,080	6,182	1,243	2,968	217	1,647r	614	1,386	17,332	3,031	6,292	1,269	3,005	173	1,634	551	1,377
Statistical difference[8]	-2	+8	-	+16	-	-3	-12	+1	-12	-20	-0	-	-9	+8	+10	-40	-0	+12
Total demand	17,339r	3,072	6,173	1,226	2,968	220	1,660r	613	1,406	17,352	3,031	6,267	1,279	2,998	162	1,674	551	1,391
TRANSFORMATION	254	-	-	20	-	40	170	-	25	239	-	-	21	-	28	165	-	25
Electricity generation	110	-	-	18	-	29	63	-	-	100	-	-	20	-	17	63	-	-
Heat generation	14	-	-	1	-	11	2	-	-	14	-	-	1	-	11	2	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	22	-	-	-	-	-	0	-	22	18	-	-	-	-	-	0	-	18
Other transformation [9]	108	-	-	-	-	-	105	-	4	106	-	-	-	-	-	100	-	6
Energy industry use	1,019	-	-	150	-	75	492	-	302	1,026	-	-	150	-	57	521	-	299
FINAL CONSUMPTION	**16,066**	**3,072**	**6,173**	**1,057**	**2,968**	**105**	**998**	**613**	**1,079**	**16,087**	**3,031**	**6,267**	**1,108**	**2,998**	**78**	**987**	**551**	**1,067**
Iron & steel	1	-	-	-	-	1	0	-	-	0	-	-	-	-	0	-	-	-
Other industries	821r	-	-	394	-	67	99r	250	11	902	-	-	478	-	42	89	220	72
Transport	12,531	3,072	6,173	296	2,968	0	17	-	4	12,583	3,031	6,267	268	2,998	0	16	-	4
Domestic	447	-	-	36	-	-	47	364	-	413	-	-	40	-	-	42	330	-
Other final users	473r	-	-	327	-	38	108r	-	-	456	-	-	318	-	35	103	-	-
Non energy use	1,794	-	-	4	-	-	725	-	1,064	1,732	-	-	4	-	-	736	-	992

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 product
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 Statistic 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

3 OIL AND OIL PRODUCTS

Table 3.5 Biofuel sales and sales through supermarkets[1]

Thousand tonnes

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*per cent change* [2]
MOTOR SPIRIT													
of which, Hydrocarbon [3]	12,082	11,951	*-1.1%*	3,076	3,072	3,040	2,877	3,072	3,014	2,988	2,815r	3,031	*-1.3%*
of which, Bio-ethanol [4]	631	603	*-4.5%*	161	163	157	146	154	150	152	146r	157	*1.9%*
Total Motor Spirit including Bio-ethanol	**12,713**	**12,554**	*-1.3%*	**3,237**	**3,235**	**3,197**	**3,023**	**3,226**	**3,164**	**3,140**	**2,961r**	**3,188**	*-1.2%*
of which, sold through Supermarkets [5]	5,794	5,885	*1.6%*	1,467	1,435	1,473	1,480	1,479	1,453	1,473	1,388	1,445	*-2.3%*
DIESEL ROAD FUEL													
of which, Hydrocarbon [3]	23,656	24,648	*4.2%*	5,998	5,976	6,106	5,889	6,173	6,167	6,419	5,903r	6,267	*1.5%*
of which, Bio-diesel [4]	595	630	*5.8%*	135	158	191	127	195	174	133	118r	169	*-13.1%*
Total Diesel Road Fuel including Bio-diesel	**24,251**	**25,279**	*4.2%*	**6,133**	**6,134**	**6,298**	**6,016**	**6,368**	**6,342**	**6,552**	**6,022r**	**6,436**	*1.1%*
of which, sold through Supermarkets 5	6,644	7,267	*9.4%*	1,648	1,706	1,685	1,793	1,802	1,814	1,858	1,761	1,811	*0.5%*

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.

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
2012		3,829	1,194	473	195	5,690	605	1,427	1,931	491	841	2,441	7,735	2,636	10,790	13,425
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
2015	2nd quarter	3,590	1,565	474	1,862	7,491	1,150	1,265	1,706	348	697	2,315	7,481	4,177	10,795	14,972
	3rd quarter	3,098	1,211	350	1,793	6,451	1,087	1,436	1,825	314	750	2,703	8,116	4,496	10,071	14,567
	4th quarter	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	1st quarter	3,081	1,370	478	2,193	7,122	1,085	1,456	1,767	247	763	1,812	7,130	4,005	10,247	14,253
	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	1,968	230r	678	1,949	7,612r	4,178	10,658r	14,835r
	2nd quarter p	3,003	1,550	653	2,129	7,334	1,115	1,430	2,042	207	698	1,876	7,368	4,005	10,697	14,702
Per cent change [11]		*-6.2*	*-2.3*	*+2.8*	*-12.3*	*-6.6*	*-3.7*	*+2.3*	*+2.6*	*-23.4*	*-10.5*	*-1.2*	*-1.7*	*-7.4*	*-2.9*	*-4.2*

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. Whilst imports were down by 17.3 per cent, exports increased 49 per cent to 41.8 TWh – the highest quarterly figure since 2011 **(Chart 4.4)**. The quarter also saw the continued contraction of Liquefied Natural Gas (LNG) imports on last year's volumes, down 27 per cent **(Chart 4.5)**.

UK production of natural gas in Q2 2017 was 6.5 per cent higher in comparison to the same quarter last year, in line with recent upwards trends, following the start-up of the Laggan gas field in mid-2016 and the Cygnus gas field in December 2016. Within this, production of associated gas was 10.9 per cent higher whilst dry gas production was 2.0 per cent lower **(Charts 4.1 & 4.2)**.

Demand for natural gas in Q2 2017 fell by 7.6 per cent compared to last year to 174 TWh, the first substantial decrease since Q4 2015 **(Chart 4.6)**.

Demand for gas for electricity generation fell by 5.3 per cent in comparison to the same quarter last year, contrasting with the recent sustained period of quarter-on-quarter growth as gas has displaced coal in electricity generation (see Chapter 5 for more details). **(Chart 4.6)**.

Similarly final consumption was down 12.2 per cent, with domestic use and other final users down 15.7 and 12.0 per cent respectively, driven by warmer weather in Q2 2017 when compared with the same period last year **(Chart 4.6)**.

Relevant table

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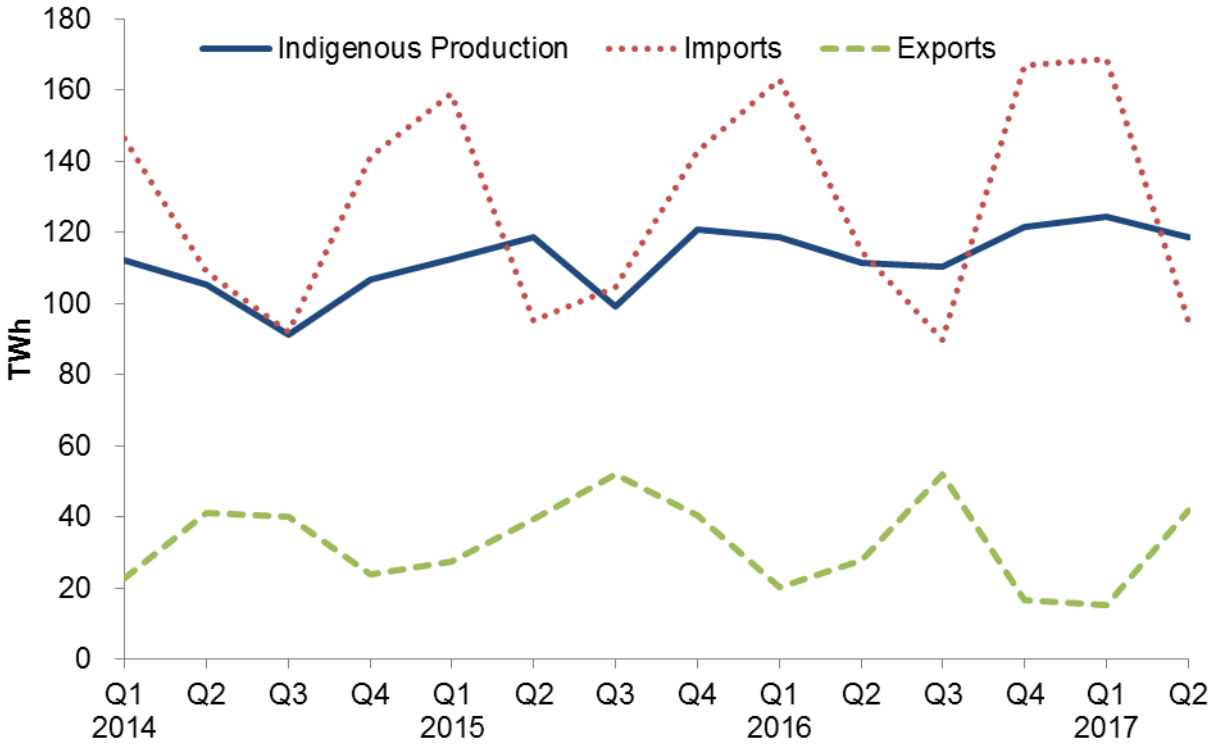
Chart 4.1 Production and imports and exports of natural gas (Table 4.1)



Gross production of natural gas was up by 6.5 per cent in Q2 2017, in line with recent upward trends, but less than 40 per cent of the average quarterly production in 2000 when gas production peaked. The recent increases are due in part to the start-up of two large gas fields, the Laggan gas field in mid-2016 and the Cygnus gas field in December 2016, alongside continued strong production across much of the UK's Continental Shelf.

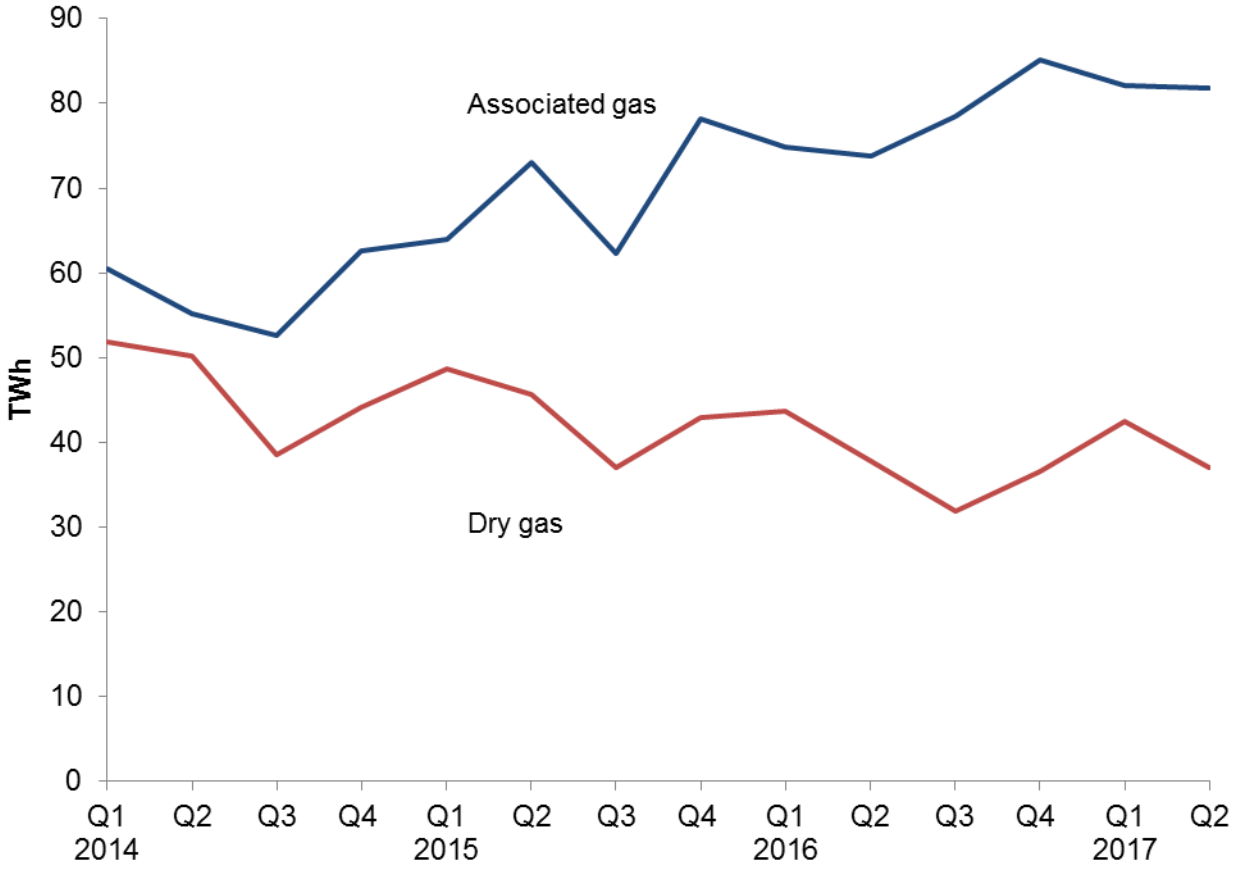
The UK imports natural gas primarily from Norway (predominantly via the Langeled, Tampen Link and Gjoa/Vega pipelines). Smaller volumes are imported from Belgium (via the UK-Belgium Interconnector) and the Netherlands (via the Balgzand to Bacton line). See Map 4.1 for an illustration of trade flows.

Imports in Q2 2017 were down 17 per cent on the same quarter in 2016, and were driven by a 27 per cent decrease in LNG imports.

The UK exports natural gas primarily to Belgium (60 per cent of total exports in 2016) and Ireland (20 per cent of total exports in 2016). Exports increased in Q2 2017 by 49 per cent, to reach the highest quarter 2 figure since 2011.

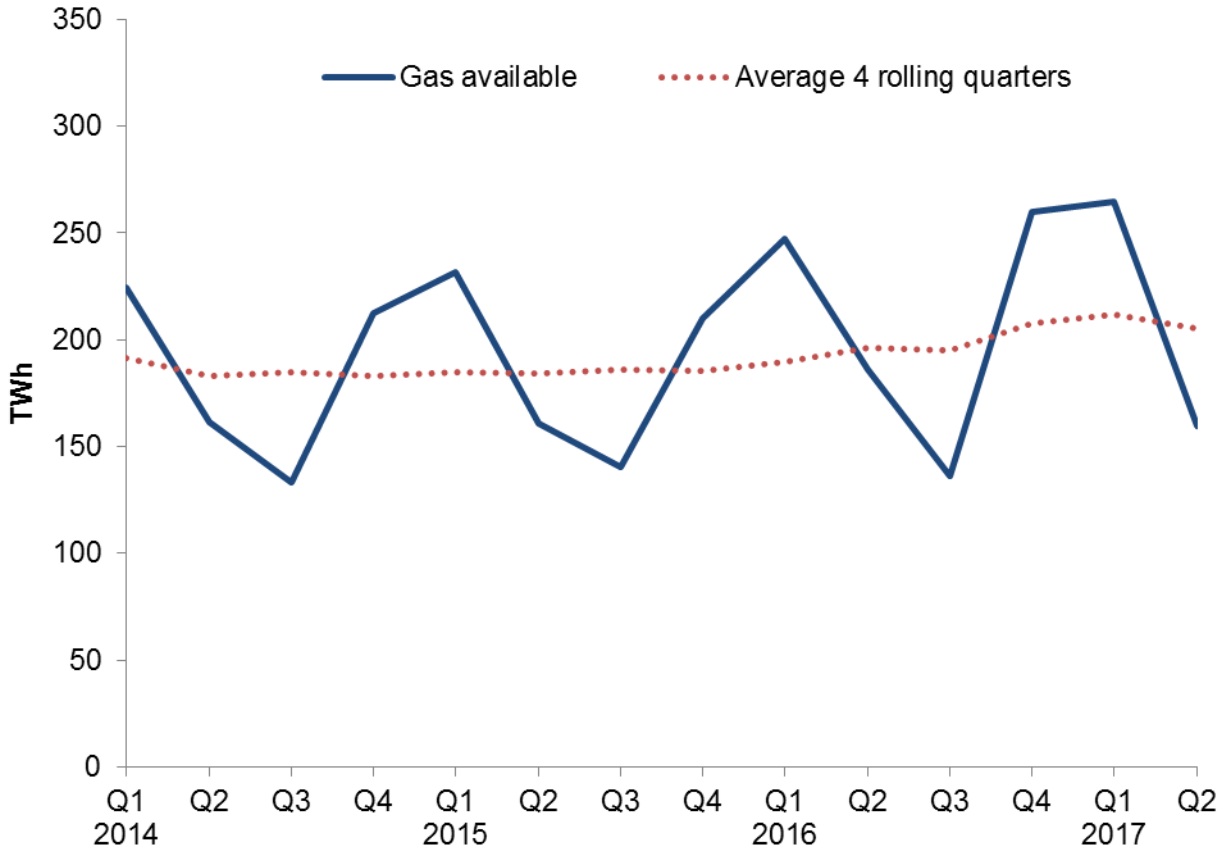
The increase in exports was driven by gas exported to Belgium more than doubling in Q2 2017 than in comparison to Q2 2016 (most notably in April and June 2017), even with the annual 2 week maintenance shutdown on the BBL interconnector in June 2017. These figures have been affected by the suspension of gas injections into the Rough storage facility (which accounts for around 70 per cent of the UK's gas storage capacity).

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 2017 was up 11 per cent compared to the same quarter last year, from 74 to 82 TWh. This increase partly reflects the steady production of a number of relatively new condensate fields in the North Sea. In comparison dry gas production (natural gas composed mainly of methane) fell by 2.0 per cent in Q2 2017 on last year.

Chart 4.3 Gas availability (Table 4.2)

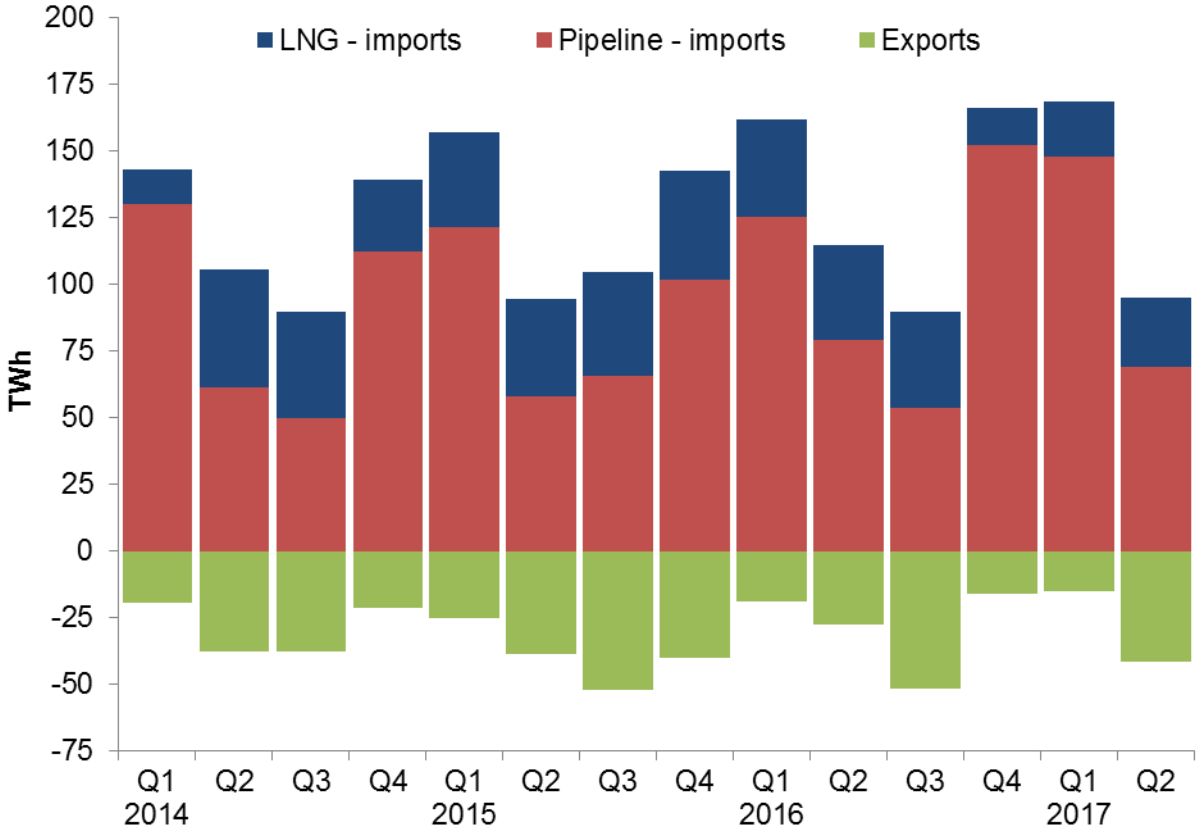


Gas available at terminals is roughly equal to gross gas production minus producers own use, plus net imports.

Gas availability is seasonal, mirroring gas demand, and peaks during Q1 and Q4 each year. Gas availability in Q2 2017 decreased by 14 per cent compared to Q2 2016 to 159 TWh, and was driven by increases in net imports and UK production.

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 2017 were down by 39 per cent in comparison to the same quarter in 2016. This increase has been driven by the higher export figure, a result of a lower demand and increased production in Q2 2017.

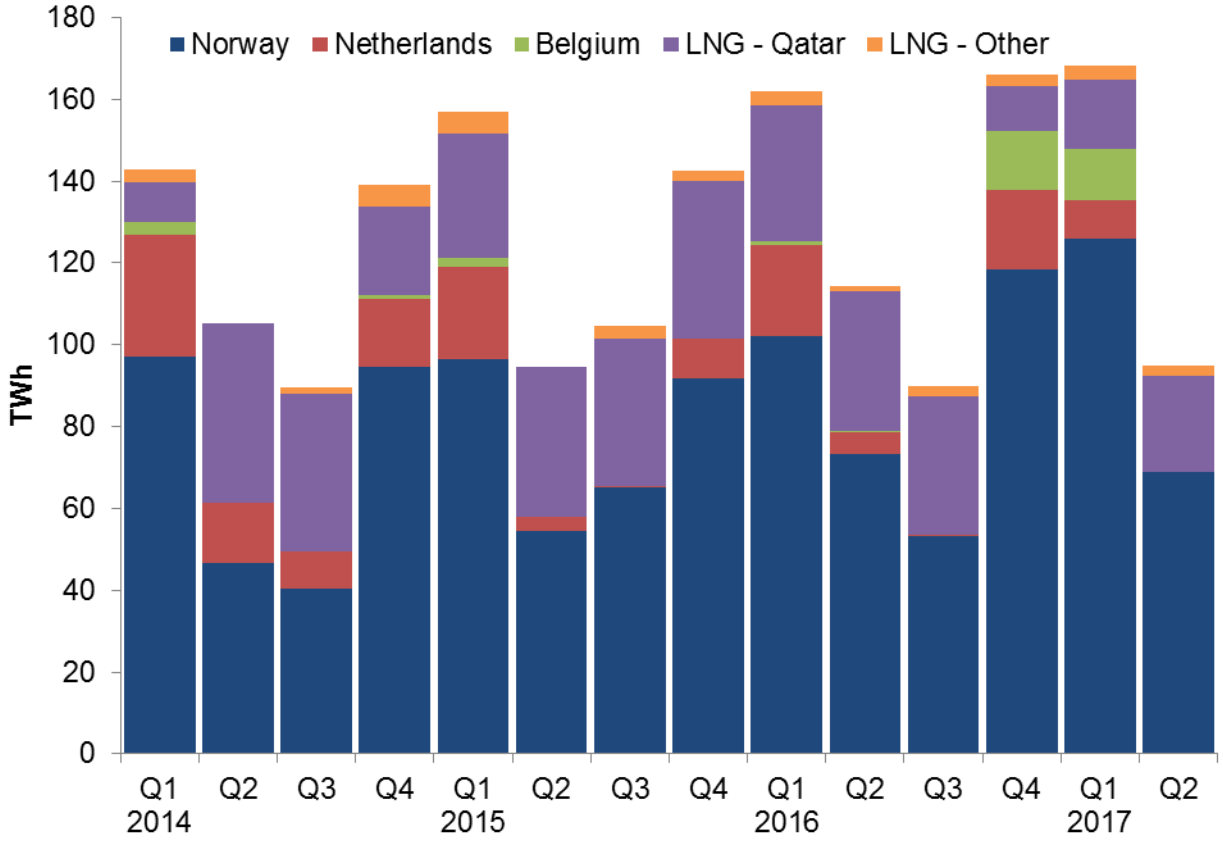
As noted in Chart 4.1, the UK imports natural gas primarily from Norway (predominantly via the Langeled, Tampen Link and Gjoa/Vega pipelines). Smaller volumes are imported from Belgium (via the UK-Belgium Interconnector) and the Netherlands (via the Balgzand to Bacton line).

Pipeline imports were down by 13 per cent, with imports from Norway down 6.1 per cent and imports from the Netherlands decreasing from 5.5 TWh to 0.1 TWh, driving an overall 17 per cent decrease in imports. Similarly imports of LNG have decreased by 27 per cent, meaning LNG only accounted for 27 per cent of total imports compared to 31 per cent in the same quarter last year.

Exports increased by just under 50 per cent over the same timeframe, driven by exports to Belgium more than doubling in Q2 2017 in comparison to Q2 2016. These figures have been affected by closure of the Rough storage facility (which accounted for around 70 per cent of the UK's gas storage capacity) and the lower gas demand experienced in the quarter.

Liquefied Natural Gas 'reloads' started in late 2014 and have continued since with the UK exporting to countries including Brazil, Pakistan and the United Arab Emirates. Unusually there were no LNG ‘reloads’ in this quarter.

Chart 4.5 Imports by origin (Table 4.4)

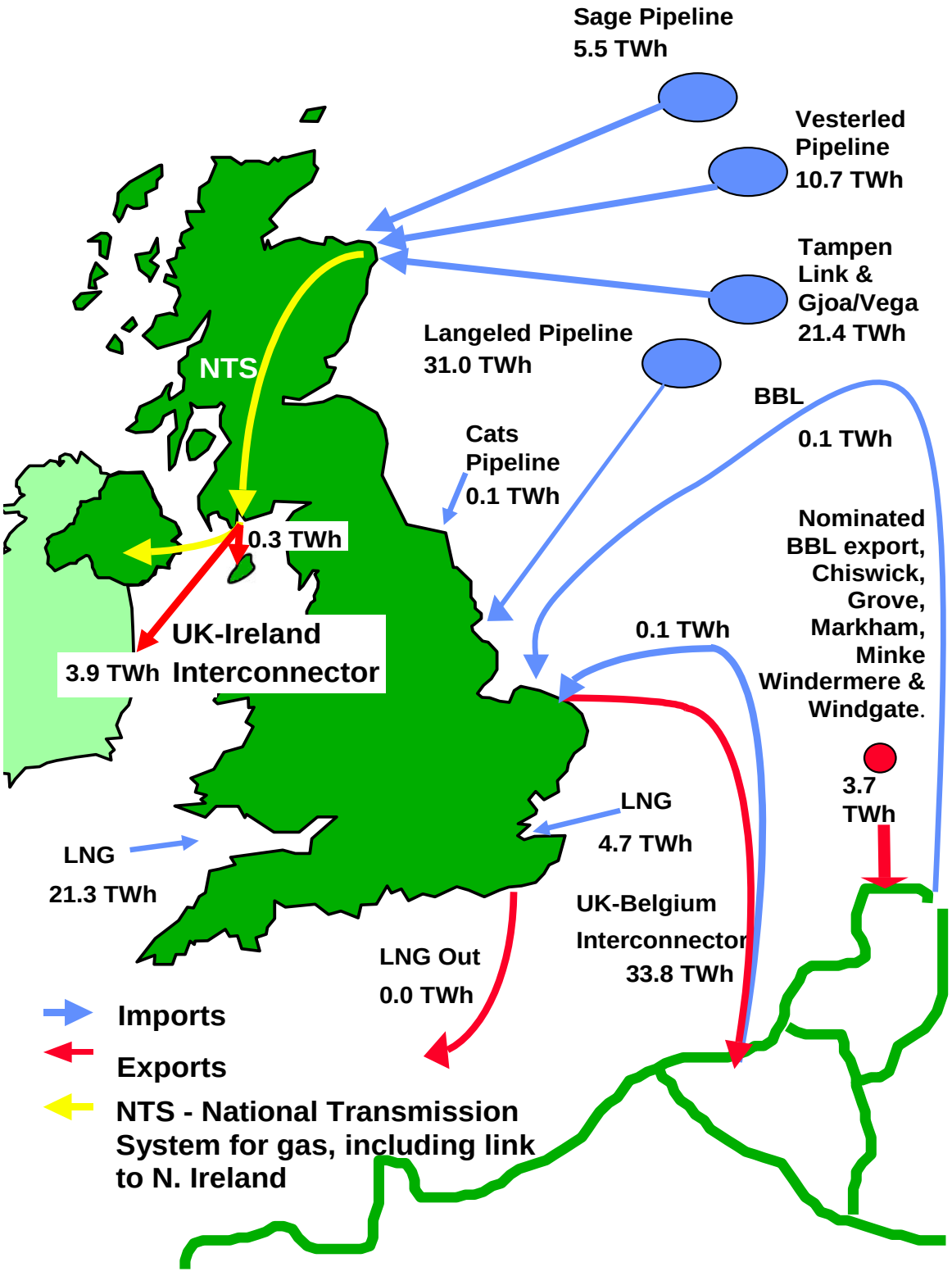


The main development in Q2 2017 is the overall reduction in the amount of imports into the UK, both pipeline and LNG imports. Pipeline imports were down 13 per cent on Q2 2016. Norway imports remain the principal source of UK gas imports (at over three-quarters of total imports in Q2 2017 compared to half in 2010) and has seen a 6.1 per cent decrease. Imports from the Netherlands have notably decreased in comparison to the same quarter last year, down 98 per cent from 5.4 TWh to 0.09 TWh.

Similarly in Q2 2017 LNG imports decreased by 27 per cent, with LNG's share of total imports decreasing to 27 per cent in 2017 compared to 31 per cent in Q2 2016. The majority of LNG imports are sourced from Qatar (around 90 per cent of total LNG imports in Q2 2017), and these volumes fell by nearly one-third in comparison to the same period last year, to 23.6 TWh. The fall in LNG was largely driven by a notably low import volume in May 2017, which coincided with high demand from the Asian market for Qatar gas along with other European countries, coupled with the general contraction of demand in the UK during the quarter.

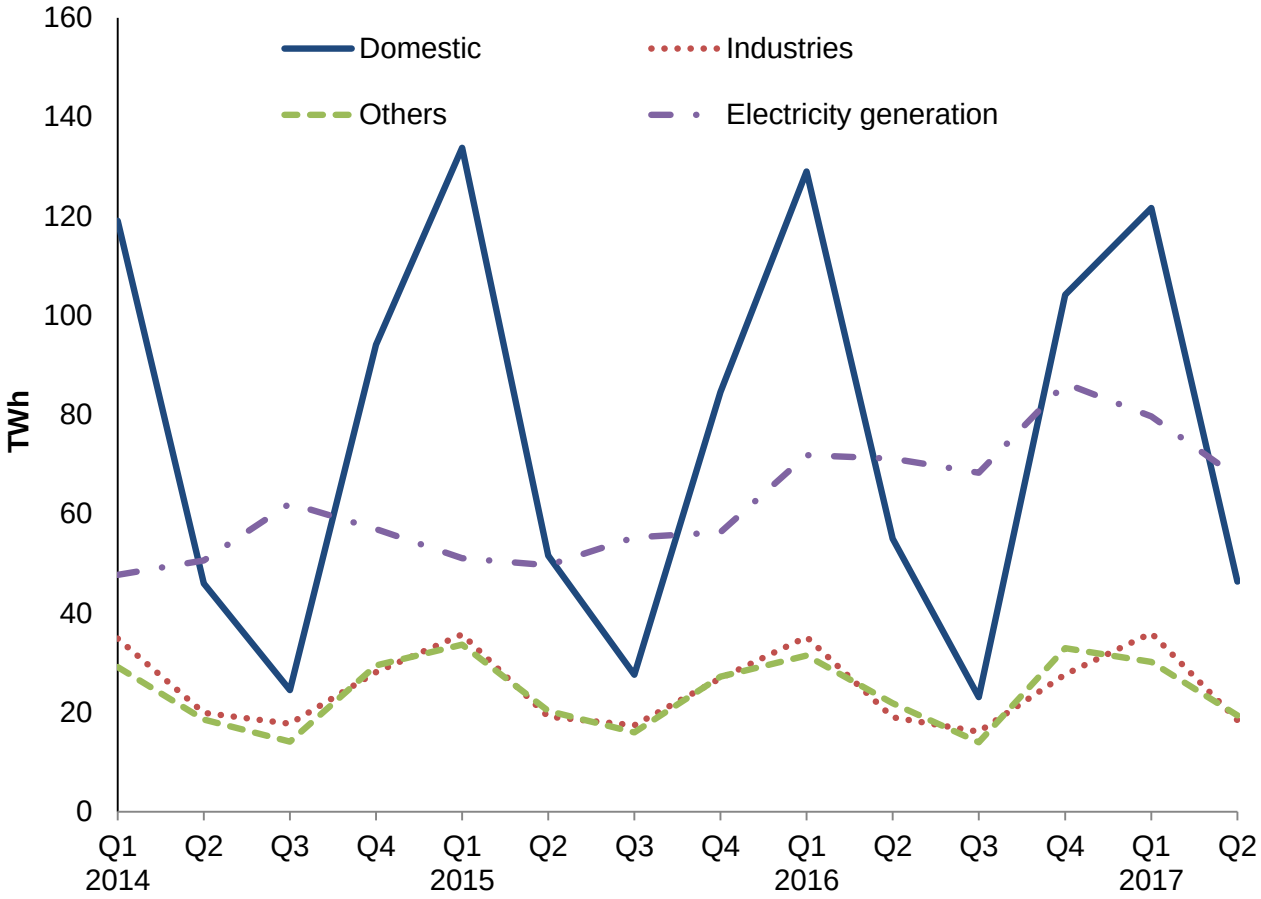
A complete country breakdown for physical pipeline and LNG imports is provided in Energy Trends Table 4.4 - *Supplementary* information *on the origin of UK gas imports*.

Map 4.1: UK imports and exports of gas Q2 2017*



*Please note that imports and exports in this map uses nominated flows through the UK-Belgium Interconnector and BBL pipeline as in Table 4.1. The figures here will differ from those in ET Table 4.3 which uses actual physical flows through the Interconnector.

Chart 4.6 UK demand for natural gas (Table 4.1)



UK demand for natural gas in Q2 2017 is down 7.6 per cent in comparison to Q2 2016 (to 174 TWh), the first substantial reduction since Q4 2015.

Demand for gas for electricity generation fell by 5.3 per cent in comparison to the same quarter last year, contrasting with the recent sustained period of quarter-on-quarter growth as gas displaced coal in electricity generation (see Chapter 5 for more details).

Similarly final consumption was down 12 per cent, with domestic use and other final users down 16 and 12 per cent respectively, driven by warmer weather in Q2 2017 when compared with the same period last year.

4 GAS

Table 4.1. Natural gas supply and consumption

GWh

	2015	2016	per cent change	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	per cent change [1]
SUPPLY													
Indigenous production	451,437	462,307	*+2.4*	118,539	99,296	121,031	118,637	111,542	110,387	121,740	124,643r	118,818	*+6.5*
Imports	501,563	534,740	*+6.6*	95,206	104,648	142,788	162,960	114,908	89,950	166,923	168,807	94,995	*-17.3*
of which LNG	*152,406*	*122,310*	*-19.7*	*36,581*	*39,207*	*41,001*	*36,505*	*35,591*	*36,351*	*13,863*	*20,424*	*26,008*	*-26.9*
Exports	159,517	116,862	*-26.7*	39,356	52,184	40,459	20,163	27,979	51,985	*16,735*	15,417r	41,758	*+49.2*
Stock change [2]	3,515	16,242		-11,042	-15,919	-4,024	31,688	-9,551	-6,797	901	13,185	1,697	*(-)*
Transfers [3]	559	1,575		135	182	190	238	345	457	535	562r	631	
Total supply	797,558	898,002	*+12.6*	163,481	136,023	219,526	293,361	189,265	142,013	273,363	291,780r	174,383	*-7.9*
Statistical difference	779	1,476		471	-135	443	626	859	24	-34	-461r	363	
Total demand	796,779	896,527	*+12.5*	163,010	136,158	219,083	292,735	188,406	141,988	273,397	292,241r	174,019	*-7.6*
TRANSFORMATION	237,682	323,763	*+36.2*	55,292	60,220	62,975	79,870	77,013	73,250	93,629	87,706r	73,233	*-4.9*
Electricity generation	212,289	297,643	*+40.2*	49,655	55,277	56,289	71,854	71,180	68,295	86,314	79,690r	67,400	*-5.3*
Heat generation [4]	25,393	26,120	*+2.9*	5,637	4,942	6,687	8,016	5,833	4,955	7,315	8,016	5,833	-
Energy industry use	58,645	57,773	*-1.5*	15,512	13,115	15,326	16,014	14,096	13,913	13,749	15,594r	15,423	*+9.4*
Losses	6,469	5,396	*-16.6*	1,115	1,833	2,082	1,154	1,393	1,636	1,212	1,085r	1,141	*-18.1*
FINAL CONSUMPTION	493,983	509,596	*+3.2*	91,090	60,990	138,699	195,697	95,903	53,189	164,806	187,856r	84,222	*-12.2*
Iron & steel	5,374	4,155	*-22.7*	1,476	1,253	1,118	1,161	990	973	1,032	1,212	1,024	*+3.5*
Other industries	93,825	93,842	-	17,680	16,140	25,793	34,033	18,017	15,166	26,625	34,797r	17,417	*-3.3*
Domestic	297,582	311,375	*+4.6*	51,606	27,617	84,549	129,040	55,039	23,098	104,197	121,675r	46,399	*-15.7*
Other final users	91,935	95,115	*+3.5*	19,012	14,664	25,923	30,186	20,580	12,674	31,676	28,895r	18,104	*-12.0*
Non energy use [4]	5,267	5,109	*-3.0*	1,317	1,317	1,317	1,277	1,277	1,277	1,277	1,277r	1,277	-

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 2017 figures currently shown are the 2016 figures carried forward - these will be updated in June 2018.

Section 5 - Electricity

Key results show:

In 2017 Q2, total electricity generated fell by 3.3 per cent to 75.5 TWh compared to a year earlier. Temperatures were 1.1 degrees higher than in 2016 Q2. (**Chart 5.1**)

For only the second time in the UK, generation from low carbon sources (renewables plus nuclear) provided more than half of generation, with a record of 53.4 per cent compared to 46.7 per cent in the same period last year. **(Chart 5.3)**

Renewables' share of electricity generation increased from 25.3 per cent in 2016 Q2 to a record 29.8 per cent in 2017 Q2 due to increased capacity and better weather conditions. **(Chart 5.2)**

Nuclear's share of generation increased from 21.3 per cent in the second quarter of 2016 to 23.6 per cent in the second quarter of 2017. This was due to fewer days being lost to outages, with no change in capacity. **(Chart 5.2)**

Coal's share of generation decreased from 5.9 per cent in 2016 Q2 to a record low of 2.1 per cent in 2017 Q2, whilst gas' share of generation decreased slightly from 44.2 per cent to 41.3 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 6.9 per cent of electricity supplied from net imports in the second quarter of 2017. (**Chart 5.4)**

Relevant tables

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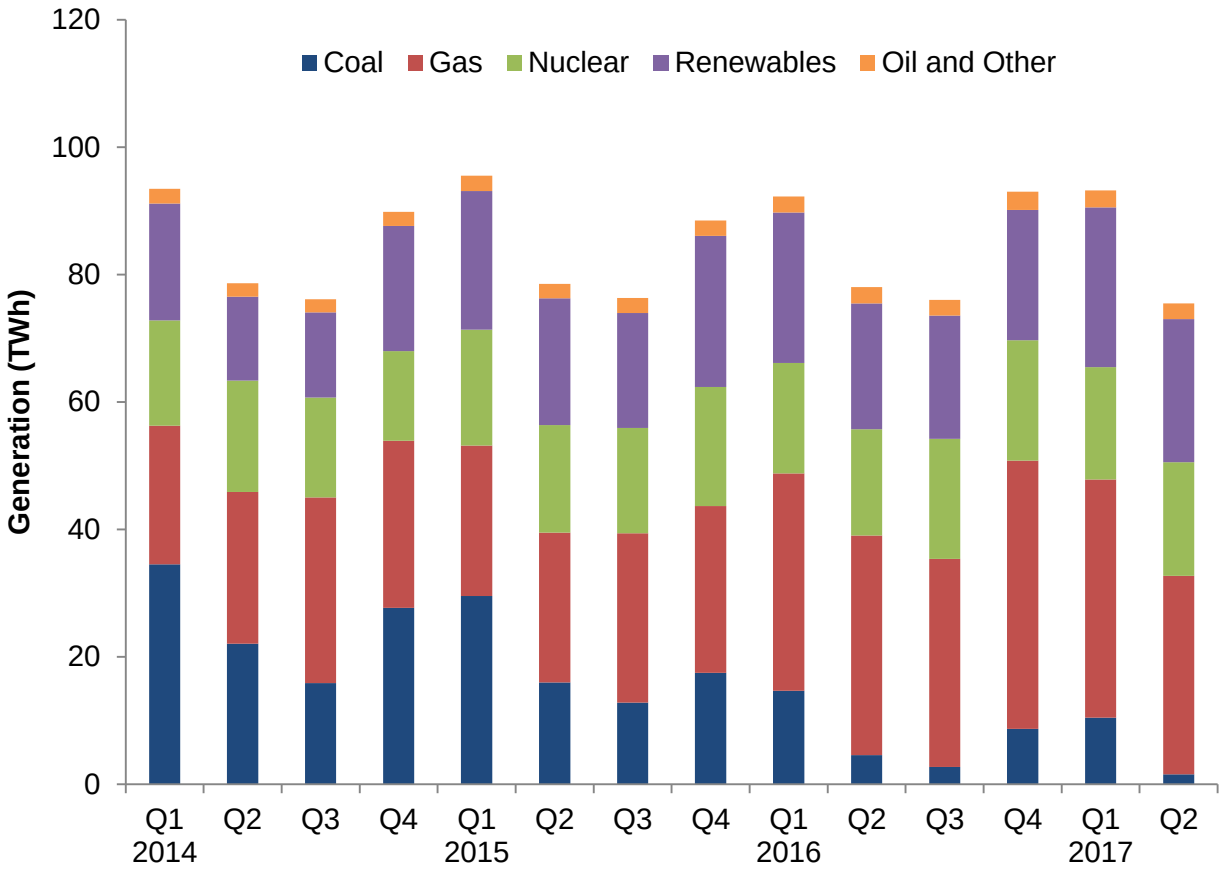
Chart 5.1 Electricity generated by fuel type (Table 5.1)



Generation by Major Power Producers (MPPs) fell by 3.6 per cent whilst generation from other sources fell by 1.4 per cent. This led to an overall drop of 3.3 per cent in generation compared to Q2 last year as demand fell with warmer temperatures. Fossil fuel generation fell 16 per cent whilst low carbon generation increased 11 per cent to a record high 40.3 TWh. By fuel type:

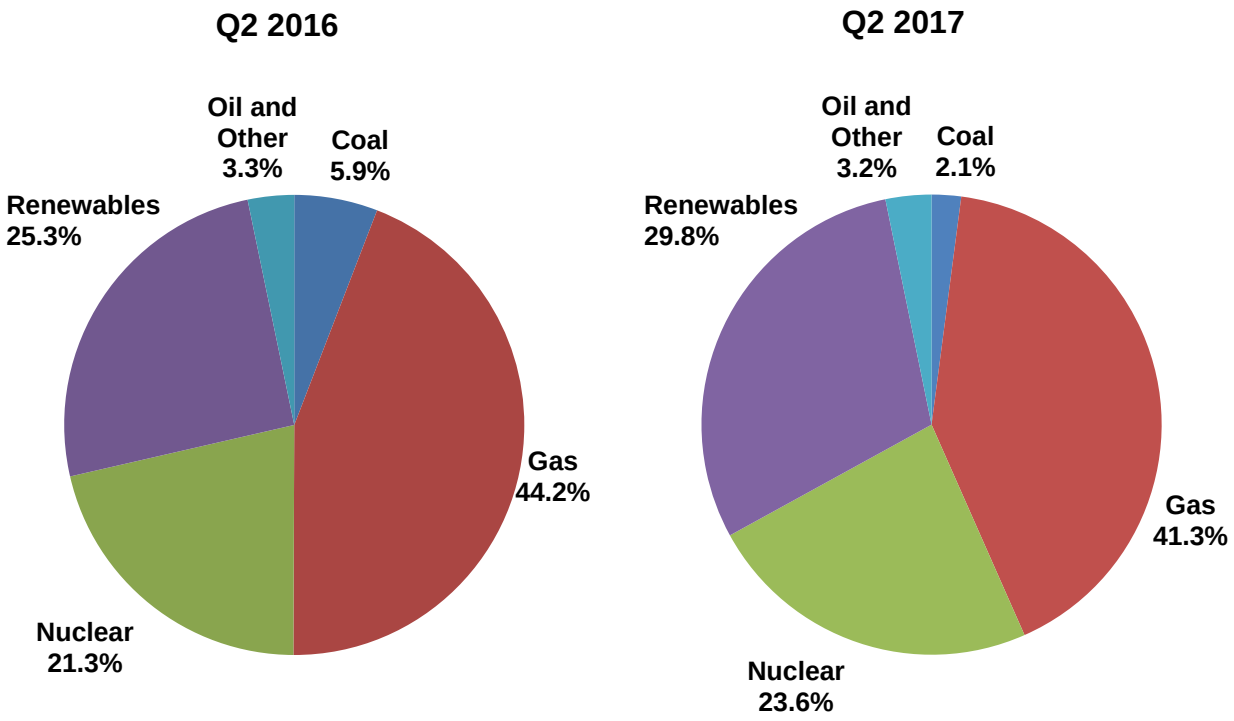
Coal fired generation fell by 66 per cent from 4.6 TWh in 2016 Q2 to 1.6 TWh in 2017 Q2, due to gas generation being favoured over coal. Whilst fuel costs for coal fired generation are lower than for gas, emissions from coal are higher so generators must pay a greater carbon price per GWh produced. The fall follows the general downward trend in coal fired generation over the last three years.

Gas fired generation decreased 9.6 per cent compared to Q2 2016, down 3.3 TWh to 31.2 TWh.

Nuclear generation increased by 7.1 per cent from 16.7 TWh in 2016 Q2 to 17.8 TWh in 2017 Q2.

In 2017 Q2 wind and PV generation increased by 25.6 per cent from 11.1 TWh to 14.0 TWh. Wind generation was up by 37 per cent (+2.7 TWh) compared with a year ago, due to an 8.3 per cent increase in average wind speed, and a 21 per cent increase in capacity. Solar generation increased by 3.4 per cent (+0.1 TWh), due to a 17.1 per cent increase in average daily sun hours, and an 8.9 per cent increase in capacity. Hydro generation decreased by 12.5 per cent (-0.1 TWh) partly due to a 1.9 per cent decrease in rainfall compared with a year earlier.

Chart 5.2 Shares of electricity generation (Table 5.1)



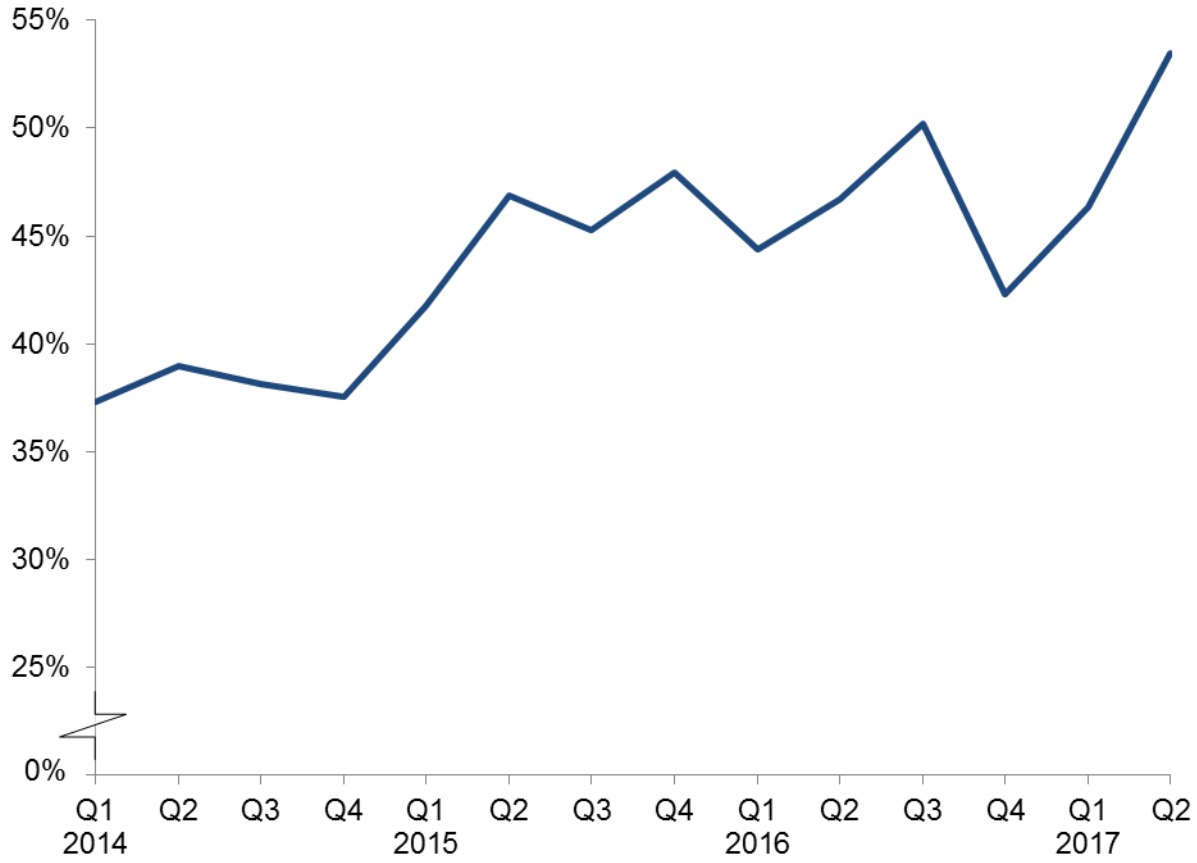
The share of electricity generated from renewables (hydro, wind and other renewables) grew from 25.3 per cent in 2016 Q2 to a record 29.8 per cent in 2017 Q2. This was due to a rise of 0.6 knots in the average wind speeds and a 0.9 hours per day rise in average daily sun hours. Wind and solar activity also increased due to an increase in capacity over the period of 21% wind capacity and 8.9% solar.

Nuclear's share of generation increased from 21.3 per cent in the second quarter of 2016 to 23.6 per cent in the second quarter of 2017 following fewer outages.

The share of generation from coal decreased from 5.9 per cent in 2016 Q2 to a record low of 2.1 per cent in 2017 Q2.

Gas' share of generation decreased from 44.2 per cent in 2016 Q2 to 41.3 per cent in 2017 Q2 as favourable weather conditions for renewable generation displaced gas.

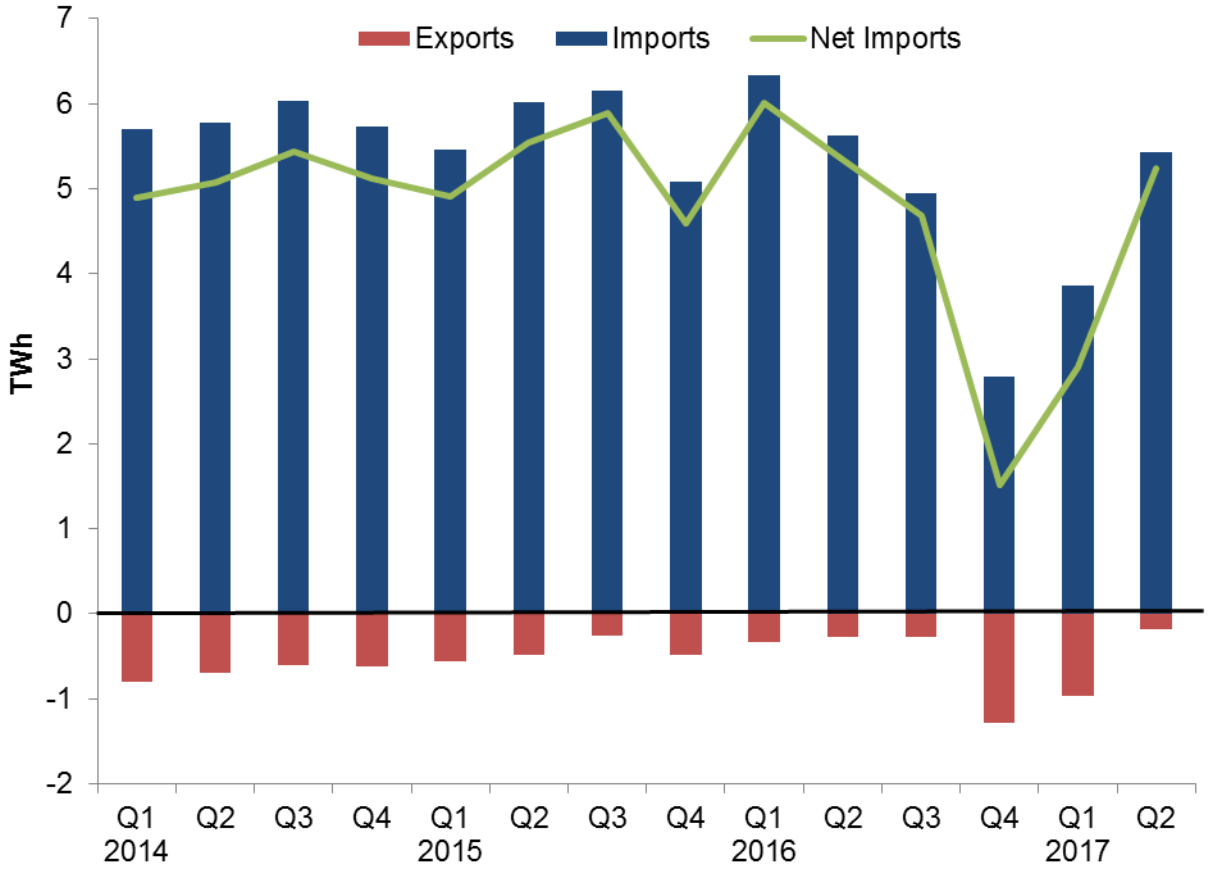
Chart 5.3 Low carbon electricity's share of generation (Table 5.1)



Continuing the general upward trend in low carbon electricity's share of generation, the share increased from 46.7 per cent in 2016 Q2 to 53.4 per cent in 2017 Q2, due to increases in both renewable and nuclear generation.

This is the highest ever low carbon share of electricity generation in the UK, and shows the growing adoption of renewable technology in the UK.

Chart 5.4 UK trade in electricity (Table 5.6)

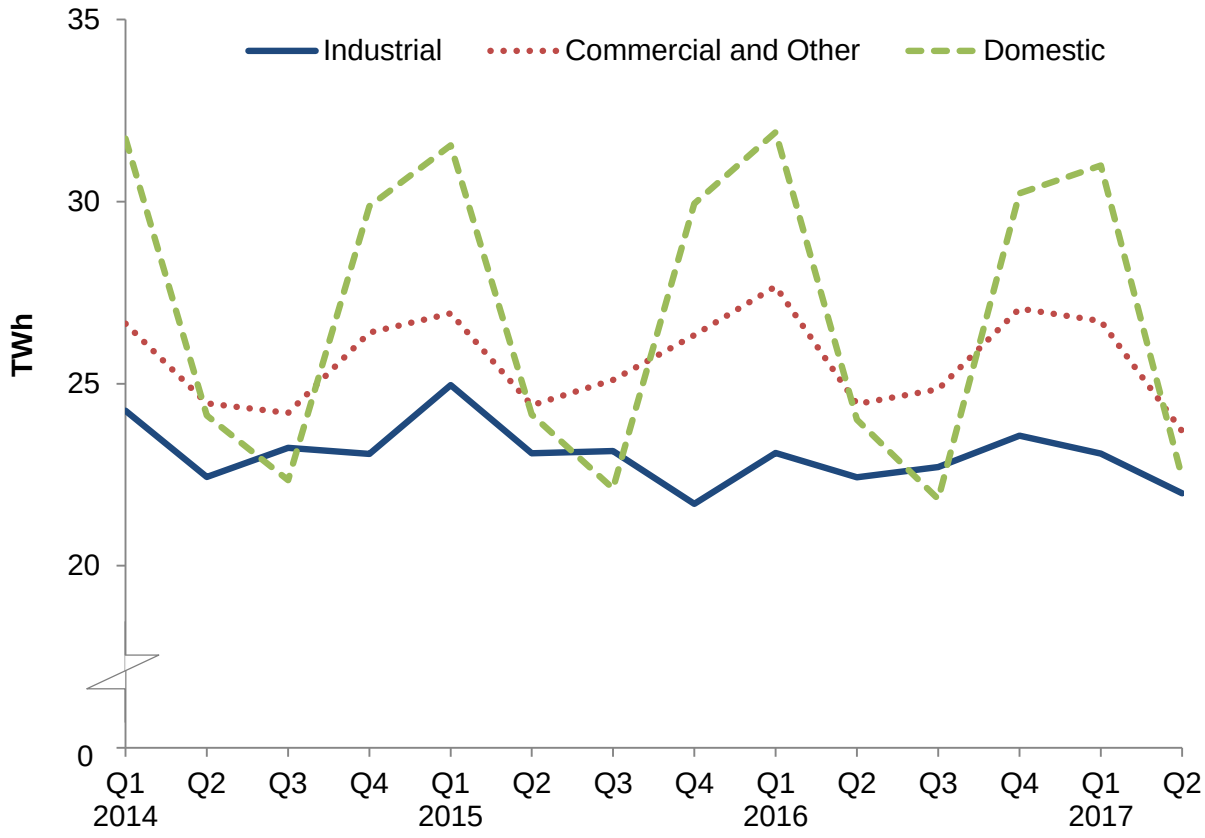


The UK has four interconnectors allowing trade with continental Europe: England-France (2 GW capacity), England-Netherlands (1 GW), Northern Ireland-Ireland (0.6 GW) and Wales-Ireland (0.5 GW).

In 2017 Q2, compared with the same period in 2016, imports of electricity fell by 3.5 per cent (-0.2 TWh), whilst exports fell by 35 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 1.9 per cent from 5.35 TWh in 2016 Q2 to 5.24 TWh in 2017 Q2. Net imports represented 6.9 per cent of electricity supplied in 2017 Q2, up 0.1 percentage points from the same time last year.

Chart 5.5 Electricity final consumption (Table 5.2)

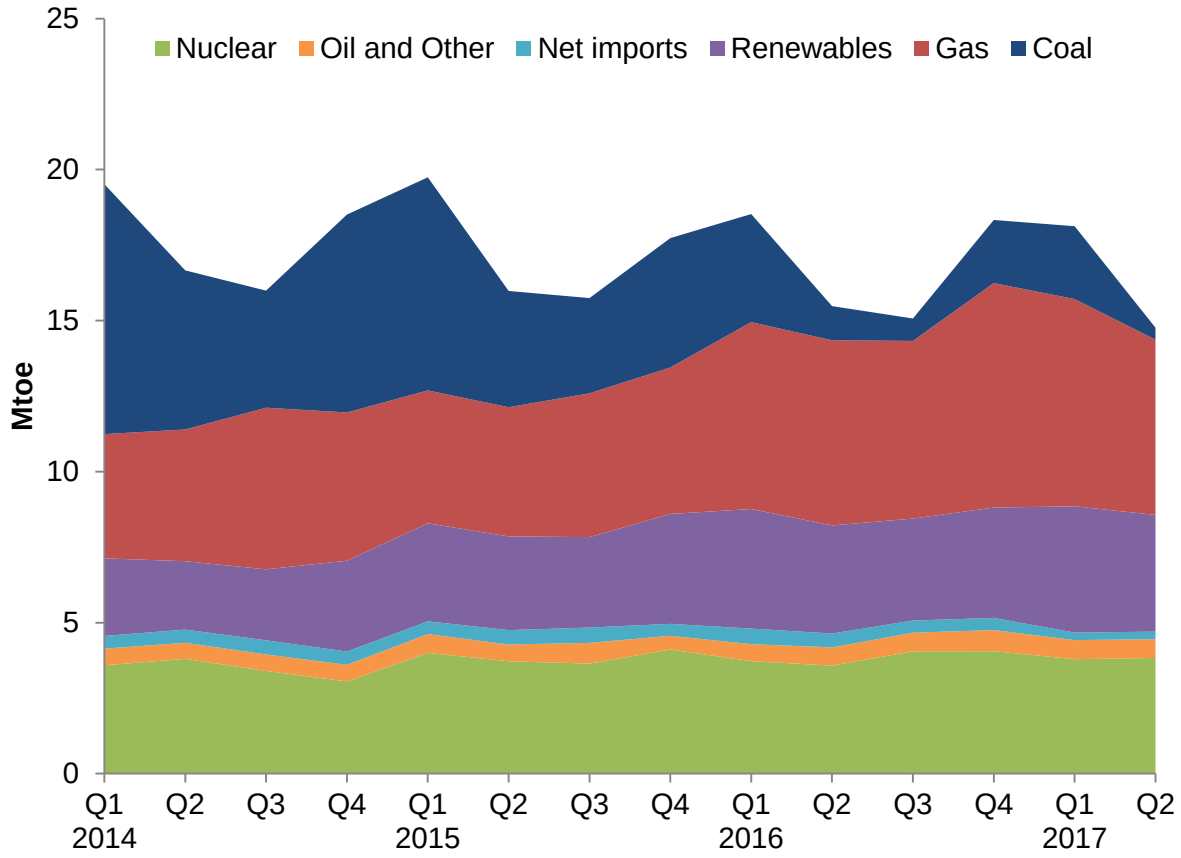


Final consumption of electricity fell by 3.9 per cent in 2017 Q2, from 70.9 TWh in 2015 Q2, to 68.1 TWh.

Domestic use fell by 6.6 per cent, from 24.0 TWh to 22.4 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. Temperatures were on average 1.1 degrees higher than in 2016 Q2 – 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, fell by 2.0 per cent, from 22.4 TWh to 22.0 TWh, and consumption by commercial and other users decreased by 3.0 per cent, from 24.4 TWh to 23.7 TWh.

Chart 5.6 Fuel used for electricity generation (Table 5.1)



Fuel used by generators in 2017 Q2 fell by 4.6 per cent, from 15.5 mtoe in 2016 Q2 to 14.8 mtoe in 2017 Q2 (note that *for wind (and other primary renewable sources), the fuel used is assumed the same as the electricity generated, unlike thermal generation where conversion losses are incurred).*

In 2017 Q2, gas use was 5.3 per cent lower than in 2016 Q2. Coal use during the quarter was 65 per cent lower than a year earlier, and nuclear sources were 7.1 per cent higher. Renewables (hydro, wind, solar and thermal renewables) accounted for 26.2 per cent of all fuel used (including net imports).

5 ELECTRICITY

Table 5.1. Fuel used in electricity generation and electricity supplied

	2015	2016	per cent change	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	per cent change [1]
FUEL USED IN GENERATION													
All generating companies												**Million tonnes of oil equivalent**	
Coal	18.34	7.54	*-58.9*	3.85	3.15	4.28	3.58	1.13	0.74	2.09	2.41r	0.40	*-65.0*
Oil	0.61	0.58	*-3.6*	0.13	0.17	0.17	0.11	0.15	0.16	0.16	0.18	0.16	*+8.4*
Gas	18.28	25.63	*+40.2*	4.28	4.76	4.85	6.19	6.13	5.88	7.43	6.86r	5.80	*-5.3*
Nuclear	15.48	15.41	*-0.4*	3.72	3.64	4.11	3.73	3.58	4.05	4.06	3.79	3.83	*+7.1*
Hydro	0.54	0.46	*-14.4*	0.12	0.09	0.16	0.18	0.08	0.10	0.10	0.15	0.07	*-12.5*
Wind and Solar [2]	4.12	4.11	*-0.2*	0.98	0.85	1.18	1.12	0.96	1.03	1.00	1.25r	1.20	*+25.6*
Bioenergy [3]	8.32	9.99	*+20.0*	1.99	2.05	2.31	2.66	2.54	2.25	2.55	2.77r	2.59	*+2.0*
Other fuels	1.71	1.90	*+10.7*	0.43	0.51	0.28	0.46	0.45	0.45	0.54	0.45	0.46	*+1.6*
Net imports	1.80	1.78	*-1.1*	0.48	0.51	0.40	0.52	0.46	0.40	0.40	0.25	0.25	*-45.7*
Total all generating companies	69.20	67.41	*-2.6*	15.98	15.75	17.73	18.53	15.48	15.07	18.33	18.13r	14.77	*-4.6*
ELECTRICITY GENERATED													
All generating companies												**TWh**	
Coal	75.88	30.71	*-59.5*	16.01	12.83	17.48	14.69	4.58	2.72	8.72	10.49r	1.56	*-66.0*
Oil	2.04	1.84	*-9.7*	0.42	0.54	0.55	0.34	0.56	0.44	0.50	0.55r	0.32	*-42.0*
Gas	99.88	143.36	*+43.5*	23.48	26.56	26.20	34.11	34.49	32.67	42.10	37.38r	31.18	*-9.6*
Nuclear	70.34	71.73	*+2.0*	16.92	16.56	18.69	17.34	16.66	18.86	18.87	17.64	17.83	*+7.1*
Hydro (natural flow)	6.30	5.39	*-14.4*	1.43	1.03	1.83	2.09	0.94	1.15	1.21	1.79r	0.82	*-12.5*
Wind and Solar [2]	47.86	47.79	*-0.2*	11.45	9.93	13.69	13.02	11.13	11.96	11.67	14.59r	13.99	*+25.6*
- of which, Offshore [6]	17.42	16.41	*-5.8*	3.58	3.41	5.76	5.15	3.25	3.58	4.42	5.18r	3.98	*+22.4*
Bioenergy [3]	29.24	30.04	*+2.7*	7.01	7.06	8.22	8.52	7.70	6.22	7.60	8.65	7.66	*-0.5*
Pumped Storage	2.74	2.96	*+8.0*	0.65	0.65	0.71	0.76	0.69	0.69	0.82	0.79	0.69	*+0.7*
Other fuels	4.64	5.57	*+20.2*	1.16	1.17	1.11	1.40	1.30	1.34	1.53	1.35r	1.41	*+9.1*
Total all generating companies	338.92	339.40	*+0.1*	78.53	76.34	88.49	92.27	78.04	76.06	93.03	93.23r	75.46	*-3.3*
ELECTRICITY SUPPLIED [4]													
All generating companies												**TWh**	
Coal	71.99	29.14	*-59.5*	15.19	12.17	16.58	13.94	4.34	2.58	8.28	9.95r	1.48	*-66.0*
Oil	1.85	1.67	*-9.7*	0.38	0.49	0.50	0.30	0.51	0.40	0.46	0.51r	0.30	*-41.3*
Gas	98.00	140.84	*+43.7*	23.02	26.06	25.73	33.56	33.87	32.07	41.34	36.71r	30.62	*-9.6*
Nuclear	63.89	65.15	*+2.0*	15.37	15.04	16.98	15.75	15.13	17.13	17.14	16.03	16.20	*+7.1*
Hydro	6.25	5.35	*-14.4*	1.41	1.02	1.82	2.07	0.93	1.14	1.20	1.78r	0.81	*-12.6*
Wind and Solar [2]	47.87	47.79	*-0.2*	11.45	9.93	13.69	13.02	11.13	11.96	11.67	14.59r	13.99	*+25.6*
- of which, Offshore [6]	17.42	16.41	*-5.8*	3.58	3.41	5.76	5.15	3.25	3.58	4.42	5.18r	3.98	*+22.4*
Bioenergy [3]	25.38	26.02	*+2.5*	6.08	6.12	7.15	7.41	6.69	5.34	6.58	7.56r	6.66	*-0.4*
Pumped Storage (net supply) [5]	-0.98	-1.07	*+8.6*	-0.23	-0.25	-0.25	-0.27	-0.26	-0.23	-0.30	-0.29	-0.25	*-5.2*
Other fuels	4.30	5.16	*+20.1*	1.07	1.09	1.03	1.30	1.20	1.25	1.42	1.25r	1.31	*+9.1*
Net imports	20.94	17.55	*-16.2*	5.54	5.89	4.60	6.00	5.35	4.68	1.51	2.90	5.24	*-1.9*
Total all generating companies	339.49	337.59	*-0.6*	79.29	77.57	87.83	93.08	78.88	76.33	89.30	90.97r	76.35	*-3.2*

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

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Table 5.2 Supply and consumption of electricity

GWh

	2015	2016	*Per cent change*	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	*Per cent change* [1]
SUPPLY													
Indigenous production	338,917	339,398	*+0.1*	78,533	76,337	88,489	92,267	78,039	76,062	93,029	93,233r	75,463	*-3.3*
Major power producers [2 3]	293,251	289,985	*-1.1*	66,645	64,903	77,438	80,565	65,450	63,025	80,945	80,924r	63,040	*-3.7*
Auto producers	42,926	46,453	*+8.2*	11,238	10,780	10,337	10,940	11,900	12,345	11,268	11,517r	11,730	*-1.4*
Other sources [4]	2,739	2,959	*+8.0*	650	653	714	762	689	693	815	791	694	*+0.7*
Imports	22,716	19,699	*-13.3*	6,023	6,152	5,080	6,334	5,622	4,951	2,792	3,863	5,423	*-3.5*
Exports	1,778	2,153	*+21.1*	484	259	480	331	275	268	1,279	960	179	*-35.0*
Transfers	-	-		-	-	-	-	-	-	-	-	-	
Total supply	359,855	356,943	*-0.8*	84,072	82,230	93,088	98,271	83,386	80,745	94,543	96,135r	80,707	*-3.2*
Statistical difference	1,192	194		307	193	455	- 85	186	120	- 26	26r	389	
Total demand	358,663	356,749	*-0.5*	83,765	82,037	92,633	98,356	83,200	80,625	94,568	96,109r	80,318	*-3.5*
TRANSFORMATION	-	-		-	-	-	-	-	-	-	-	-	
Energy industry use [5]	27,896	26,631	*-4.5*	6,615	6,592	7,154	6,974	6,297	6,273	7,087	6,969	6,194	*-1.6*
Losses	27,319	26,323	*-3.6*	5,499	5,065	7,499	8,713	6,016	4,969	6,624	8,348	6,016	-
FINAL CONSUMPTION	303,448	303,795	*+0.1*	71,651	70,380	77,979	82,669	70,886	69,383	80,857	80,793r	68,108	*-3.9*
Iron & steel	3,688	2,847	*-22.8*	935	887	875	708	703	707	730	714	702	*-0.1*
Other industries	89,219	88,961	*-0.3*	22,156	22,267	20,827	22,387	21,728	22,000	22,845	22,369r	21,287	*-2.0*
Transport	4,516	4,669	*+3.4*	1,129	1,129	1,129	1,167	1,167	1,167	1,167	1,167	1,167	-
Domestic	107,764	107,971	*+0.2*	24,148	22,124	29,947	31,904	24,014	21,831	30,222	30,994r	22,422	*-6.6*
Other final users	98,262	99,347	*+1.1*	23,282	23,974	25,202	26,502	23,274	23,679	25,892	25,548r	22,530	*-3.2*
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 2016 they were:

AES Electric Ltd., Anesco Ltd., 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., 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., 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.

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 29.8 per cent in 2017 Q2, up 4.4 percentage points on the share in 2016 Q2, reflecting both increased wind capacity and wind speeds, as well as lower overall electricity generation. **(Chart 6.1)**

Renewable electricity generation was 22.5 TWh in 2017 Q2, an increase of 13.6 per cent on the 19.8 TWh in 2016 Q2, but 10.3 per cent lower than the peak quarterly generation of 2017 Q1 (25.0 TWh). **(Chart 6.2)**

Onshore wind generation increased by 50 per cent (2.0 TWh), the highest increase across the technologies, to 6.0 TWh, while offshore wind rose by 22 per cent (0.7 TWh), to 4.0 TWh. Generation from biodegradable waste was up 30 per cent (0.2 TWh) to 0.8 TWh, due to much increased capacity. **(Chart 6.2)**

Renewable electricity capacity was 38.0 GW at the end of 2017 Q2, a 13.2 per cent increase (4.4 GW) on a year earlier, and a 1.5 per cent (0.6 GW) increase on the previous quarter, with over half of the annual increase coming from onshore wind, and around one quarter from solar photovoltaics (driven by growth in 2017 Q1). **(Chart 6.3)**

In 2017 Q2, just 39 MW of capacity eligible for the Feed in Tariff scheme was installed, increasing the total to 6.1 GW, across 905,000 installations. **(Chart 6.5)**

Liquid biofuels consumption fell by 6.1 per cent, from 413 million litres in 2016 Q2 to 388 million litres in 2017 Q2, with a 13 per cent fall in biodiesel consumption. In 2017 Q2, liquid biofuels represented 3.2 per cent of petrol and diesel consumed in road transport, down from 3.4 per cent a year earlier. **(Chart 6.6)**

Relevant tables

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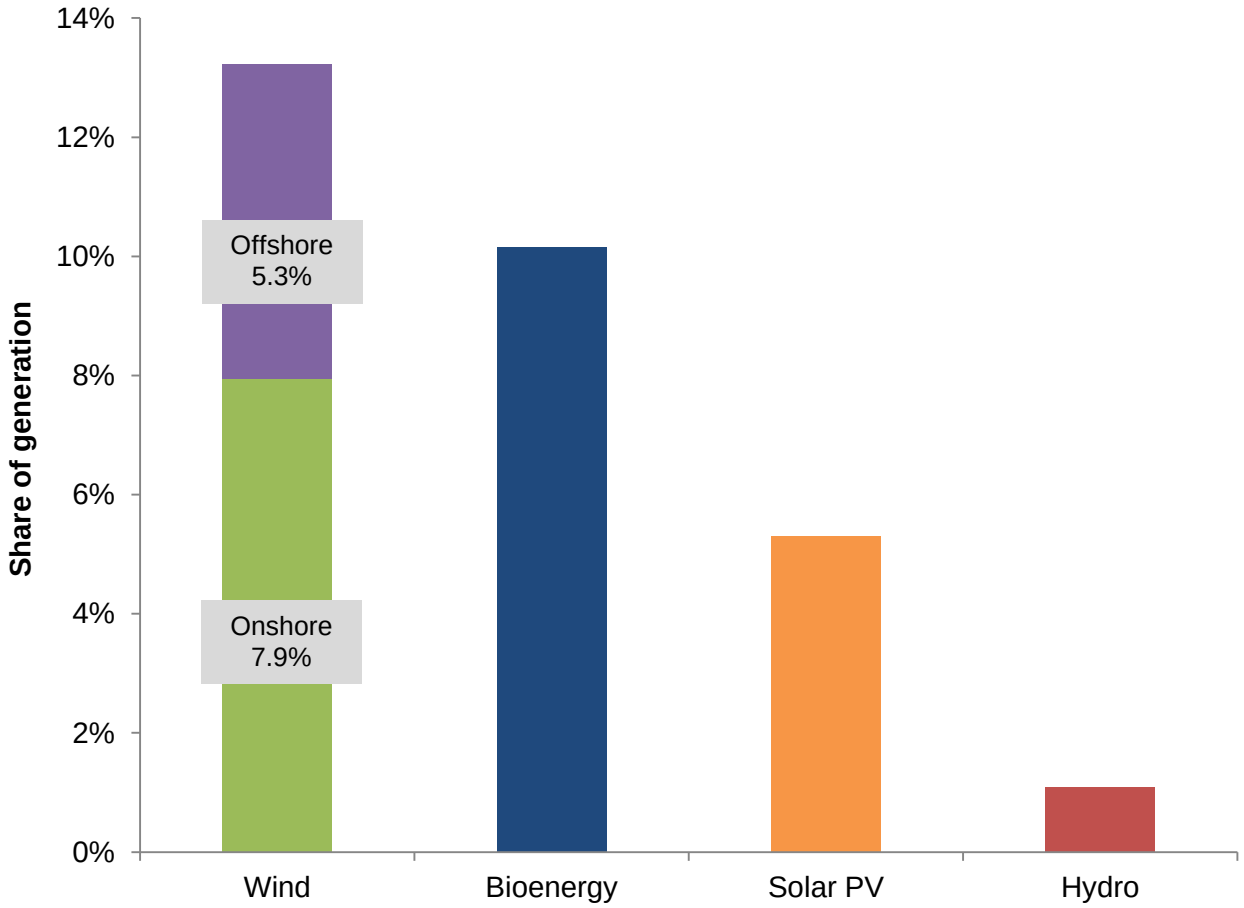
Chart 6.1 Renewables' share of electricity generation (Table 6.1)



Renewables' share of electricity generation increased from 25.3 per cent in 2016 Q2 to a record 29.8 per cent in 2017 Q2, up from the previous record 26.9 per cent in 2017 Q1.

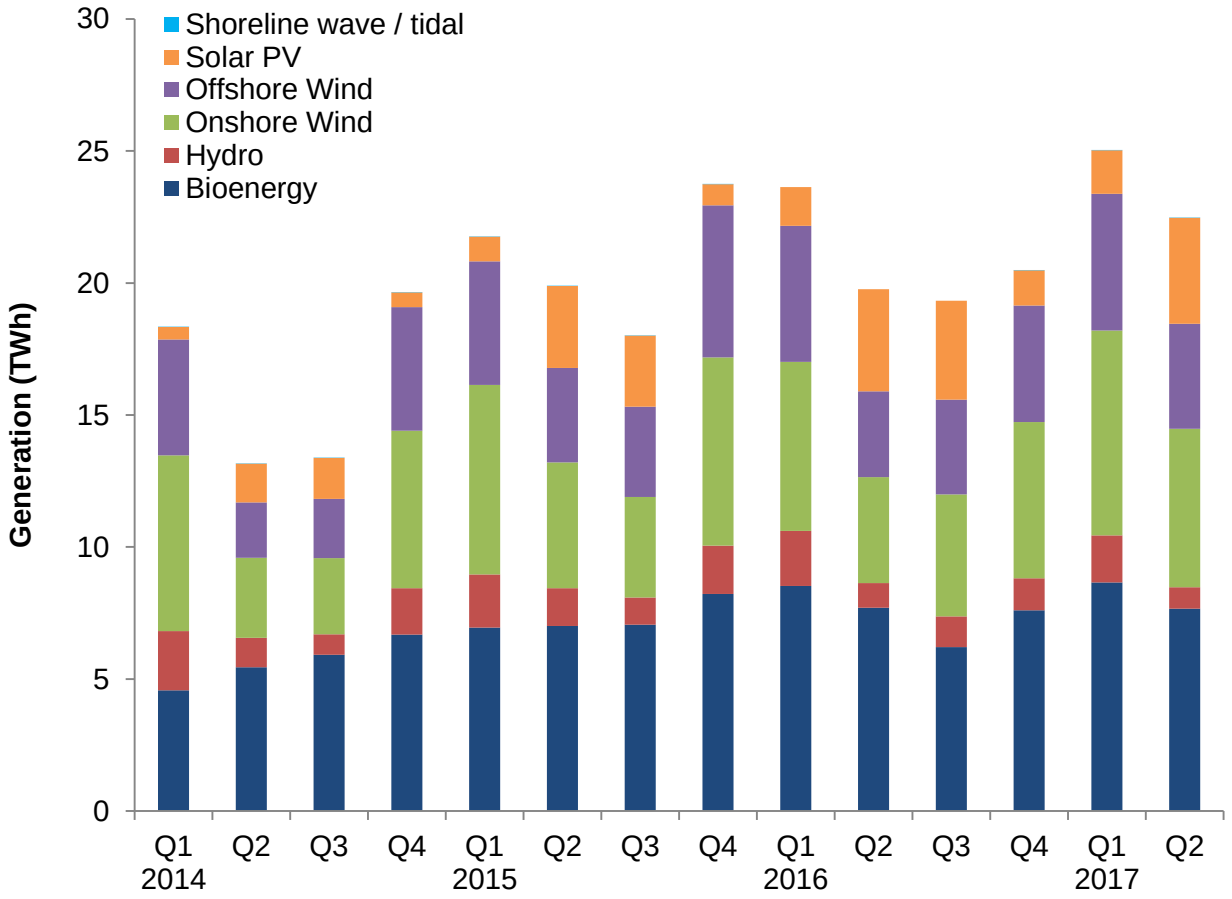
The increased share on a year earlier mostly reflects increased capacity, particularly onshore wind and solar PV, as well as higher wind speeds and lower overall generation.

Total electricity generated from renewables in 2017 Q2 was up by 2.7 TWh (14 per cent) on 2016 Q2, to 22.5 TWh, but remained 2.6 TWh (10.3 per cent) lower than the record of 25.0 TWh in 2017 Q1.

Overall electricity generation was 3.3 per cent lower in 2017 Q2 (75.5 TWh) compared to 2016 Q2 (78.0 TWh). This decrease accounted for one percentage point of the 4.4 percentage point increase in the share of renewable generation.

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 2017 Q2, electricity generated from onshore wind increased by 50 per cent, from 4.0 TWh in 2016 Q2 to 6.0 TWh, with generation from offshore wind up by 22 per cent to 4.0 TWh. Large increases in capacity over the year, particularly for onshore wind, were accentuated by increased wind speeds during the quarter. Wind speeds in 2017 Q1, at 8.3 knots, were up 0.6 knots on 2016 Q2, but slightly 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 by 3.4 per cent (0.1 TWh) to a record 4.0 TWh compared to 2016 Q2, due to increased capacity.

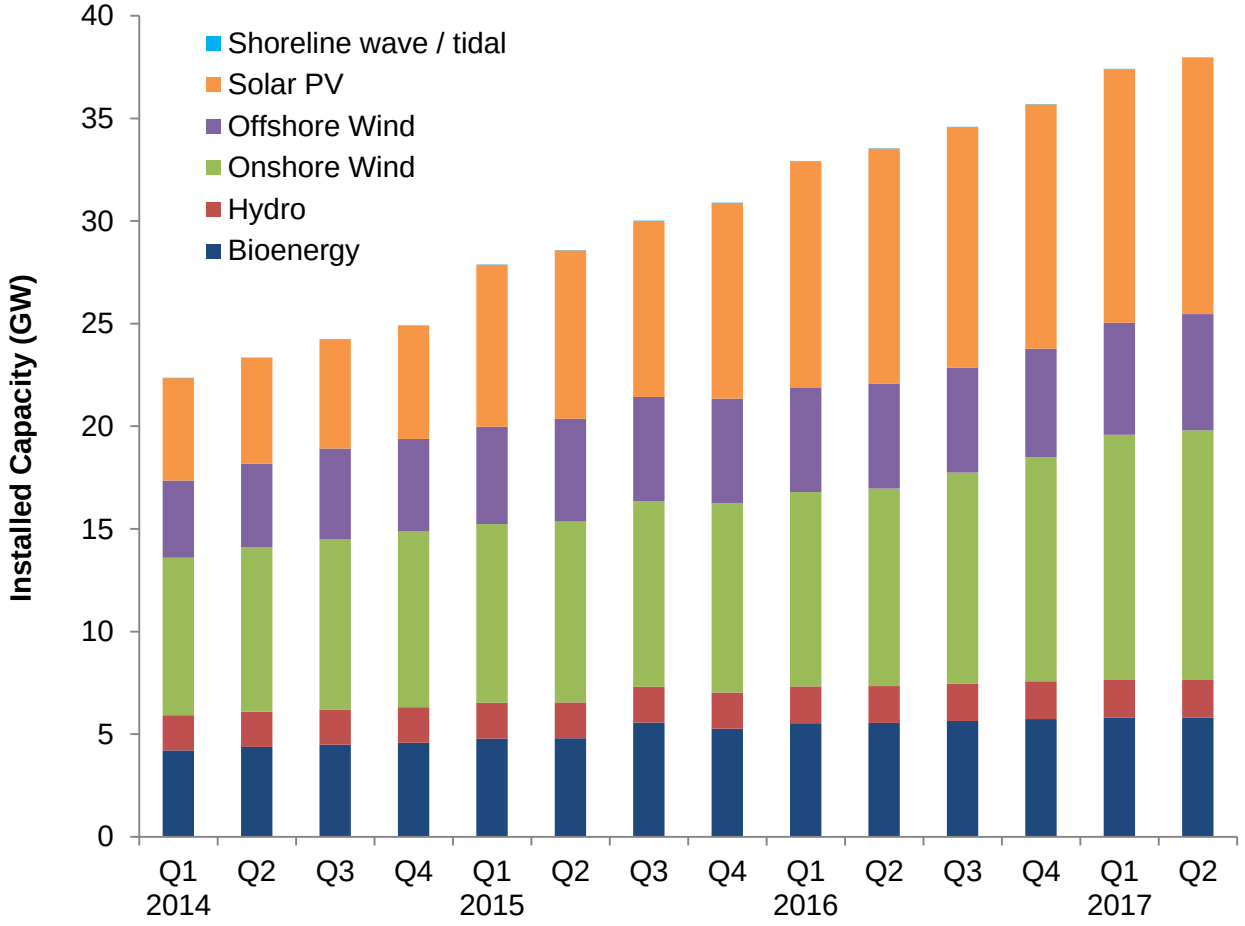
Hydro generation fell by 12.4 per cent on a year earlier to 0.8 TWh; average rainfall (in the main hydro catchment areas) fell by 1.9 per cent during the quarter; however, within this, rainfall in the more critical first two months was around half that of a year earlier, and included the driest April since 2003 - see Energy Trends table 7.4 at: www.gov.uk/government/statistics/energy-trends-section-7-weather.

In 2017 Q2, generation from bioenergy[1], at 7.7 TWh, was down slightly (0.5 per cent) on a year earlier. Within this, generation from biodegradable waste was up 30 per cent (0.2 TWh), due to increased capacity; however, this was offset by reduced generation from landfill gas and plant biomass.

Bioenergy had the largest share of generation (34 per cent) with, 27 per cent from onshore wind, 18 per cent from each of offshore wind and solar PV, and 3.7 per cent from hydro.

[1] Bioenergy consists of: landfill gas, sewage gas, energy from 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 2017 Q2, the UK's renewable electricity capacity totalled 38.0 GW, an increase of 13 per cent (4.4 GW) on that installed at the end of 2016 Q2, and 1.5 per cent (0.6 GW) higher than the previous quarter.

At the end of 2017 Q2, solar PV, at 12.5 GW, represented one-third of all renewable capacity, the highest share of renewable technologies. This was followed by onshore wind (32 per cent), bioenergy (15 per cent) and offshore wind (15 per cent).[2]

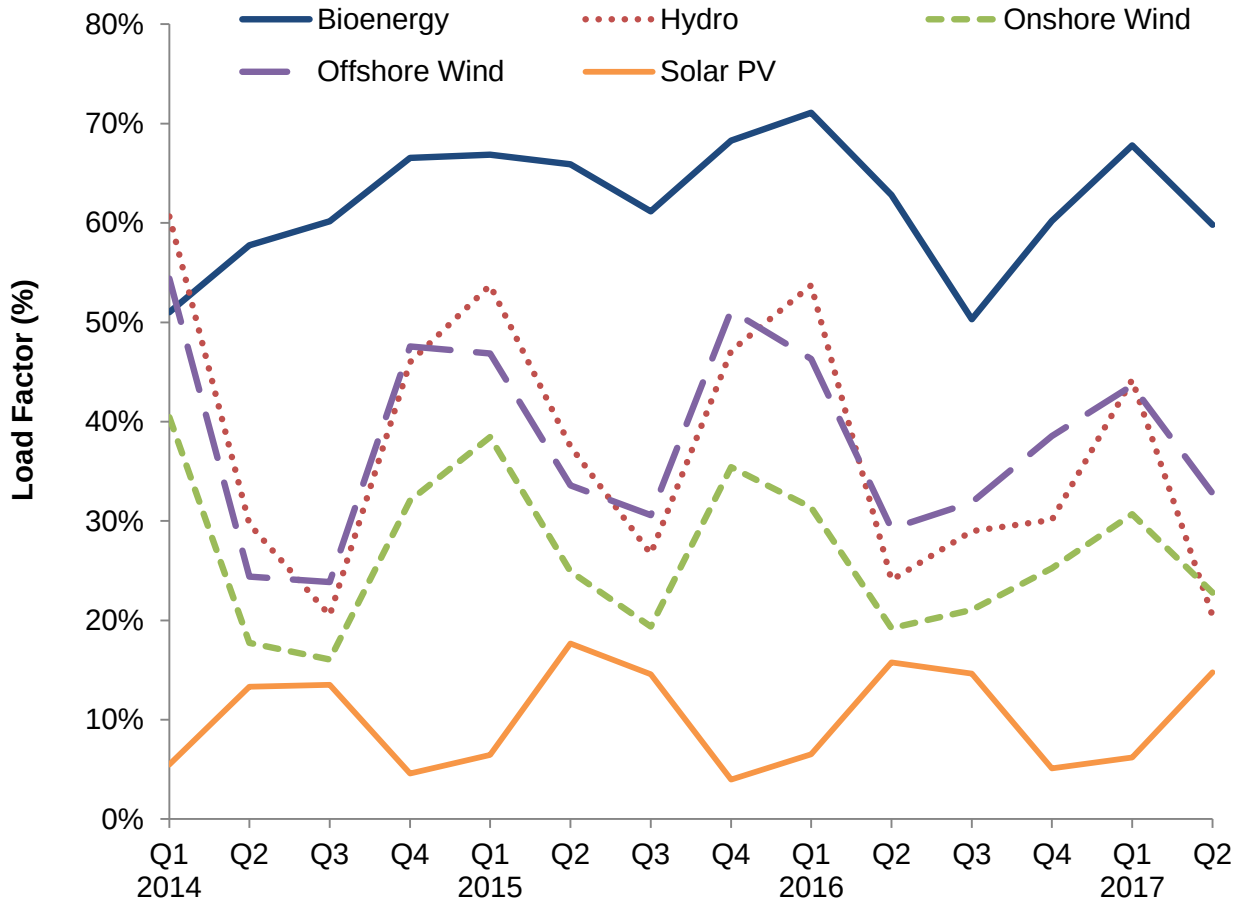
Compared with 2016 Q2, onshore wind capacity increased by 2.5 GW (26 per cent), and offshore wind by 0.6 GW (11 per cent). During 2017 Q2, onshore wind capacity increased by 202 MW, with a further 73 MW installed at Scotland's Kilgallioch (increasing capacity to 118 MW, of the final 239 MW), the final 33 MW of the 228 MW Pen y Cymoedd wind farm in Wales installed, as well as the opening of Auchrobert (39 MW, Scotland) and Beckburn (31 MW, England). Meanwhile, offshore wind capacity increased by 216 MW, with a further 138 MW installed at Dudgeon (238 MW of the final 402 MW now installed) and the first 78 MW (of 573 MW final capacity) installed at Race Bank.

Solar PV increased by 1.0 GW on a year ago, with almost half deployed in 2017 Q1, with the closure of the Renewables Obligation (RO) to the remaining new (grace period) solar schemes on 31 March 2017. During 2017 Q2, just 141 MW was deployed, with reduced RO/FiT support levels.

Across the year, bioenergy capacity increased by 256 MW, including the 50 MW Wilton 11 and the 27 MW Cornwall Energy Recovery Centre waste schemes.

[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 2017 Q2, onshore wind's load factor rose by 3.6 percentage points, from 19.2 per cent in 2016 Q2 to 22.8 per cent, due to higher onshore wind speeds. Offshore wind's load factor increased by 3.5 percentage points, from 29.2 per cent in 2016 Q2 to 32.8 per cent in 2017 Q2. [3]

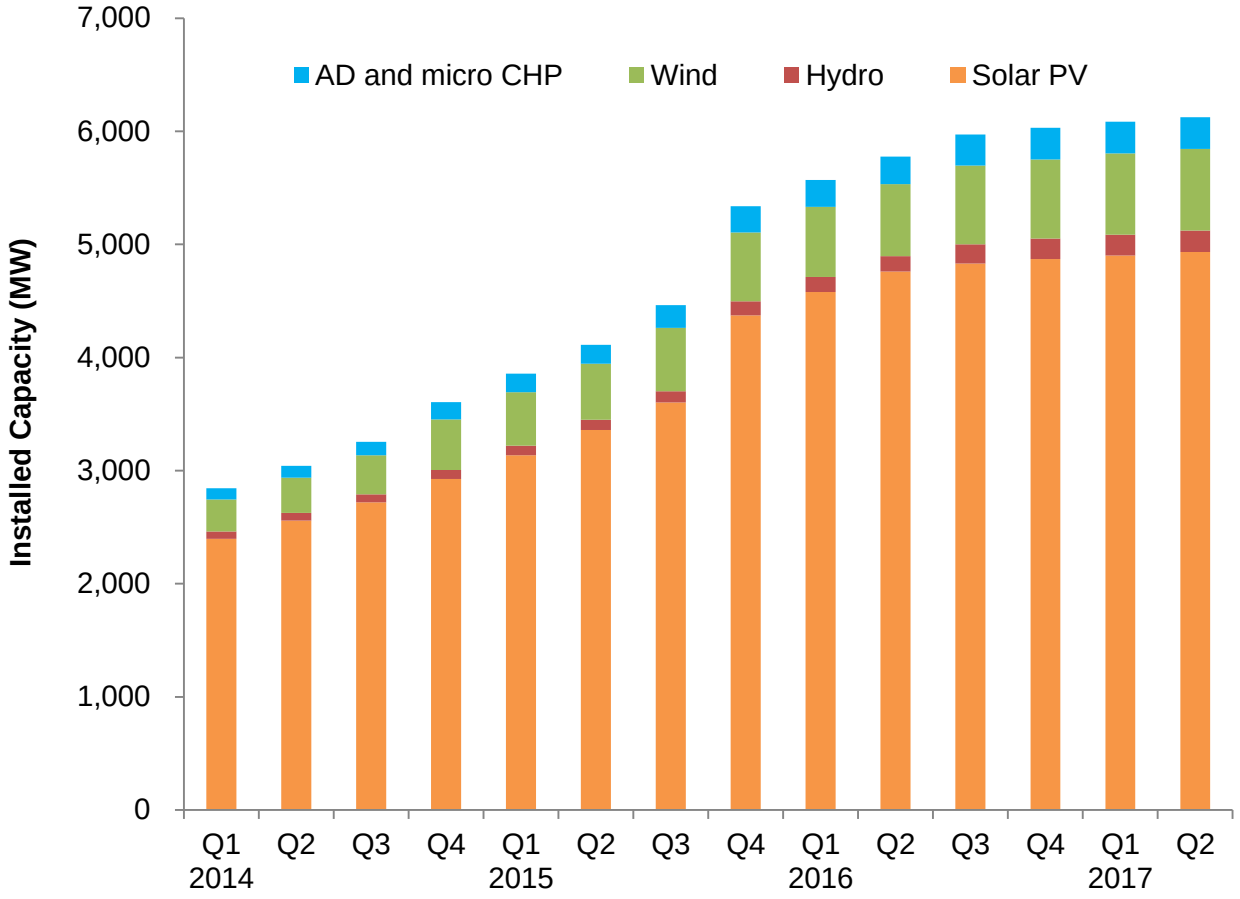
Compared with 2017 Q1, onshore wind's load factor was down by 7.9 percentage points, while offshore wind's load factor was 10.9 percentage points lower, with wind speeds 0.6 knots higher, at 8.3 knots.

Hydro's load factor in 2017 Q2 decreased by 3.6 percentage points, from 24.1 per cent in 2016 Q2 to 20.5 per cent, the lowest since 2013 Q3, due to lower rainfall. Compared with 2017 Q1, hydro's load factor in 2017 Q2 was 24 percentage points lower, with 37 per cent less rainfall in the main hydro areas.

For bioenergy, the load factor in 2017 Q2, at 59.8 per cent, was down by 3.0 percentage points on a year earlier, and down by 8.0 percentage points on 2017 Q1, due to an outage at Drax, the largest generator within the bioenergy category, in June.

[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. This may particularly be the case for large wind farms, such as London Array offshore, that come online incrementally throughout the quarter.

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



At the end of 2017 Q2, 6,124 MW of capacity was installed and eligible for the GB Feed in Tariff (FiT) scheme[4]. This was a 6.0 per cent increase on that installed at the end of 2016 Q2, but just 0.6 per cent (39 MW) up on the previous quarter.

In terms of number of installations, at the end of 2017 Q2, there were over 905,000 installed and eligible for the FiT scheme, a 4.2 per cent increase on the number installed a year earlier.

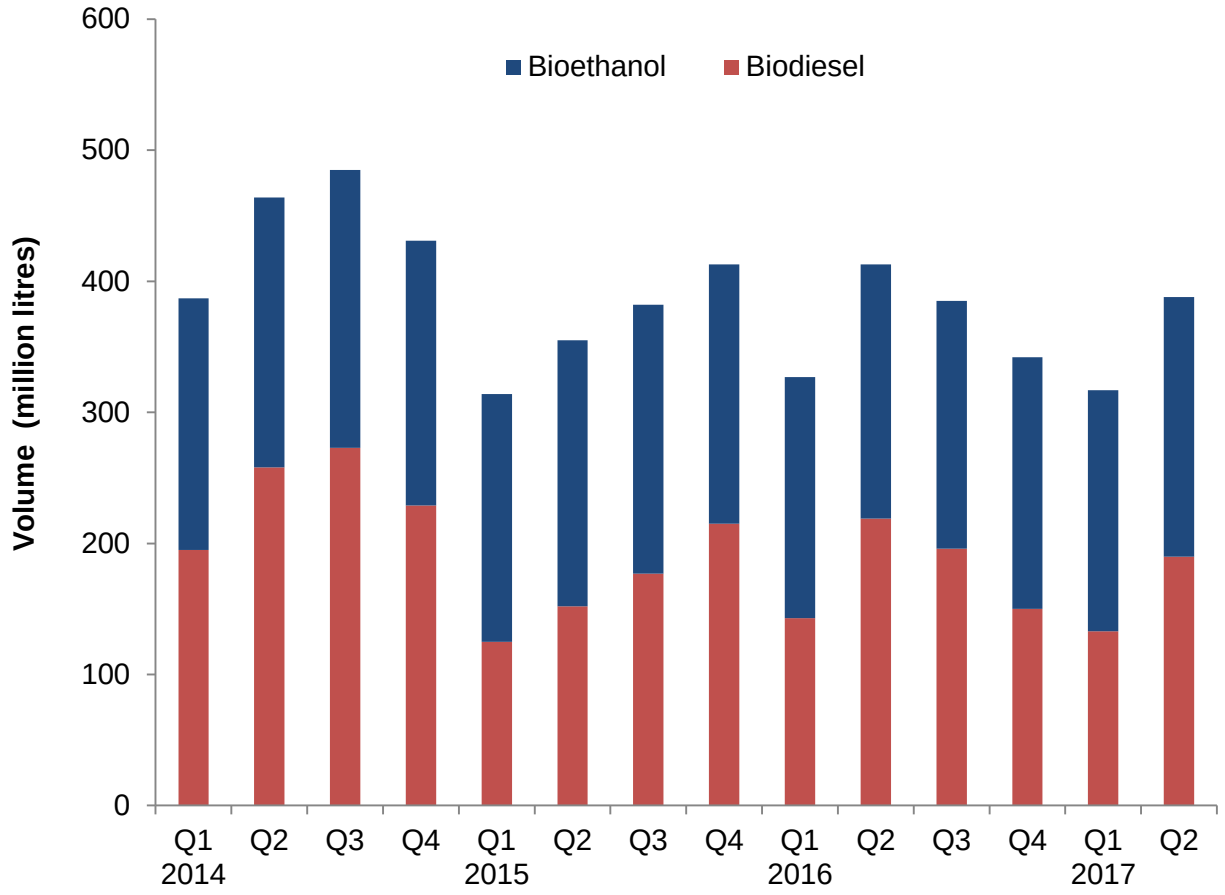
Solar photovoltaics (PVs) represent the majority of both installations and installed capacity on FiTs, with, respectively, 99 per cent and 81 per cent of the total. The majority of FiT-eligible PV installations are sub-4 kW retrofitted schemes, 2,436 MW (49 per cent) in 2017 Q2.

Renewable installations eligible for FiTs (all except MicroCHP) represented 17 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 2017 Q2, 388 million litres of liquid biofuels were consumed in transport, a fall of 6.1 per cent on the total in 2016 Q2 (25 million litres).

In 2017 Q2, biodiesel accounted for 2.5 per cent of diesel, and bioethanol 4.6 per cent of motor spirit. The combined contribution of the two fuels was 3.2 per cent, 0.2 percentage points lower than 2016 Q2's share.

Bioethanol consumption rose by 0.4 per cent, from 194 million litres in 2016 Q2 to 198 million litres in 2017 Q2, while biodiesel consumption fell by 29 million litres (13 per cent), to 190 million litres over the same period.

Biofuel consumption was split broadly equally between bioethanol and biodiesel, with bioethanol taking the slightly larger share at 51 per cent.

6 RENEWABLES

Table 6.1. Renewable electricity capacity and generation

	2015	2016	per cent change	2015 2nd quarter	2015 3rd quarter	2015 4th quarter	2016 1st quarter	2016 2nd quarter	2016 3rd quarter	2016 4th quarter	2017 1st quarter	2017 2nd quarter p	per cent change [13]
Cumulative Installed Capacity [1]												**MW**	
Onshore Wind	9,222	10,924	*+18.5*	8,810	9,022	9,222	9,479	9,633	10,295	10,924	11,952r	12,154	*+26.2*
Offshore Wind	5,094	5,294	*+3.9*	5,014	5,094	5,094	5,094	5,094	5,094	5,294	5,455	5,671	*+11.3*
Shoreline wave / tidal	9	13	*+50.9*	9	9	9	8	8	8	13	17	17	*(+)*
Solar photovoltaics	9,535	11,899	*+24.8*	8,206	8,581	9,535	11,008	11,469	11,742	11,899	12,352r	12,493	*+8.9*
Small scale Hydro	299	358	*+19.6*	266	271	299	307	311	343	358	361r	365	*+17.6*
Large scale Hydro	1,477	1,477	-	1,477	1,477	1,477	1,477	1,477	1,477	1,477	1,477	1,477	-
Landfill gas	1,061	1,062	*+0.1*	1,061	1,061	1,061	1,062	1,062	1,062	1,062	1,065r	1,067	*+0.4*
Sewage sludge digestion	231	257	*+11.3*	231	231	231	257	257	257	257	259	259	*+0.7*
Energy from waste	925	1,017	*+9.9*	834	902	925	934	934	983	1,017	1,033r	1,033	*+10.6*
Animal Biomass (non-AD) [2]	111	129	*+17.0*	111	111	111	129	129	129	129	129	129	-
Anaerobic Digestion	323	420	*+29.9*	266	299	323	370	377	405	420	434r	434	*+15.3*
Plant Biomass [3]	2,607	2,850	*+9.3*	2,298	2,963	2,607	2,787	2,787	2,796	2,850	2,880r	2,880	*+3.3*
Total	30,893	35,700	*+15.6*	28,582	30,021	30,893	32,909	33,537	34,591	35,700	37,415r	37,980	*+13.2*
Co-firing [4]	21	13	*-35.9*	21	21	21	13	13	13	13	2r	2	*-81.9*
Generation [5]												**GWh**	
Onshore Wind [6]	22,894	20,962	*-8.4*	4,767	3,817	7,135	6,406	4,010	4,631	5,915	7,749r	5,997	*+49.6*
Offshore Wind [6, 7]	17,423	16,406	*-5.8*	3,578	3,412	5,757	5,150	3,253	3,584	4,419	5,180r	3,984	*+22.4*
Shoreline wave / tidal [6]	2	0	*-99.6*	0	0	0	-	-	-	0	0	0	
Solar photovoltaics [6]	7,546	10,420	*+38.1*	3,109	2,701	798	1,464	3,872	3,750	1,335	1,657r	4,005	*+3.4*
Hydro [6]	6,298	5,395	*-14.3*	1,425	1,028	1,834	2,089	938	1,154	1,214	1,793r	822	*-12.4*
Landfill gas [6]	4,872	4,703	*-3.5*	1,212	1,201	1,220	1,218	1,171	1,158	1,156	1,093r	1,042	*-11.0*
Sewage sludge digestion [6]	894	950	*+6.3*	233	217	220	236	251	229	234	253r	290	*+15.8*
Energy from waste [8]	2,585	2,741	*+6.0*	603	687	688	728	626	677	710	791r	812	*+29.8*
Co-firing with fossil fuels	183	117	*-35.9*	36	57	55	51	15	5	47	21r	0	*-97.6*
Animal Biomass (non-AD) [2, 6]	648	650	*+0.4*	171	142	165	171	165	140	173	173r	181	*+9.4*
Anaerobic Digestion	1,471	2,052	*+39.5*	349	371	426	482	492	524	554	544r	465	*-5.4*
Plant Biomass [3, 6]	18,587	18,829	*+1.3*	4,409	4,383	5,443	5,637	4,981	3,481	4,730	5,779r	4,869	*-2.2*
Total	83,403	83,225	*-0.2*	19,893	18,015	23,741	23,633	19,773	19,333	20,485	25,034r	22,467	*+13.6*
Non-biodegradable wastes [9]	2,586	2,742	*+6.0*	604	687	688	728	626	678	710	791r	811	*+29.6*
Load Factors [10]													
Onshore Wind	29.4%	23.7%		24.9%	19.4%	35.4%	31.4%	19.2%	21.0%	25.2%	31.4%r	22.8%	
Offshore Wind	41.5%	36.0%		33.6%	30.6%	51.2%	46.3%	29.2%	31.9%	38.5%	44.6%r	32.8%	
Solar photovoltaics	11.4%	11.1%		17.7%	14.6%	4.0%	6.5%	15.8%	14.6%	5.1%	6.3%r	14.8%	
Hydro	41.0%	34.0%		37.5%	26.7%	47.1%	53.7%	24.1%	29.0%	30.1%	45.2%r	20.5%	
Landfill gas	52.5%	50.4%		52.3%	51.2%	52.1%	52.5%	50.5%	49.4%	49.3%	47.6%r	44.8%	
Sewage sludge digestion	44.2%	44.3%		46.1%	42.4%	43.1%	44.3%	44.7%	40.3%	41.3%	45.4%r	51.3%	
Energy from waste	36.8%	32.1%		33.3%	35.8%	34.1%	35.9%	30.7%	32.0%	32.1%	35.7%r	36.0%	
Animal Biomass (non-AD)	66.9%	61.7%		70.9%	58.1%	67.7%	65.4%	58.5%	49.2%	60.7%	62.0%r	64.0%	
Anaerobic Digestion	59.3%	62.8%		60.6%	59.5%	61.9%	63.7%	60.4%	60.7%	60.8%	58.9%r	49.1%	
Plant Biomass	87.2%	78.6%		87.9%	75.5%	88.5%	95.7%	81.8%	56.5%	75.9%	93.4%r	77.4%	
Total (excluding co-firing and non-biodegradable wastes)	34.0%	28.4%		32.2%	27.8%	35.2%	33.8%	27.2%	25.7%	26.3%	31.7%r	27.3%	

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:
www.gov.uk/government/publications/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

	2015	2016	*per cent change*	2015 2nd quarter	2015 3rd Quarter	2015 4th Quarter	2016 1st quarter	2016 2nd quarter	2016 3rd Quarter	2016 4th Quarter	2017 1st Quarter	2017 2nd Quarter p	*per cent change*[1]
Volume (million litres)													**Million litres**
Bioethanol	795	759	*-4.5*	203	205	198	184	194	189	192	184	198	*2.1%*
Biodiesel	669	708	*+5.8*	152	177	215	143	219	196	150	133	190	*-13.2%*
Total biofuels for transport	1,464	1,467	*+0.2*	355	382	413	327	413	385	342	317	388	*-6.1%*
Energy (thousand toe)													
Bioethanol	448	428	*-4.5*	114	116	112	104	109	107	108	104	112	*2.1%*
Biodiesel	550	582	*+5.8*	125	145	177	117	180	161	123	109	156	*-13.2%*
Total biofuels for transport	998	1,010	*+1.2*	239	261	288	221	289	268	231	213	268	*-7.5%*
Shares of road fuels													
Bioethanol as per cent of Motor Spirit	4.6%	4.4%		4.6%	4.7%	4.5%	4.5%	4.4%	4.4%	4.5%	4.6%	4.6%	
Biodiesel as per cent of DERV	2.3%	2.4%		2.1%	2.4%	2.9%	2.0%	2.9%	2.6%	1.9%	1.9%	2.5%	
Total biofuels as per cent of road fuels	3.2%	3.1%		3.0%	3.3%	3.5%	2.9%	3.4%	3.2%	2.8%	2.8%	3.2%	

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

Shares of road fuels - % change on quarter in previous year	**% change on quarter in previous year (-ve value is decrease)**								
Bioethanol as per cent of Motor Spirit	0.1%	-0.1%	0.0%	-0.1%	-0.2%	-0.3%	-0.1%	0.1%	0.1%
Biodiesel as per cent of DERV	-1.6%	-1.4%	-0.3%	0.2%	0.8%	0.2%	-0.9%	-0.1%	-0.4%
Total biofuels as per cent of road fuels	-1.0%	-0.9%	-0.2%	0.0%	0.4%	0.0%	-0.7%	-0.1%	-0.2%

Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2016

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 (LFs), for the four UK countries, the nine English regions, and, from 2014, UK Local Authorities.[1] [2] [3] It updates that published in the September 2016 edition of *Energy Trends*

These data are consistent with that published for the UK in Table 6.4 of the Digest of United Kingdom Energy Statistics 2017 (DUKES), and use similar categories[4]. 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, as well as those not eligible for support, such as pre-April 2002 large-scale hydro and energy from waste (non-CHP) schemes.

The tables in this, and previous *Energy Trends* articles, show snapshots of the position as at the time of publication, for the latest year (2016 in this case). Consistent time-series data for each year from 2003 (comparable to the data shown in Tables 1 to 3), and Local Authority data from 2014, are available as Excel spreadsheets at:
www.gov.uk/government/statistics/regional-renewable-statistics.

Key points – 2016:

- England had the most renewable capacity and generation, largely due to the three biomass units[5] at Drax in Yorkshire and the Humber.
- Scotland had the highest capacity per £ of GVA.
- Yorkshire and the Humber had the highest generation per £ of GVA.
- The highest technology growth in capacity was solar PV, notably in the South-West, driven by large-scale schemes supported by the RO. Next highest was onshore wind, primarily in Scotland, followed by biomass and waste, with Yorkshire and the Humber the largest, and then offshore wind in the North West.
- The largest new schemes in 2016 were as follows - offshore wind: Burbo Bank Extension (200 MW); onshore wind: Dunmaglass (94 MW), Corriegarth (69 MW), Dersalloch (69 MW); solar PV: Shotwick (72 MW), Swindon (61 MW), Sandridge (50 MW); biomass and waste: Brigg REP (55 MW), Snetterton (45 MW), Wilton International 11 (50 MW).
- For the second consecutive year (in 17 years), England had the highest onshore wind load factor (and Scotland the lowest due to significant outages and curtailments at some large Scottish wind farms).

UK country summary

Table 1 and Chart 1 show that there were 5,073 non-PV sites in England generating electricity from renewable sources, with 3,735 non-PV sites in Scotland, 834 in Wales and 1,093 in Northern Ireland. In addition, there were 677,632 PV sites reported for England, 53,027 for Scotland, 51,998 for Wales and 22,779 for Northern Ireland[6].

[1] Offshore wind is allocated to the region to which its output is connected. The exception is Robin Rigg which comes ashore at Seaton, Cumbria but whose generation is associated with Scotland.
[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.
[5] The third biomass unit operated as high-range co-firing for most of the year, fully converting to biomass in late December 2016.
[6] No geographical information was available for a further 94,654 PV schemes, 862 wind schemes, 321 hydro schemes and 143

Table 1: Number of sites generating electricity from renewable sources, 2016[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	**3,761**	**3,737**	**24**	**2**	**677,632**	**277**	**363**	**166**	**283**	**221**	**5,073**	**682,705**
East Midlands	389	386	3	-	80,595	25	39	15	42	25	535	**81,130**
East of England	851	845	6	-	96,257	6	69	14	40	21	1,001	**97,258**
North East	260	258	2	-	44,357	11	20	7	9	10	317	**44,674**
North West	471	464	7	-	79,117	52	49	24	28	39	663	**79,780**
London	31	31	-	-	21,658	-	5	10	5	13	64	**21,722**
South East	106	102	4	-	102,099	18	70	33	18	25	270	**102,369**
South West	745	745	-	1	112,190	106	39	18	49	18	976	**113,166**
West Midlands	162	162	-	-	63,574	20	30	20	60	36	328	**63,902**
Yorkshire and the Humber	746	744	2	1	77,785	39	42	25	32	34	919	**78,704**
Northern Ireland	**935**	**935**	**-**	**-**	**22,779**	**66**	**16**	**2**	**59**	**15**	**1,093**	**23,872**
Scotland	**3,144**	**3,141**	**3**	**11**	**53,027**	**464**	**46**	**8**	**27**	**35**	**3,735**	**56,762**
Wales	**571**	**568**	**3**	**1**	**51,998**	**189**	**25**	**16**	**14**	**18**	**834**	**52,832**
Other Sites	862	862	-	-	94,654	321	-	-	143	-	1,326	**95,980**
UK Total	**9,273**	**9,243**	**30**	**14**	**900,090**	**1,317**	**450**	**192**	**526**	**289**	**12,061**	**912,151**

For notes to Table 1 and 2, see below Table 3

Table 2: Installed capacity of sites generating electricity from renewable sources, 2016[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	**7,111.1**	**2,731.0**	**4,380.1**	**0.1**	**9,503.5**	**34.4**	**879.3**	**237.4**	**255.9**	**3,639.9**	**21,661.5**
East Midlands	842.9	378.5	464.4	-	1,260.2	4.2	68.0	20.3	49.3	149.5	**2,394.3**
East of England	1,513.8	449.0	1,064.8	-	1,795.2	0.1	185.5	17.6	43.5	189.3	**3,745.0**
North East	460.2	393.8	66.4	-	191.0	7.8	45.0	11.5	16.2	158.8	**890.4**
North West	1,711.4	425.4	1,286.0	-	410.9	7.4	134.8	31.4	28.8	182.1	**2,506.9**
London	11.3	11.3	-	-	93.4	-	25.8	58.7	5.6	187.7	**382.4**
South East	1,170.1	100.6	1,069.5	-	1,849.3	0.7	166.6	32.0	19.5	298.5	**3,536.7**
South West	310.6	310.6	-	-	2,806.2	9.9	100.5	14.6	36.7	108.9	**3,387.5**
West Midlands	7.5	7.5	-	-	654.9	1.1	60.9	35.0	37.4	140.5	**937.4**
Yorkshire and the Humber	1,083.3	654.3	429.0	0.1	442.5	2.9	92.3	16.3	19.0	2,224.7	**3,881.0**
Northern Ireland	**885.7**	**885.7**	**-**	**-**	**135.2**	**9.6**	**18.9**	**0.2**	**31.9**	**30.8**	**1,112.3**
Scotland	**6,462.2**	**6,274.9**	**187.4**	**13.0**	**256.2**	**1,533.0**	**116.3**	**7.2**	**30.1**	**225.8**	**8,643.9**
Wales	**1,541.2**	**815.2**	**726.0**	**0.4**	**843.1**	**161.0**	**47.3**	**12.5**	**5.8**	**99.7**	**2,711.0**
Other Sites	216.7	216.7	0.0	0.0	1,160.8	96.9	0.0	0.0	96.6	-	**1,570.9**
UK Total	**16,216.9**	**10,923.5**	**5,293.4**	**13.5**	**11,898.7**	**1,834.8**	**1,061.9**	**257.3**	**420.3**	**3,996.2**	**35,699.7**
Co-firing[4]					-			-		13.4	**13.4**

For notes to Table 1 and 2, see below Table 3.

Table 3: Generation of electricity from renewable sources, 2016[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	**19,456.0**	**5,564.2**	**13,891.8**	**-**	**8,466.7**	**100.2**	**3,960.9**	**871.9**	**1,311.5**	**20,442.3**	**54,609.6**
East Midlands	2,302.2	804.6	1,497.5	-	1,139.0	14.5	281.6	92.8	260.5	690.0	**4,780.6**
East of England	4,489.7	939.8	3,549.9	-	1,641.4	0.3	838.0	67.7	243.1	879.8	**8,160.0**
North East	1,016.7	828.4	188.4	-	146.7	30.4	148.9	27.7	57.0	518.2	**1,945.6**
North West	4,450.1	885.1	3,565.1	-	353.2	20.1	466.9	121.0	113.8	749.9	**6,275.0**
London	14.9	14.9	-	-	79.8	-	165.5	140.8	29.7	617.5	**1,048.1**
South East	3,686.7	214.7	3,472.0	-	1,709.1	1.9	850.7	136.0	96.9	968.9	**7,450.2**
South West	589.6	589.6	-	-	2,481.5	22.2	467.4	56.1	193.5	138.0	**3,948.3**
West Midlands	14.2	14.2	-	-	539.2	3.0	313.8	155.8	215.3	444.6	**1,685.9**
Yorkshire and the Humber	2,891.9	1,272.9	1,619.0	-	376.8	7.9	428.1	74.0	101.6	15,435.5	**19,315.9**
Northern Ireland	**1,732.3**	**1,732.3**	**-**	**-**	**110.3**	**23.6**	**93.7**	**0.6**	**186.0**	**178.2**	**2,324.7**
Scotland	**12,340.5**	**11,838.1**	**502.4**	**0.0**	**221.6**	**4,765.0**	**492.8**	**32.0**	**125.5**	**1,232.4**	**19,209.8**
Wales	**3,400.9**	**1,389.4**	**2,011.5**	**-**	**714.0**	**307.5**	**155.5**	**45.8**	**31.5**	**484.2**	**5,139.3**
Other Sites	437.5	437.5	-	-	907.8	198.5	-	-	397.9	-	**1,941.7**
UK Total	**37,367.3**	**20,961.6**	**16,405.7**	**0.0**	**10,420.4**	**5,394.8**	**4,702.9**	**950.3**	**2,052.3**	**22,337.2**	**83,225.1**

Notes to Tables 1 to 3
Components may not add exactly to totals because of rounding.
1 As at 31 December 2016.
2 Offshore Wind is allocated to regions/countries where the cabling comes ashore.
3 Six 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 (87 per cent of the UK's bioenergy capacity) and PV capacity (80 per cent of the UK's PV capacity). For similar reasons, generation from renewable sources in England during 2016 was almost three 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 PV) in each region varies from 64 in London to 1,001 in the East of England (Table 1 and Chart 2). The highest capacity in England (including PV) is in Yorkshire and the Humber, followed by East of England and the South East (Table 2 and Chart 4). In Yorkshire and the Humber, 57 per cent of capacity is from biomass and waste (mostly from Drax dedicated biomass), 28 per cent from wind and 11 per cent is from PV. In the East of England, 48 per cent of capacity is from PV and 40 per cent is from wind (28 per cent offshore and 12 per cent onshore). In the South East, 52 per cent of capacity is from PV, 33 per cent from wind (30 per cent offshore and 3 per cent onshore) and 8 per cent from biomass and waste.

Chart 1: Number of sites by country[1]

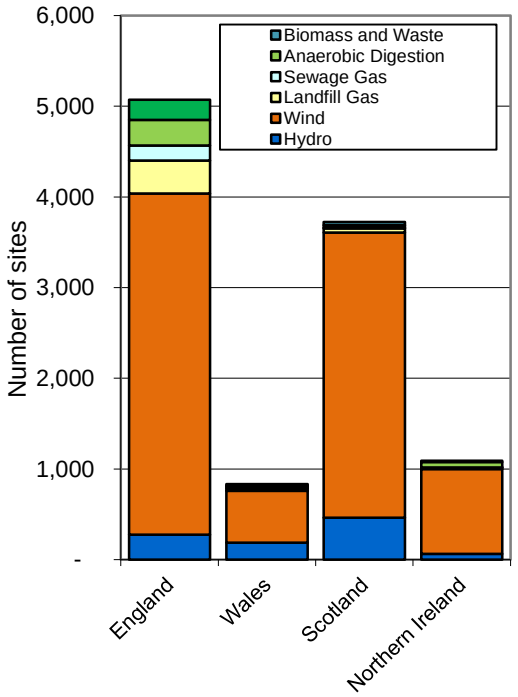
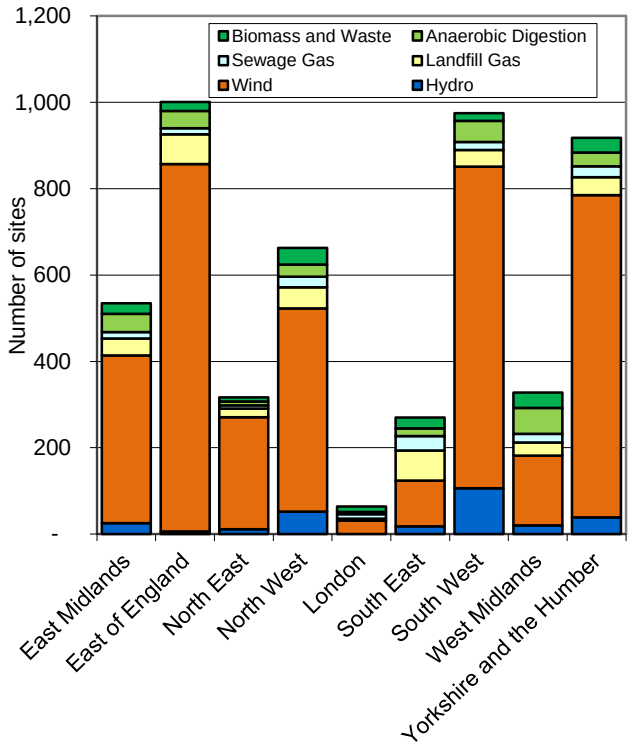


Chart 2: Number of sites by English region[1]



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 80 per cent of the total UK solar capacity and 81 per cent of the total UK generation. The South West accounts for 24 per cent of the total UK solar capacity (24 per cent of the generation), the South East 16 per cent (16 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[7].

In 2016, England had the most wind capacity and generation, at 44 per cent and 52 per cent of the UK, respectively. Almost two-thirds of this is offshore (4.4 GW), which also represents 83 per cent of the UK's 5.3 GW of offshore capacity. Until 2016, England's Westermost Rough (in the North Sea) utilised the largest turbines, at 6 MW each; however, these have now been superseded by the 8 MW turbines of the Burbo Bank Extension (in the Irish Sea). Figure 1 displays how wind installations are spread across the UK.

Scotland had 40 per cent of the UK's wind capacity and 33 per cent of the output (Tables 2 and 3; Charts 5a, 5b, 9a and 9b). Of Scotland's wind capacity, 97 per cent was from onshore wind, up one percentage point on 2015; this comprises 3,141 sites, including the UK's largest, Whitelee, at 539 MW. Other regions with high shares of UK wind are: the North West, with 7.9 percent of offshore (10 per cent of generation), including the first 200 MW of the extension to the existing 90 MW at Burbo Bank[8], and 2.6 per cent of onshore capacity (2 per cent of generation); Wales, with 5 per cent of onshore capacity (4 per cent of generation) and 4.5 per cent of offshore capacity (5 per cent of generation); East of England, with 6.6 per cent of offshore capacity (9 per cent of generation), including Greater Gabbard (504 MW) and Sheringham Shoal (316 MW), and 2.8 per cent of onshore capacity (3 per cent of generation) (Tables 2 and 3).

Ninety-two per cent of UK generation from sewage in 2016 took place in England. The major sewage gas generating regions were: the West Midlands (16 per cent), London (15 per cent), the South East (14 per cent) and the North West (13 per cent). This is reflected in capacity terms with London being the highest (23 per cent), followed by the West Midlands (14 per cent), the North West jointly with the South East (12 per cent).

Eighty-four per cent of the UK generation from biomass and waste (including that used for co-firing) took place in England, with Yorkshire and the Humber having the largest share (63 per cent) mostly from Drax, followed by Scotland (5 per cent) and the East of England jointly with the South East (4 per cent). Excluding bioenergy sources used for standard co-firing (see note 4 to Table 2), Yorkshire and the Humber has the largest capacity to generate from biomass and waste (50 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 (5 per cent).

[7] JRC Solar radiation and photovoltaic electricity potential http://re.jrc.ec.europa.eu/pvgis/cmaps/eu_cmsaf_opt/G_opt_UK.png. More detailed analysis also available from Met Office www.metoffice.gov.uk/renewables/solar

[8] This will be 259 MW on completion in 2017.

Chart 3: Renewable capacity by country

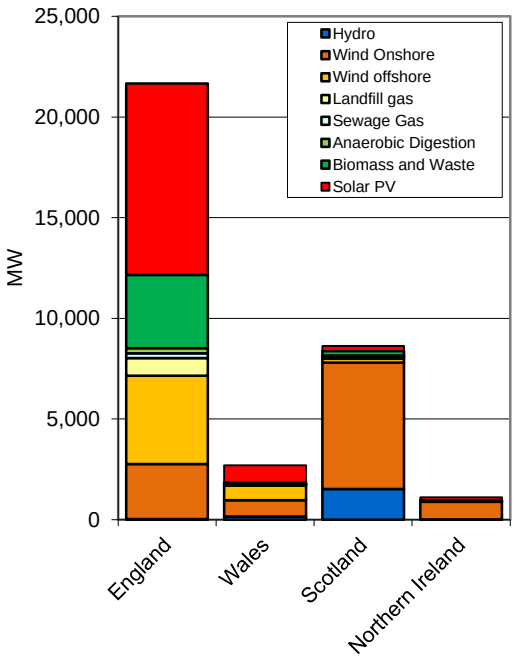


Chart 4: Renewable capacity by English region

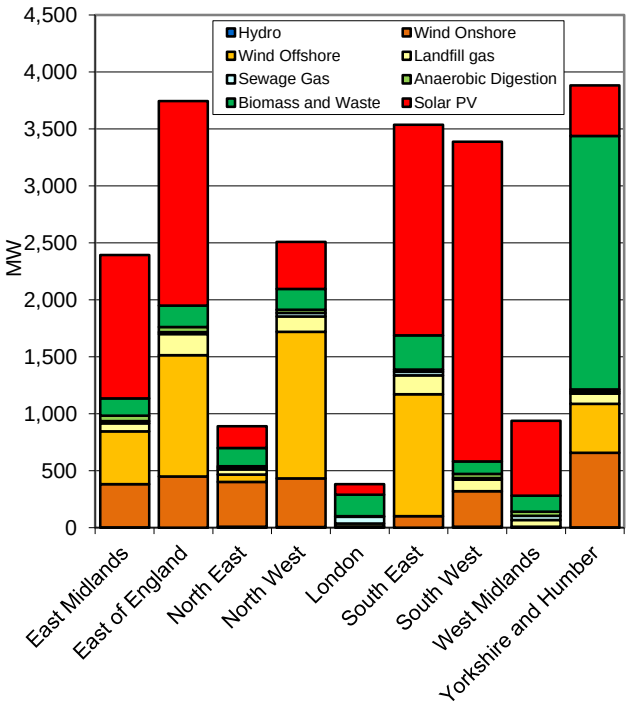


Chart 5a: Onshore wind capacity by country

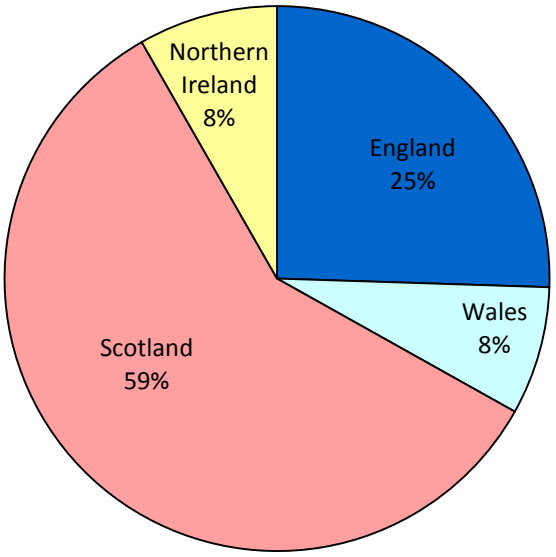


Chart 5b: Offshore wind capacity by country

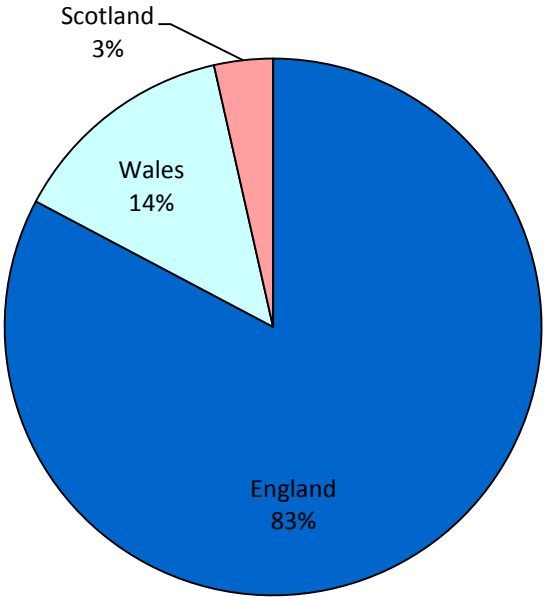


Chart 6a: Onshore wind capacity by English region

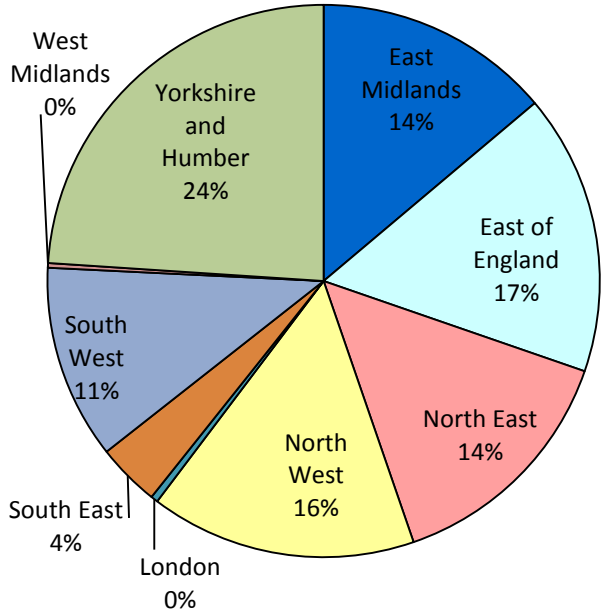


Chart 6b: Offshore wind capacity by English region

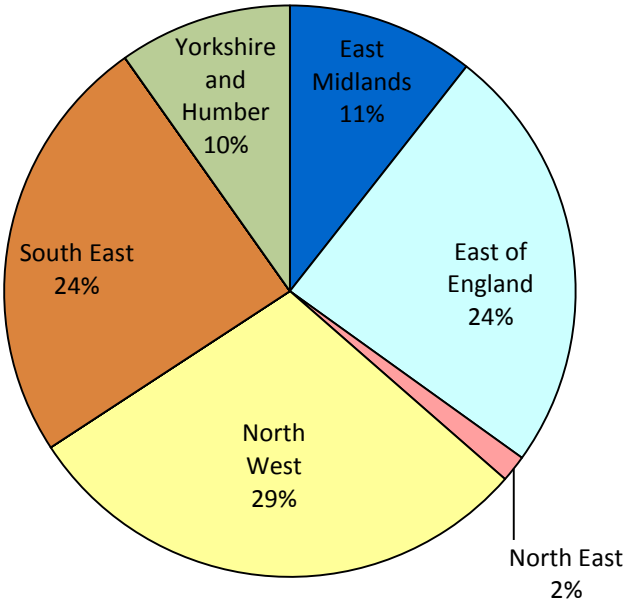


Chart 7: Renewable generation by country

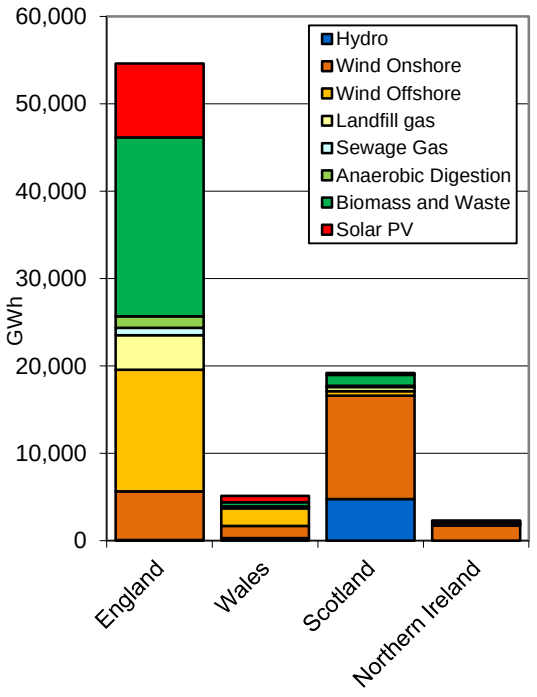


Chart 8: Renewable generation by English region

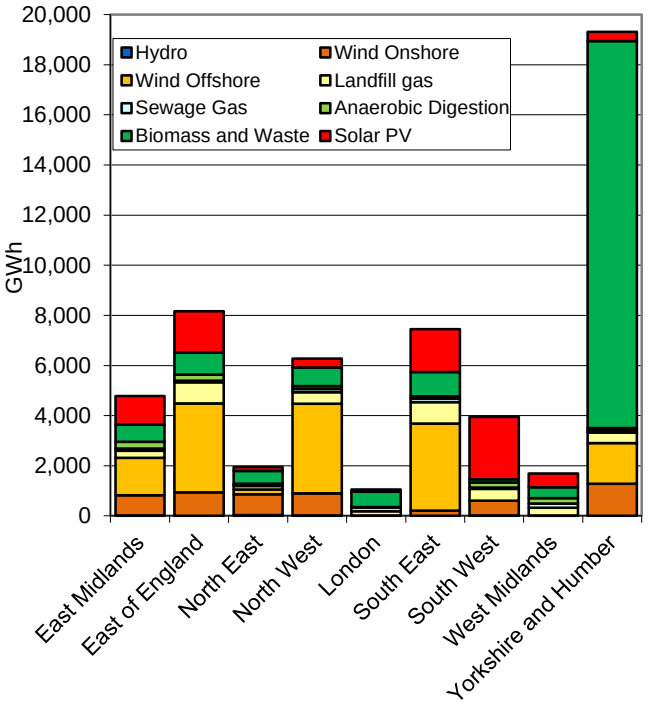


Chart 9a: Onshore wind generation by country

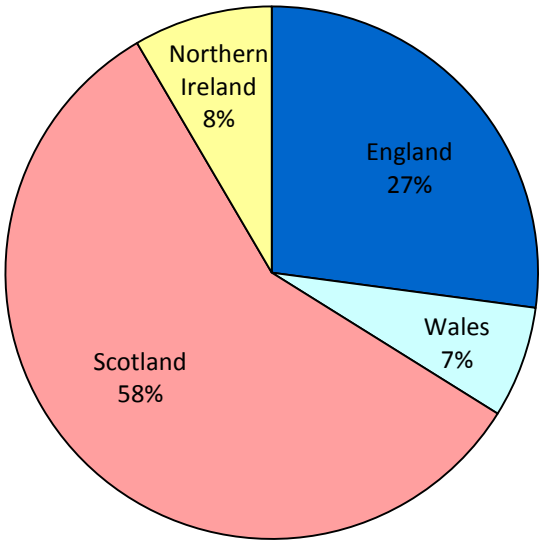


Chart 9b: Offshore wind generation by country

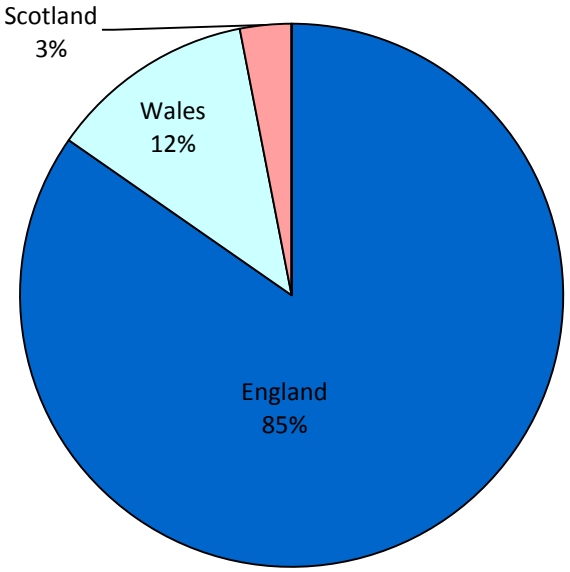


Chart 10a: Onshore wind generation by English region

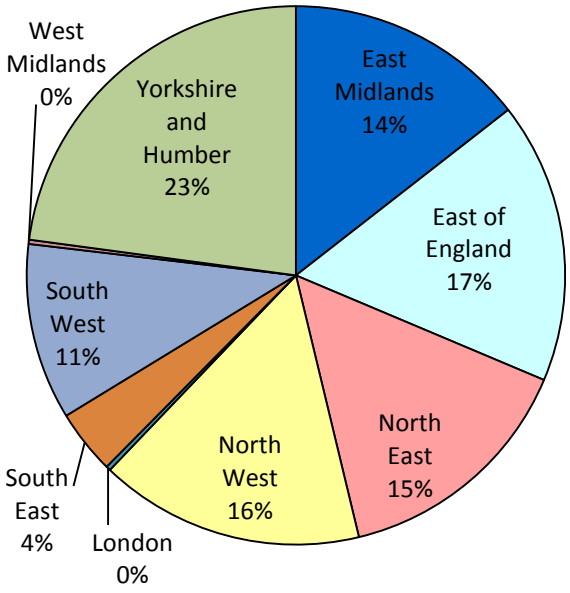
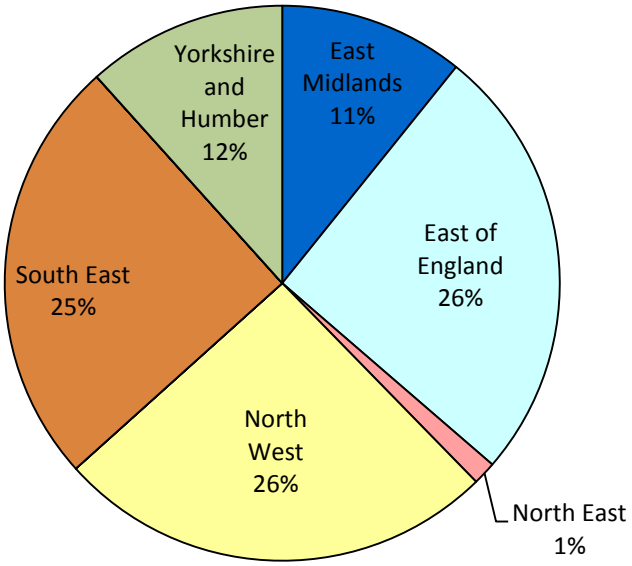


Chart 10b: Offshore wind generation by English region



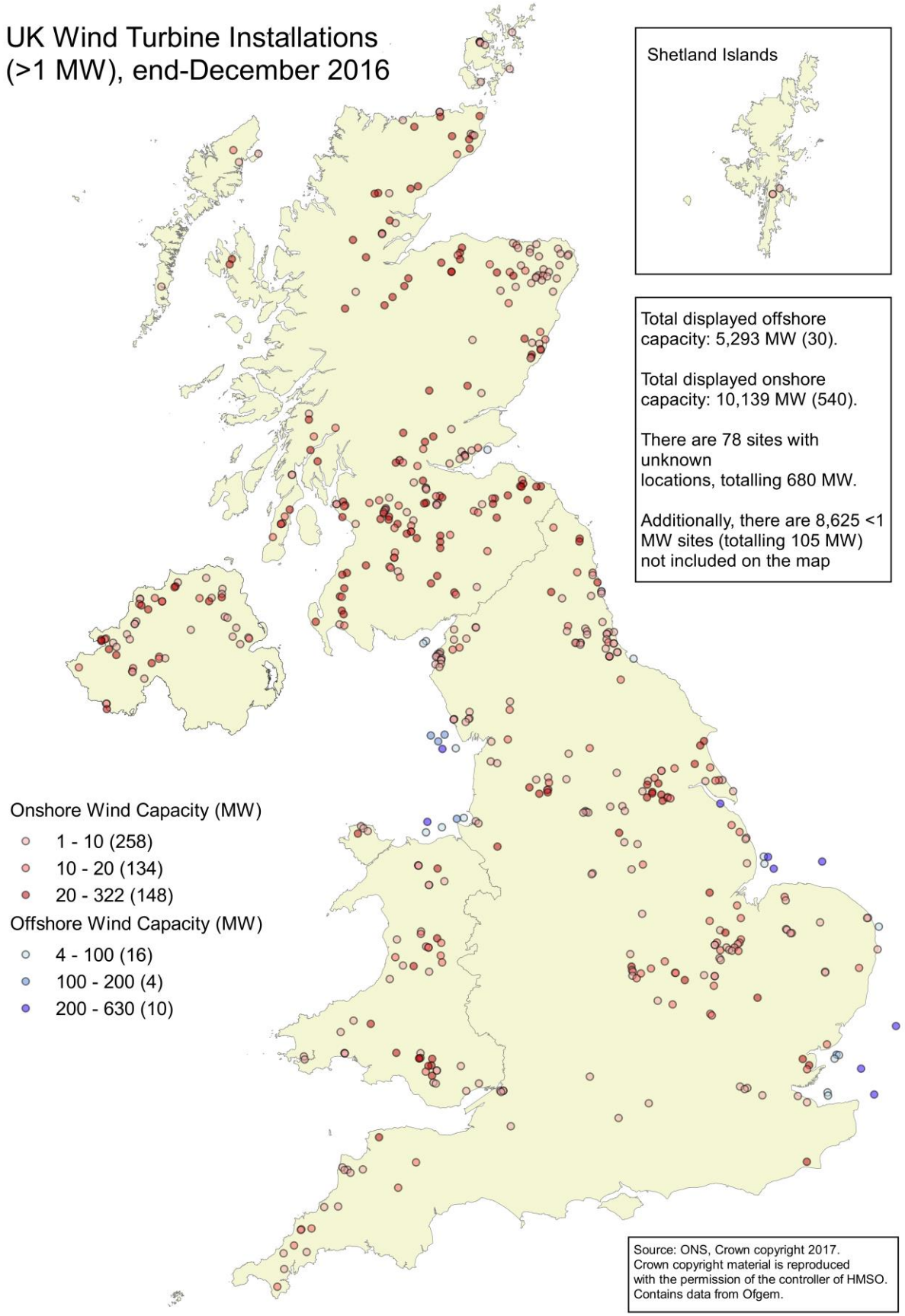


Figure 1: UK wind turbine installations (> 1 MW), by capacity band, December 2016

Regional trends: 2016

Across the year, Scotland (+979 MW), South West (+562 MW), Wales (+413 MW), East of England (+399 MW), South East (+381 MW), East Midlands (+357 MW) and the North West (+351 MW) have all shown considerable growth in generating capacity.

The growth in overall renewables capacity in these regions has primarily come from solar (46 per cent) and onshore wind (28 per cent). Table 4 summarises the key contributors to capacity growth in 2016 for each region.

The rapid uptake of solar in 2016 was again primarily driven by the pending closure of RO to certain schemes (in March 2016, this was grace period large-scale schemes, as well as non-grace period small-scale schemes), as well as the reform to the FiT financial support mechanisms in February 2016, and decreasing technology costs. Several large solar farms were built in 2016, including Shotwick (72 MW) and Swindon (61 MW).

Onshore wind and offshore wind capacity has increased by 35 per cent and 4.2 per cent, respectively, due to new schemes, such as the first 156 MW of Pen y Cymoedd [9] in Wales, Dunmaglass (94 MW) in Scotland, and the Burbo Bank Extension (200 MW).

Biomass and waste capacity has grown by 7.4 per cent. This year has seen the addition of two new straw-fired power stations in Yorkshire and the Humber (Brigg 55 MW) and Eastern (Snetterton 45 MW). All four UK operational straw-fired stations are in the eastern part of England coinciding where the most straw arises because of the high levels of arable farming in this area.

Regional trends: 2003-2016

Between 2003 and 2016, there was a 932 per cent increase in overall **capacity** from renewables in the UK. Faster rates of growth were recorded in individual regions. These include Yorkshire and the Humber (3,083 per cent), primarily due to Drax, the East Midlands (2,927 per cent) due to PV and wind, the South West (2,773 per cent) from primarily PV, Northern Ireland (2,193 per cent) from mainly onshore wind, the South East (2,104 per cent) and the East of England (1,349 per cent) both mainly from PV and offshore wind, the North West (1,181 per cent) from offshore wind, and the North East (1,001 per cent) from onshore wind (see charts 11 and 12).

Between 2003 and 2016, there was a 685 per cent increase in overall **generation** from renewables in the UK, but faster rates of growth were recorded in Yorkshire and the Humber (2,866 per cent), Northern Ireland (2,129 per cent), the East Midlands (1,005 per cent), the South East (840 per cent) and the South West (772 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. Furthermore, there was very little use of some technologies in some regions driven primarily by the resource availability (e.g., wind in London and hydro in the East of England).

[9] 228 MW when complete in 2017

Table 4: Regional capacity growth, 2016

Region	Key Technology	Growth (MW)	Key Schemes
East Midlands	Solar PV	240	Copley Farm, Lincoln (Skegness), Danes Farm - extension
	Biomass and Waste	63	Balderton, Spalding
	Onshore Wind	54	Mainly medium and small-scale projects
East of England	Solar PV	293	SPD2 Hall Farm, South Creake, Rose and Crown, Royston, Vine Farm
	Biomass and Waste	54	Snetterton
	Onshore Wind	52	Wryde Croft
North East	Solar PV	45.5	Mainly medium and small-scale projects
	Onshore Wind	26.4	North Steads, Wingates
North West	Offshore Wind	200	Burbo Bank Extension (Burbo Bank 2)
	Onshore Wind	62	Frodsham Wind Farm
London	Solar PV	5.3	Primarily FiT
	Sewage gas	5.2	Riverside STW one scheme closed)
South East	Solar PV	326	Eveley
	Biomass and Waste	44	Ridham Dock
South West	Solar PV	462	Newton Ferrers, Swindon, SunE Troughton Farm, Sandridge
	Municipal Solid Waste Combustion	62	Cornwall Energy Recovery Centre, Severnside Energy Recovery Centre
West Midlands	Solar PV	157	PV Mount Farm, Charity Farm plus medium and small-scale proj
	Municipal Solid Waste Combustion	17	Birmingham Bio Power
Yorkshire and Humber	Onshore Wind	119	Goole Fields 2, Fraisthorpe, Twin Rivers
	Biomass and Waste	94	Brigg REP, Cross Green ERF
	Solar PV	60	Laceby
Northern Ireland	Onshore Wind	155	Long Mountain, Tievenameenta
	Solar PV	30	Mainly medium and small-scale projects
	AD	17	Small-scale projects
Scotland	Onshore Wind	916	Moy, A'Cruach, Black Law II, Dersalloch, Galawhistle, Dunmaglass, Harburnhead, Corriegarth
	Solar PV	36	Errol
	Biomass and Waste	21	Speyside CHP
Wales	Solar PV	216	Shotwick, plus mainly medium and small-scale projects
	Onshore Wind	183	Pen y Cymoedd

Chart 11: Trends in capacity from renewables by country

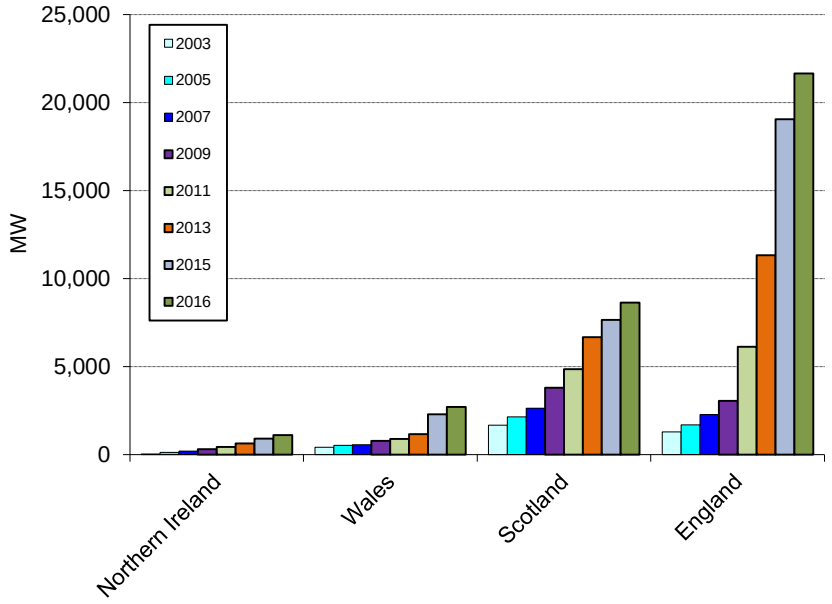


Chart 12: Trends in capacity from renewables by English region

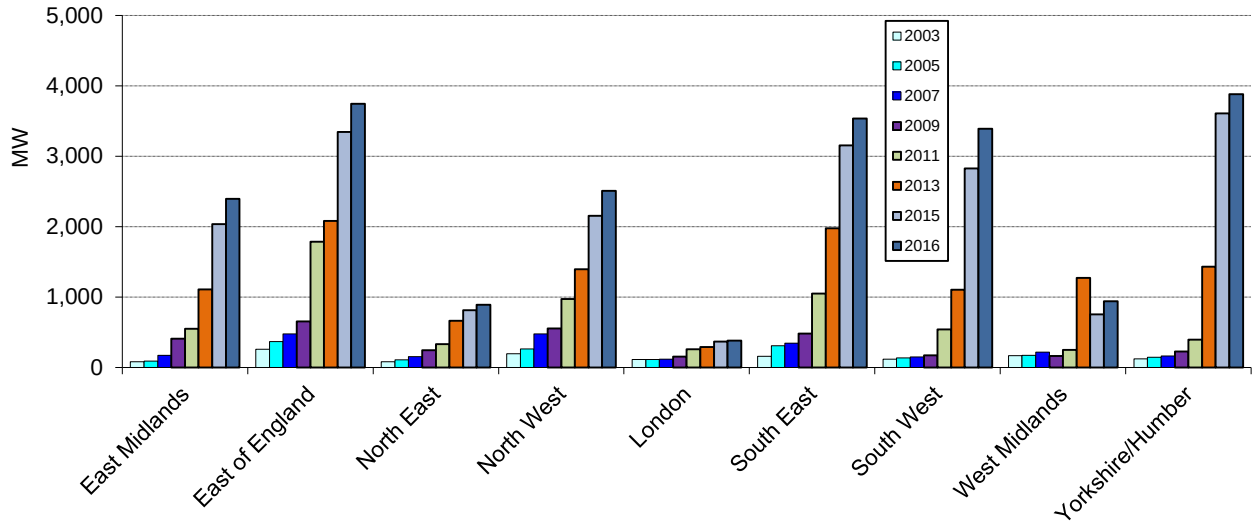


Chart 13: Trends in generation from renewables by country

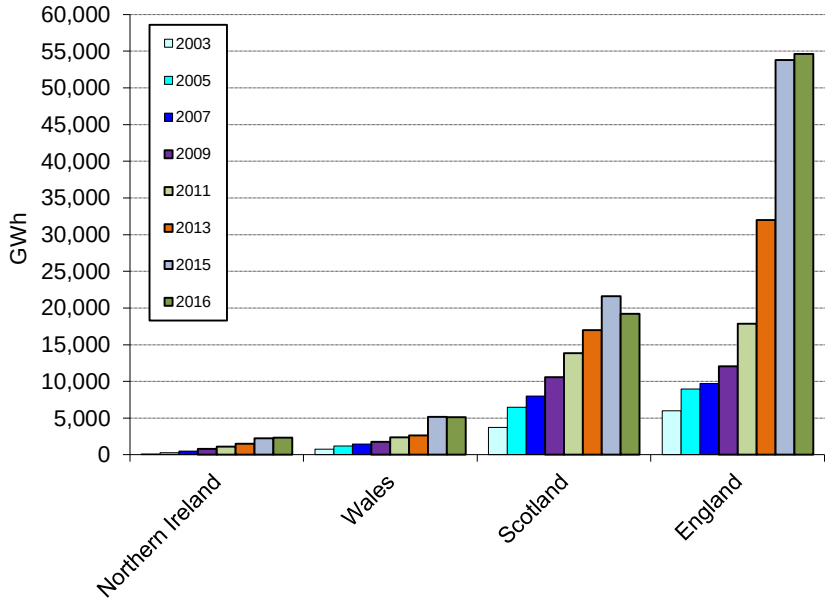
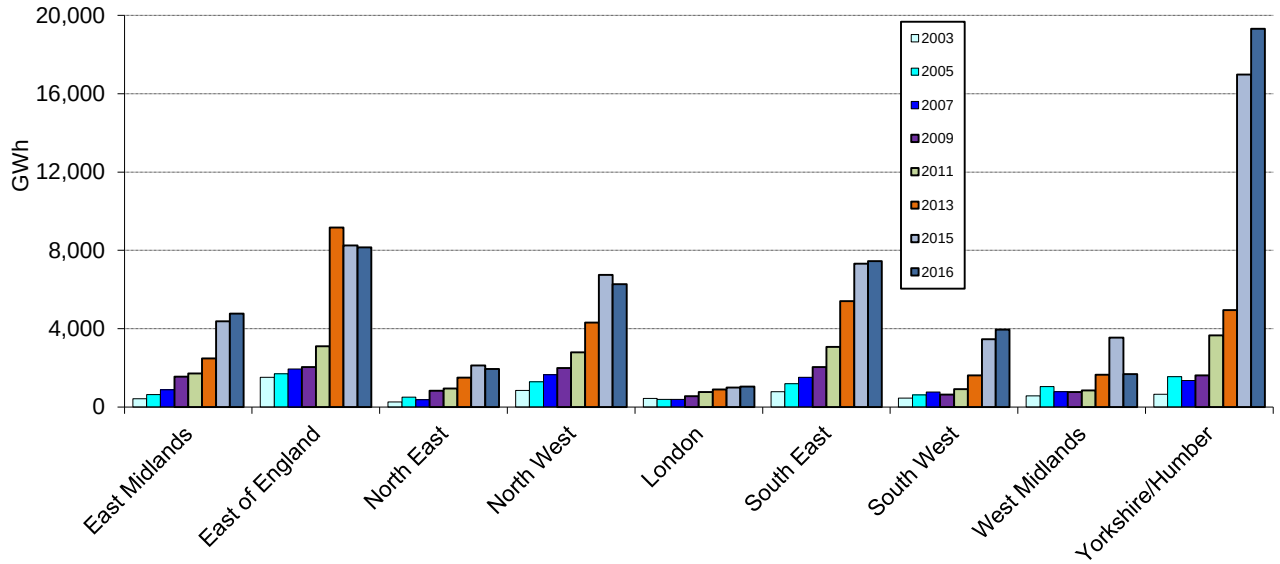


Chart 14: Trends in generation from renewables by English region

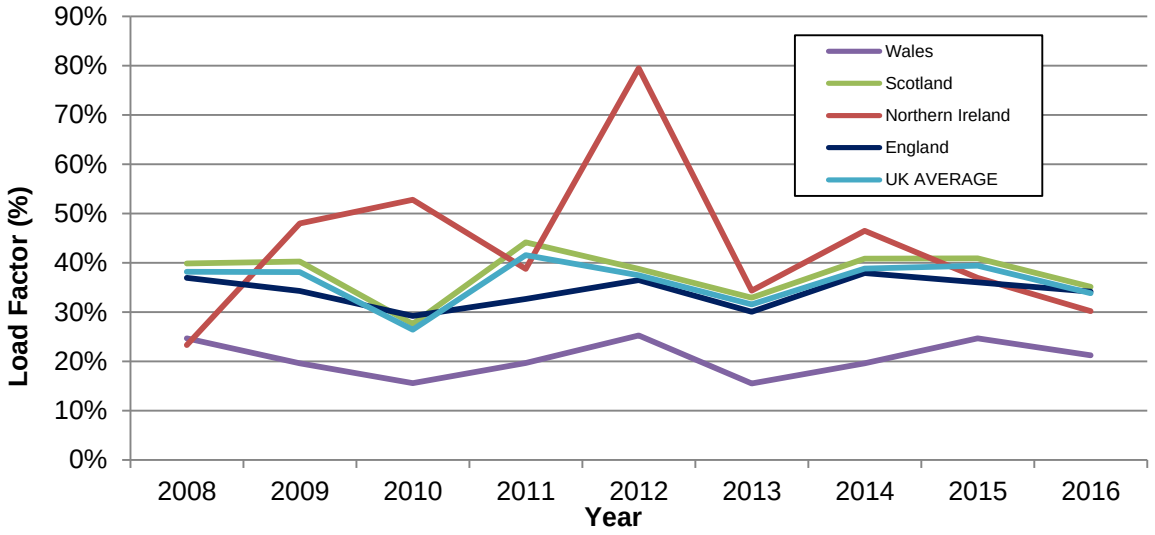


Load factor analysis

Load factors for the various technologies, presented on an unchanged configuration (UC) basis [10] [11], are shown in Table 5 from data provided in Tables 2 and 3 of this article[12], together with time-series data in several charts[13].

The load factors for hydro range from 42.5 per cent in the East Midlands to 13.0 per cent in the South East, with the UK average (mean) and median values for the UK overall of 33.8 and 31.6 per cent respectively. Rainfall for 2016 was much lower than for 2015 and the third lowest recorded over a 10-year period; again, this is reflected in the low LFs for hydro. Chart 15 shows the time series variation in load factors and whilst Scotland generally follow variations in annual rainfall, Wales, England and particularly Northern Ireland exhibit more unusual behaviour with a time lag following the record high rainfall in 2011.

Chart 15: Hydro load factor on an unchanged configuration basis, by UK country



Load factors for solar PV range from 9.3 per cent in Northern Ireland to 11.3 per cent in the South East, reflecting solar irradiance levels in the UK. The UK average is 10.8 per cent, with Wales occupying the median of 10.4 per cent. Average daily hours of sunshine in 2016 were less than that for 2015 with a correspondingly lower LF (Chart 16). There were insufficient reliable data with which to report on the performance of PV in Scotland.

[10] 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.

[11] A limitation of this analysis is the availability of Renewables Obligation Certificates (ROCs) data, which is often incomplete for the latest calendar year, when DUKES is compiled (April 2017 this year). This can have an impact on the schemes included in the unchanged configuration definition as new data could include or remove schemes.

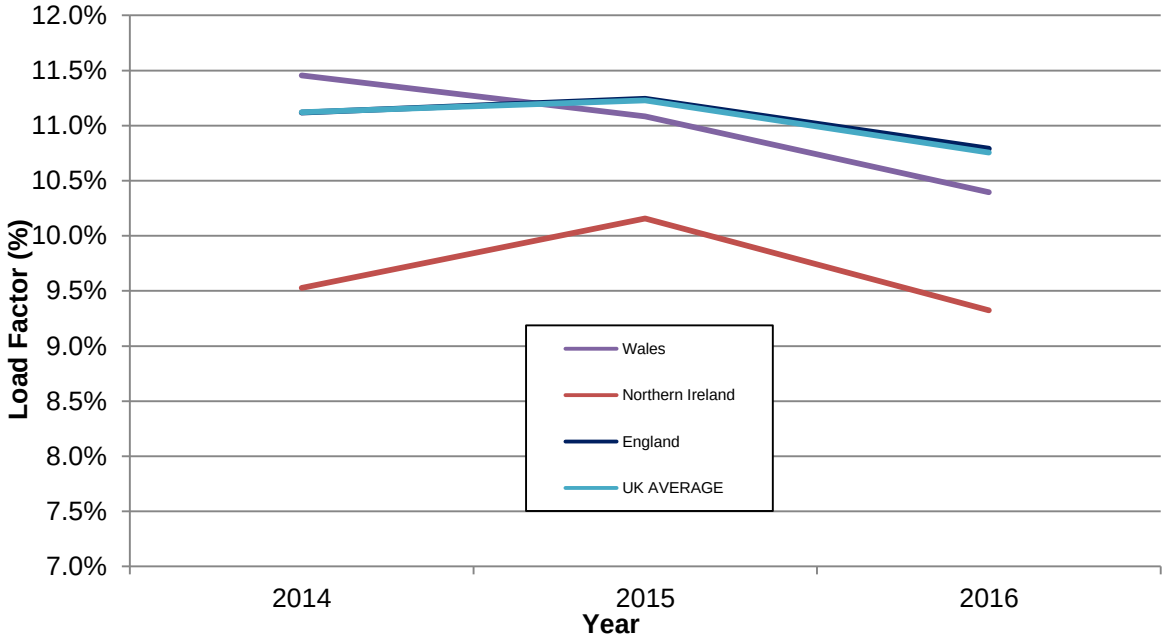
[12] The AD UCLF time series statistics have been separated out this year

[13] 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, 2016

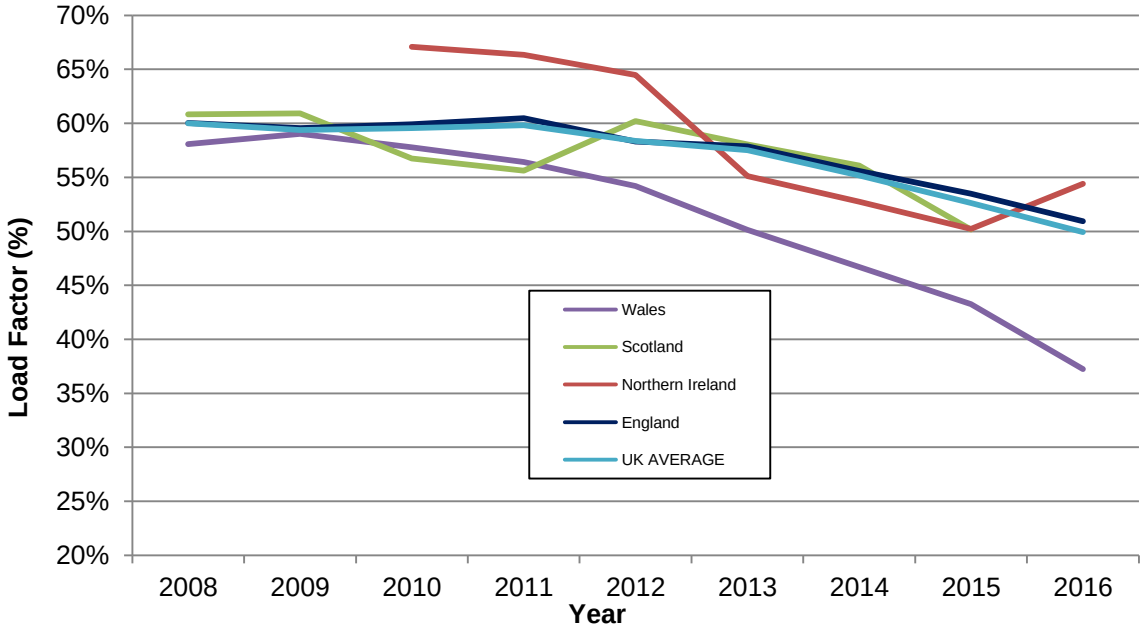
	Onshore Wind	Offshore Wind	Solar PV	Hydro	Hydro (small scale)	Hydro (large scale)	Landfill gas	Sewage gas	AD	Biomass and Waste
England	**25.4%**	**37.9%**	**10.8%**	**34.2%**	**32.5%**	**37.9%**	**50.9%**	**42.9%**	**58.0%**	**76.5%**
East Midlands	25.3%	36.7%	11.0%	42.5%	42.5%		46.4%	52.0%	75.9%	55.5%
East of England	25.3%	38.0%	10.9%				51.3%	43.9%	66.3%	78.2%
North East	25.0%	34.5%		42.2%	67.6%	37.9%	37.7%	26.7%	53.5%	68.6%
North West	27.5%	37.4%	10.5%	33.6%	33.6%		38.9%	44.1%	41.1%	65.7%
London			8.4%				76.1%	22.5%	34.3%	76.3%
South East	24.6%	37.0%	11.3%	13.0%	13.0%		58.3%	49.1%	48.4%	62.6%
South West	24.0%		10.5%	23.2%	23.2%		52.6%	43.9%	56.1%	27.1%
West Midlands			10.3%	26.0%	26.0%		58.7%	50.7%	77.7%	69.4%
Yorkshire and the Humber	25.0%	43.0%	9.6%	33.1%	33.1%		52.3%	53.9%	44.4%	81.0%
Northern Ireland	**25.3%**		**9.3%**	**30.2%**	**30.2%**		**54.4%**		**81.5%**	**68.3%**
Scotland	**23.5%**	**30.5%**		**35.2%**	**35.4%**	**35.1%**	**46.8%**	**50.3%**	**39.4%**	**70.8%**
Wales	**24.3%**	**31.5%**	**10.4%**	**21.2%**	**32.6%**	**19.5%**	**37.2%**	**42.0%**	**34.0%**	**67.0%**
UK AVERAGE	**24.2%**	**36.7%**	**10.8%**	**33.8%**	**34.6%**	**33.8%**	**49.9%**	**43.1%**	**59.4%**	**75.9%**
MEDIAN	25.0%	36.8%	10.4%	31.6%	32.8%	35.1%	51.8%	44.1%	51.0%	68.4%

Chart 16: PV load factor on an unchanged configuration basis, by UK country



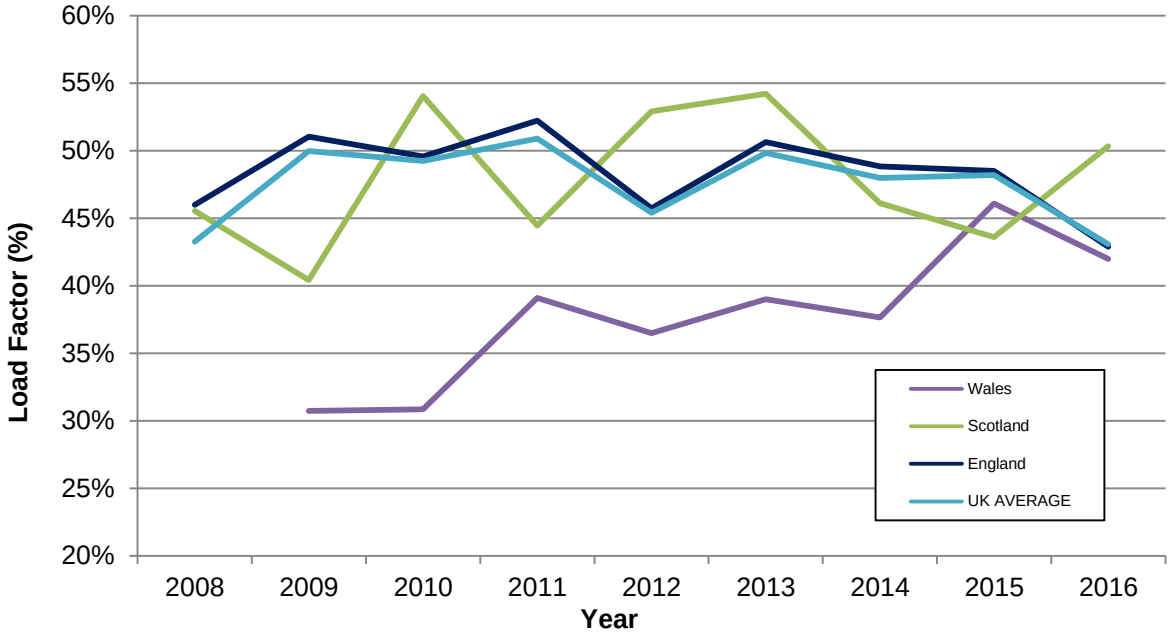
For landfill gas, the load factors vary from 76.1 per cent for London to 37.2 per cent in the Wales, with UK mean and median values of 49.9 and 51.8 per cent respectively. Chart 17 shows that for England, Wales and Scotland, the landfill gas load factor has been steadily decreasing each year and this 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 has been a growth in capacity and load factors as new sites have been exploited but this has now settled down to similar values to the rest of the UK.

Chart 17: Landfill gas load factor on an unchanged configuration basis, by UK country



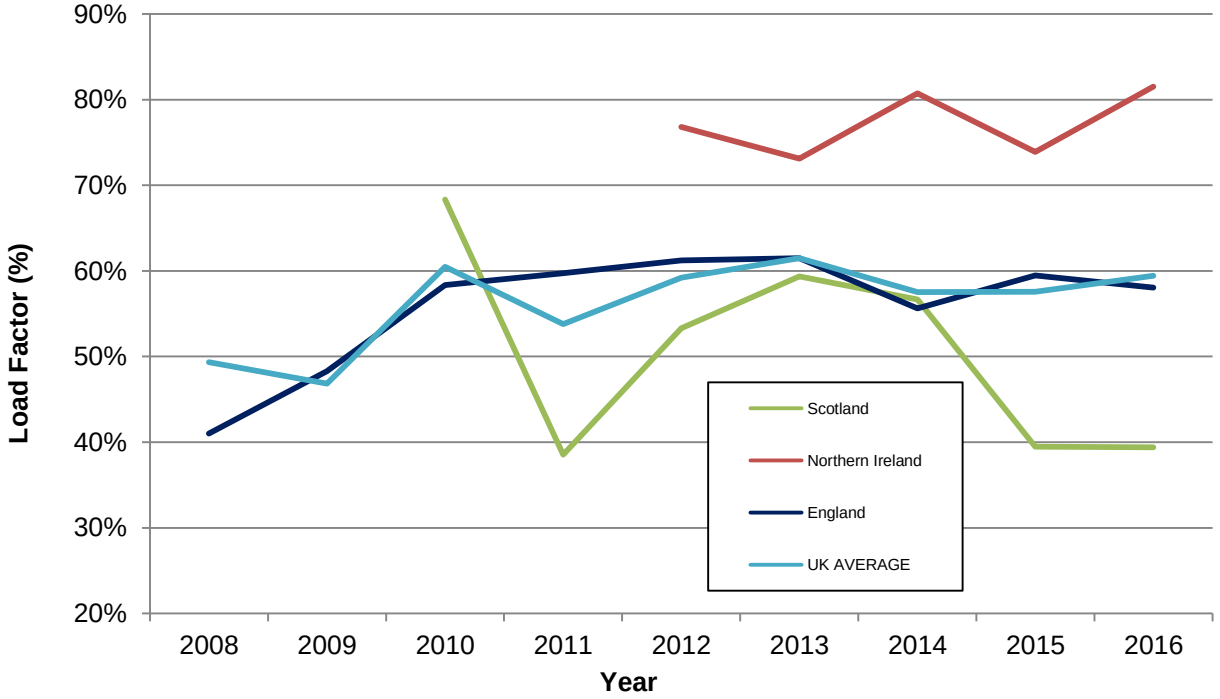
Sewage gas LFs generally fluctuate between about 40 to 50 per cent though historically there have been some unexplained low LFs for Wales, as well as extreme fluctuations in Scotland. There were insufficient reliable data with which to report on the time series performance of sewage gas in Northern Ireland.

Chart 18: Sewage gas load factor on an unchanged configuration basis, by UK country



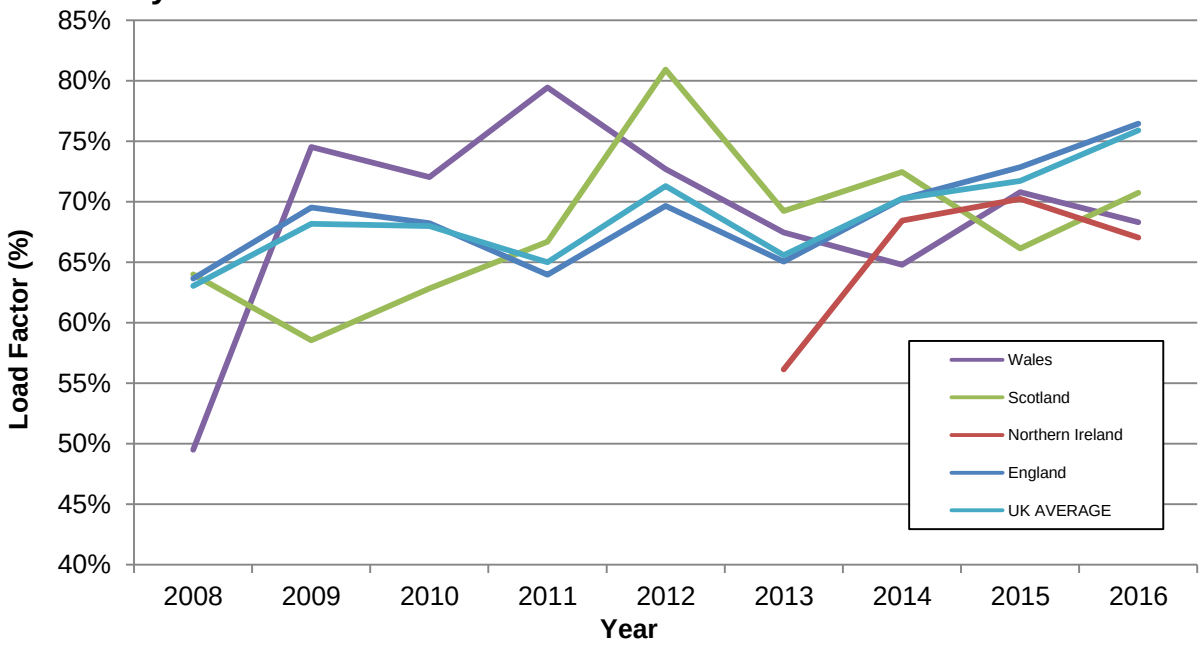
For Anaerobic Digestion (AD), LFs can vary significantly as, depending on the feedstock, full plant output post commissioning of new schemes is not fully achieved for between 3-6 months as shown by the variations in Chart 19. This year saw a 30 per cent increase in installed capacity and a UK LF of 59.4% represents the third highest recorded to date. There were insufficient reliable data with which to report on Wales. The LFs for Northern Ireland are high compared with GB data for reasons currently unknown.

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



Regional load factors for biomass and waste ranges from 81.0 per cent in the Yorkshire and the Humber (due to the high utilisation rates of Drax), to 27.1 per cent in the South West (due to the lower rates for several Advanced Conversion Technology (ACT) schemes in the region). Drax accounts for the higher average values for England in Chart 20.

Chart 20: Biomass and waste load factor on an unchanged configuration basis, by UK country



For onshore wind, the load factors ranged from 23.5 per cent in Scotland to 27.5 per cent in the North West, with the North East and Yorkshire and the Humber both occupying the median position at 25 per cent.

Chart 21 shows the annual variation in onshore wind load factors compared to the UK's average wind speed. [14] Since 2001, 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 2016 (8.3 knots) was 1.0 knot less that than for 2015 (9.3 knots), and the third lowest in the last sixteen years. This is reflected in correspondingly low load factors for onshore wind.

[14] 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 21: Annual variation in UK onshore wind load factor on an unchanged configuration basis and wind speed

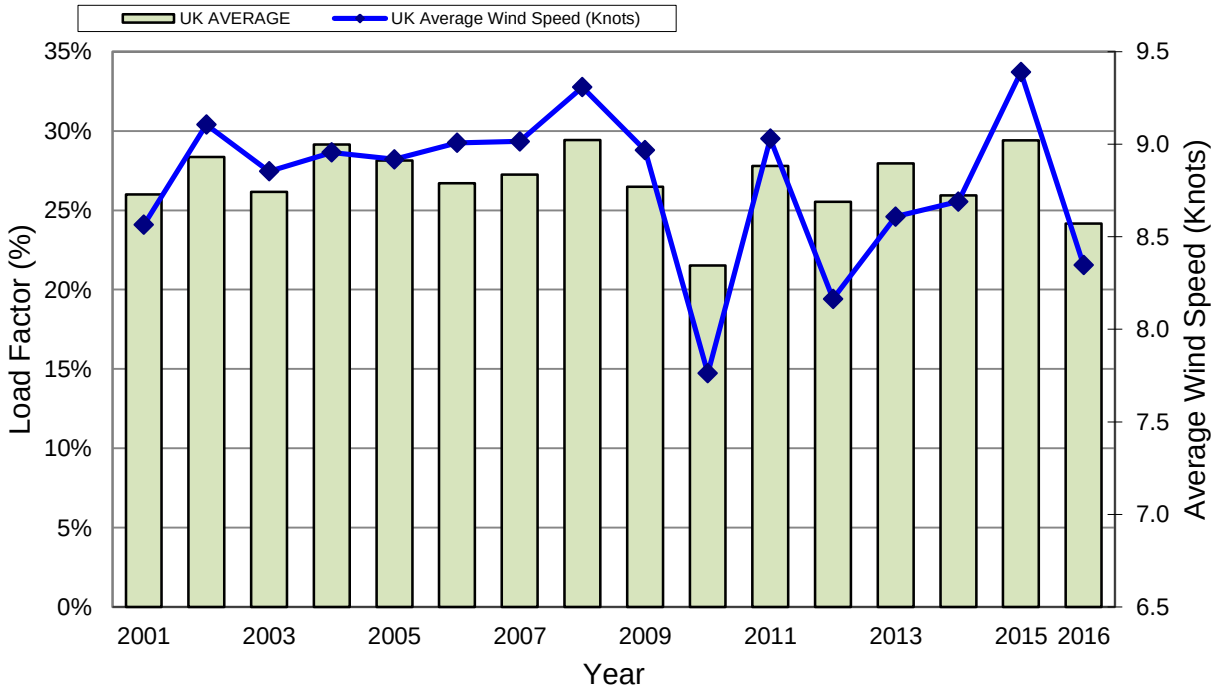
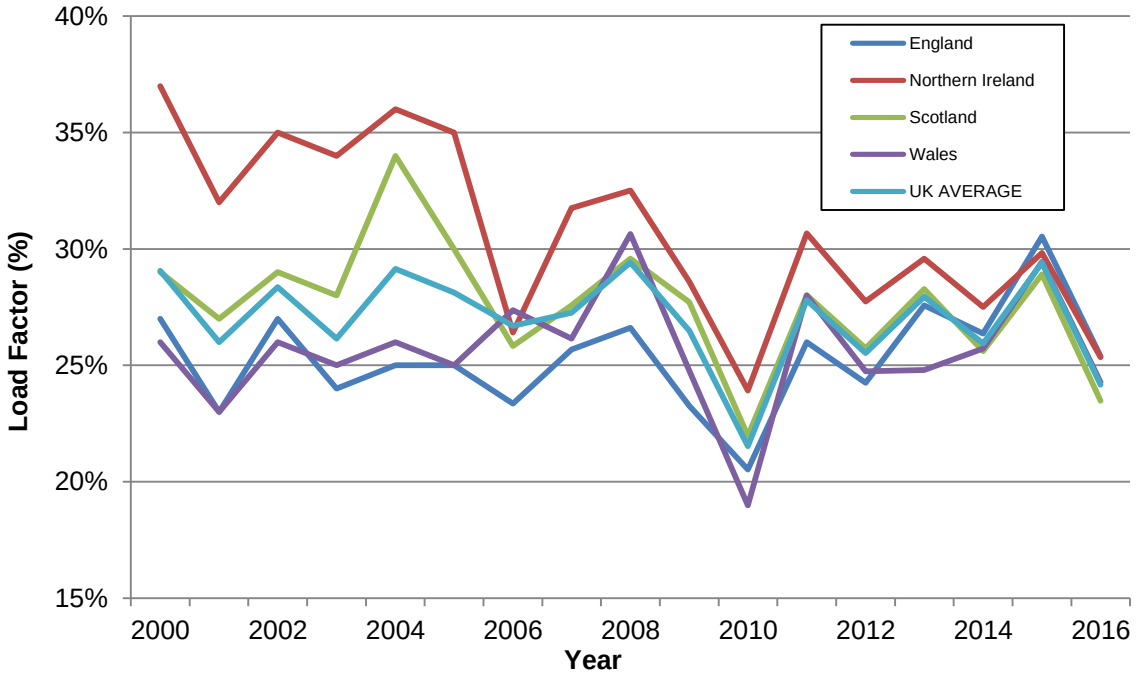


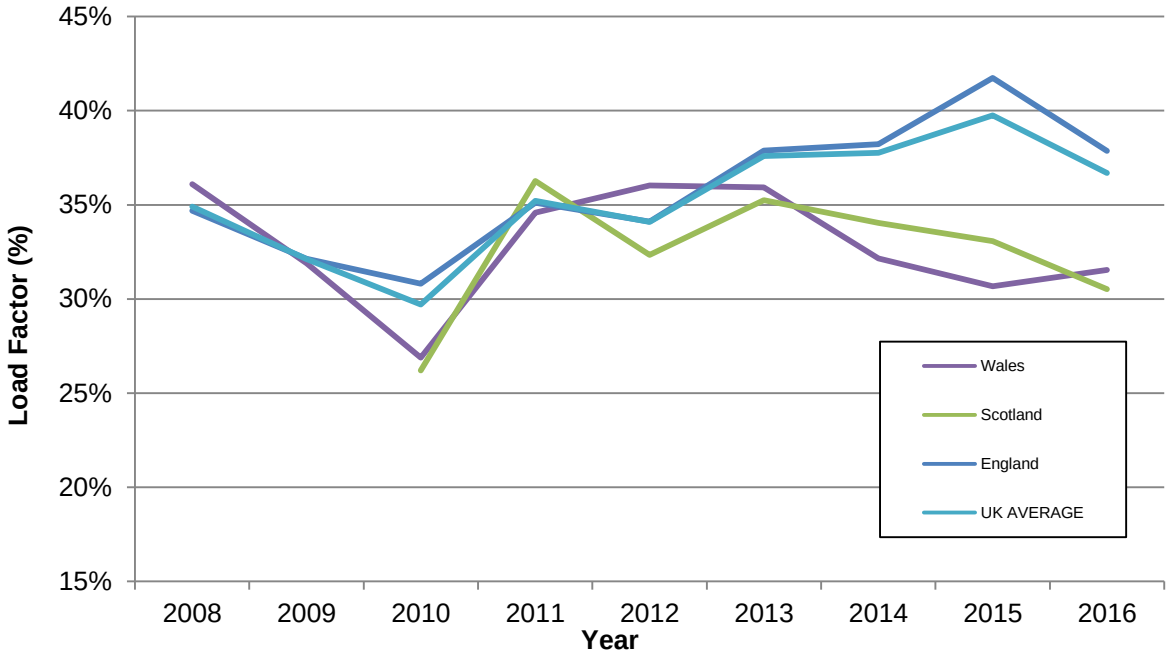
Chart 22 compares the onshore wind load factors for the four UK countries. For most of the sixteen years, the highest load factors have been experienced in the windier countries, Northern Ireland (averaging 30.8 per cent) followed by Scotland (averaging 27.6 per cent). However, in each of 2014 to 2016, 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 2016, English onshore wind farms continued to achieve, as per 2015, the highest load factor (25.4 per cent), with the North West the highest of the English regions, at 27.5 per cent.

Chart 22: Onshore wind load factor on an unchanged configuration basis, by UK country



Offshore wind load factors ranged from 30.5 per cent in Scotland to 37.9 per cent on average in England, with Yorkshire and the Humber achieving 43.0 per cent, driven by high-performing sites including Westermost Rough and Humber Gateway. The East Midlands (which includes Lynn, Inner Dowsing and Lincs) occupied the median position at 36.8 per cent. Chart 23 shows the effect of the variation in average wind speed data described above.

Chart 23: 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 (LA), per: number of installations, installed capacity, and generation for key technologies; this is also shown graphically in Charts 24 to 26.

For overall **number of sites**, Cornwall remains the top ranked, 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, AD and plant biomass are, respectively: The Orkney Islands, Cornwall, Highland, Thurrock, Shropshire and Dumfries and Galloway

Selby remains the top ranked for overall **capacity**, primarily from plant biomass, since this LA contains Drax power station (including three 645 MW biomass units). In terms of installed capacity of individual technologies, the top ranking LAs for onshore wind, PV, hydro, landfill gas, AD and plant biomass are, respectively: Highland, Cornwall, Highland, Thurrock, Shropshire and Selby.

The order of top ranked LAs for capacity is also reflected in the **generation** figures

Cornwall and Wiltshire have large numbers of PV sites with correspondingly high capacity and generation and represent 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, but little capacity or generation. This large number of small schemes probably represents the promotion of domestic installations.

Highlands overall capacity and generation is driven by the construction of large-scale wind farms. Whilst the Orkneys has the most number of wind sites, almost three times that of Highlands, it has little capacity or generation; being 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 is resolved.

Shropshire and Herefordshire show the highest number of AD facilities as well as high capacity and generation, reflecting the high availability of AD feedstock due to the livestock farming undertaken in these Districts.

Chart 24: Top five Local Authorities ranked by number of sites

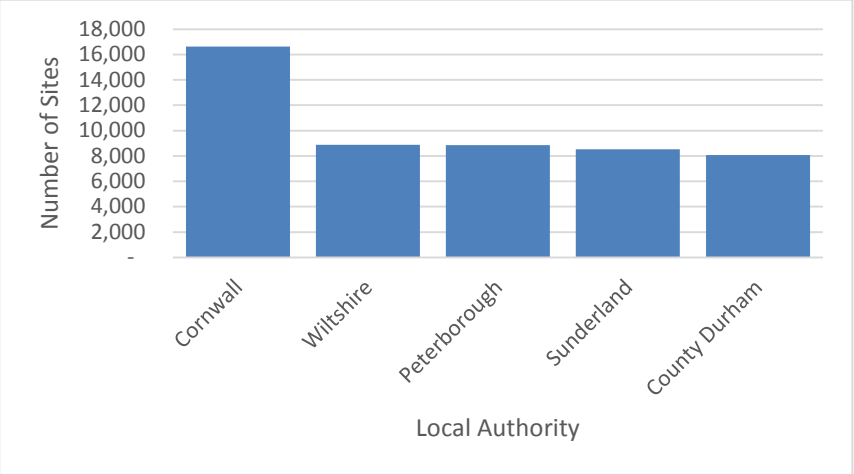


Chart 25: Top five Local Authorities ranked by capacity

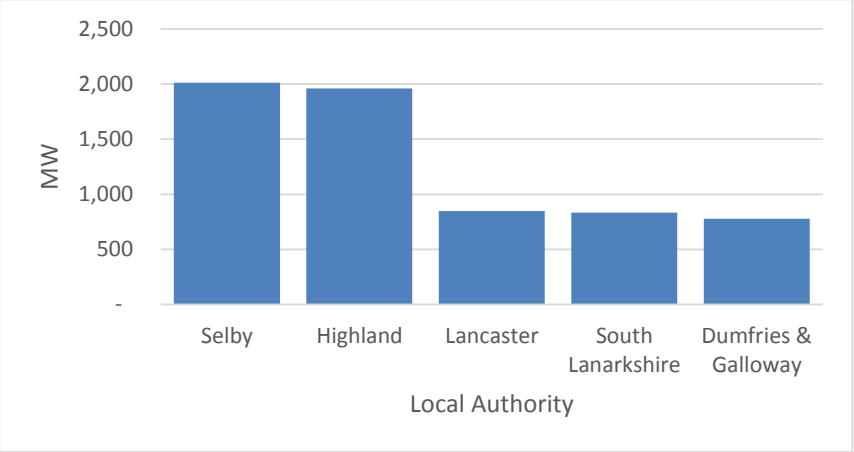


Chart 26: Top five Local Authorities ranked by generation

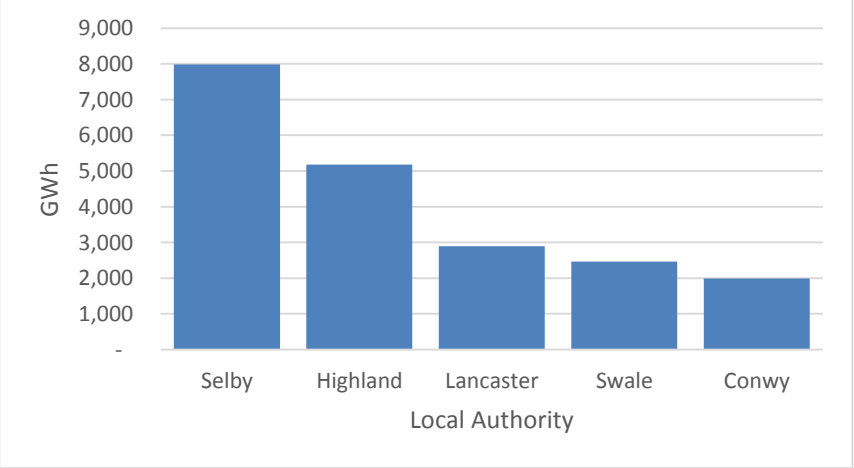


Table 6: Local Authority: Number of sites generating electricity from renewable sources, 2016[1]

Onshore Wind		Solar PV		Hydro		Landfill gas		Anaerobic Digestion		Plant Biomass		Total [2]	Number
Orkney Islands	760	Cornwall	16,215	Highland	162	Thurrock	10	Shropshire	29	Dumfries & Galloway	10	Cornwall	**16,624**
Aberdeenshire	486	Peterborough	8,848	Argyll & Bute	77	North Lanarkshire	9	Herefordshire	18	Tameside	7	Wiltshire	**8,870**
Cornwall	382	Wiltshire	8,846	Dumfries & Galloway	67	Doncaster	8	Strabane	12	Oldham	6	Peterborough	**8,855**
Dumfries & Galloway	270	Sunderland	8,525	Perth & Kinross	60	Warrington	8	East Riding of Yorkshire	8	Sheffield	6	Sunderland	**8,534**
Highland	235	County Durham	7,948	Gwynedd	56	Wiltshire	8	Dumfries & Galloway	7	Herefordshire	5	County Durham	**8,059**
								West Dorset	7				
UK Total	**9,243**		**900,090**		**1,316**		**450**		**526**		**224**		**912,151**

Table 7: Local Authority: Installed capacity of sites generating electricity from renewable sources, 2016[1]

MW

Onshore Wind		Solar PV		Hydro		Landfill gas		Anaerobic Digestion		Plant Biomass		Total [2]	
Highland	1,186	Cornwall	553	Highland	734	Thurrock	44	Shropshire	14	Selby	1,957	Selby	**2,010**
South Lanarkshire	792	Wiltshire	533	South Lanarkshire	283	Central Bedfordshire	33	Newark and Sherwood	10	Fife	77	Highland	**1,960**
Scottish Borders	591	South Cambridgeshire	278	Scottish Borders	266	Warrington	32	Herefordshire	8	Slough	63	Lancaster	**849**
Aberdeenshire	505	Pembrokeshire	186	Aberdeenshire	152	North Lanarkshire	27	South Ayrshire	7	North Lincolnshire	55	South Lanarkshire	**833**
South Ayrshire	409	North Norfolk	183	South Ayrshire	70	Aylesbury Vale	21	East Lindsey	7	Allerdale	50	Dumfries & Galloway	**780**
UK Total	**10,921**		**11,890**		**1,835**		**1,062**		**420**		**2,850**		**35,702**

Table 8: Local Authority: Generation of electricity from renewable sources, 2016[1]

GWh

Onshore Wind		Solar PV		Hydro		Landfill gas		Anaerobic Digestion		Plant Biomass		Total [2]	
Highland	2,283	Cornwall	509	Highland	2,789	Thurrock	188	Shropshire	77	Selby	7,874	Selby	**7,988**
South Lanarkshire	1,602	Wiltshire	418	Perth & Kinross	751	Aylesbury Vale	145	Cannock Chase	46	Fife	380	Highland	**5,176**
Scottish Borders	1,234	South Cambridgeshire	262	Argyll & Bute	500	Warrington	142	Herefordshire	46	Allerdale	372	Lancaster	**2,896**
Aberdeenshire	1,150	North Norfolk	167	Dumfries & Galloway	384	Central Bedfordshire	140	East Lindsey	38	Dumfries & Galloway	322	Swale	**2,464**
Moray	693	Pembrokeshire	164	Stirling	221	North Lanarkshire	128	Newark and Sherwood	38	North Kesteven	298	Conwy	**1,984**
UK Total	**20,959**		**10,420**		**5,390**		**4,703**		**2,052**		**18,829**		**83,217**

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 Yorkshire and the Humber. Yorkshire and the Humber shows the largest generation per unit of GVA, due to Drax, followed by Scotland and Wales. Among the English regions, the highest generating capacity per unit of GVA after Yorkshire and the Humber is the South West, followed by the East of England 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	**15.11**	**38,104**
East Midlands	24.46	48,838
East of England	25.71	56,024
North East	17.92	39,165
North West	15.98	40,001
London	1.01	2,770
South East	14.19	29,900
South West	26.88	31,334
West Midlands	7.83	14,076
Yorkshire and the Humber	35.38	176,073
Northern Ireland	**32.32**	**67,558**
Scotland	**67.92**	**150,949**
Wales	**48.60**	**92,122**
UK average	**20.48**	**48,780**

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/regionalgrossvalueaddedincomeapproach/previousReleases

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

Revisions

This year saw the separation of wind statistics into onshore and offshore as well as the separation of other bioenergy into AD and biomass and waste. It has resulted to changes in the presentation of both tables and charts allowing a better understanding of the impact of these technologies.

A reconciliation exercise was also undertaken this year using finalised Ofgem ROCs data covering the period 2010 to 2014, inclusive. This has resulted in some significant changes to both capacity and generation for several regions which are summarised in Table 10, alongside further revisions to 2015 data.

Table 10: Historic capacity and generation revisions by country

Year	2010		2011		2012		2013		2014		2015	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
England												
East Midlands	-4	10	2	79	4	-2	4	27	10	-12	14	-1
East of England	0	0	0	0	0	0	0	0	0	0	0	0
North East	-7	-10	15	30	2	11	0	7	12	1	4	-344
North West	1	37	4	19	25	38	0	3	2	-6	11	0
London	-5	8	0	14	1	2	0	0	16	-2	18	7
South East	-1	51	-1	91	0	9	2	12	6	-5	-1	-6
South West	3	28	21	31	14	8	6	-26	40	-10	15	-23
West Midlands	7	15	1	1	2	-2	1	-6	28	4	12	4
Yorkshire and the Humber	0	0	0	0	0	0	0	0	0	0	0	0
Northern Ireland	**18**	**25**	**3**	**101**	**3**	**6**	**-1**	**1**	**9**	**4**	**-13**	**1**
Scotland	**4**	**42**	**106**	**181**	**24**	**-23**	**70**	**17**	**8**	**-47**	**-11**	**-89**
Wales	**0**	**48**	**1**	**38**	**38**	**53**	**0**	**6**	**0**	**-4**	**2**	**-6**
Other	**20**	**143**	**7**	**98**	**20**	**24**	**60**	**-106**	**42**	**-9**	**378**	**63**
TOTAL	36	397	159	684	133	124	144	-65	173	-85	428	-393

Further information

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Combined Heat and Power in Scotland, Wales, Northern Ireland and the regions of England in 2016

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 2017. This article updates statistics published in the September 2016 edition of Energy Trends and provides a breakdown of CHP in the Devolved Administrations and English regions in 2016[1]. In compiling the data for this article, it became apparent that a revision was required to the quantities of renewable and "other" fuels, which were published in DUKES 2017 for year of operation 2015 and 2016. These revisions have been made to DUKES and the figures presented in this article reflect the revised figures.

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 (>98 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 2015 and 2016 there was a net increase of 43 CHP schemes in the database (62 new schemes and the removal of 19 schemes), but a net decrease of 159 MWe in capacity. Good Quality CHP[2] capacity in the UK fell from 5,730 MWe (revised 2015 figure) to 5,571 MWe in 2016.

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 2014 to 2016. During this time, the total number of schemes increased from 2,076 to 2,182, however the capacity decreased from 5,892 MWe to 5,571 MWe. With the exception of Wales, the number of schemes increased in all regions over the period 2014 to 2016. Over this period, the electrical capacity decreased in the North East, North West, South East, Scotland and Wales, with capacity increasing in all other regions. The fall in capacity in the North East was substantial and occurred mainly between 2014 and 2015. The reasons for this were discussed in the Energy Trends 2016 edition; capacity serving an oil terminal ceased to operate as a CHP plant and a chemical plant significantly downgraded its capacity. Since then the capacity in the North East has fallen further due to the final closure of the power plant at what was the integrated steel works at Redcar. Between 2015 and 2016 about 10 per cent of the capacity was lost in the South East region, due to the closure of a large paper site and its CHP plant. There were further loses in capacity in the Chemicals sector in the North West region.

[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 down 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 2014-2016

	Number of Schemes			Electrical Capacity (MWe)		
	2014	**2015**	**2016**	**2014**	**2015**	**2016**
England	**1,749**	**1,808**	**1,849**	**5,075**	**4,940**	**4,778**
East Midlands	109	116	116	111	132	132
Eastern	166	169	174	304	321	323
London	290	305	319	199	232	247
North East	110	112	112	538	374	333
North West	279	291	292	780	741	695
South East	292	301	309	948	896	808
South West	140	144	149	81	116	120
West Midlands	175	177	181	112	112	114
Yorkshire/Humberside	188	193	197	2,004	2,016	2,007
Scotland	135	137	140	546	525	528
Wales	118	117	117	208	184	184
Northern Ireland	74	77	76	62	82	81
UK Total	**2,076**	**2,139**	**2,182**	**5,892**	**5,730**	**5,571**

Table 1B: Trend in CHP electricity and heat generated 2014-2016

	Electricity Generated (GWh)			Heat Generated (GWh)		
	2014	**2015**	**2016**	**2014**	**2015**	**2016**
England	**16,230**	**16,252**	**16,824**	**33,188**	**32,047**	**31,892**
East Midlands	579	629	623	1,323	1,358	1,310
Eastern	1,327	1,381	1,314	1,984	1,994	1,789
London	584	593	627	1,220	1,211	1,262
North East	1,223	1,078	1,080	4,690	4,095	3,580
North West	2,771	2,527	2,527	8,025	7,678	7,588
South East	3,200	2,729	2,826	6,704	6,395	6,483
South West	376	407	403	468	503	498
West Midlands	443	484	474	764	766	838
Yorkshire/Humberside	5,726	6,424	6,949	8,010	8,048	8,544
Scotland	2,503	2,435	2,298	5,893	5,760	6,104
Wales	738	613	615	2,361	1,931	1,918
Northern Ireland	224	258	332	515	524	509
UK Total	**19,695**	**19,558**	**20,070**	**41,957**	**40,261**	**40,423**

The region with the highest proportion of the UK's electrical capacity is still the Yorkshire and Humberside region with a 36 per cent share, followed by the South East (15 per cent) the North West (12 per cent) and Scotland (9 per cent). The Yorkshire and Humberside region hosts the largest CHP scheme in the UK. If this particular scheme were disregarded, the Yorkshire and Humberside region would host the second largest share of capacity in the UK.

The four largest regions in terms of installed capacity were also the four largest regions in terms of electricity generation, and were ranked in the same order. In 2016, the Yorkshire and Humberside region accounted for over one third of all Good Quality electricity generated in the UK. Two of the top five largest generators of Good Quality power in the UK are located in this region.

The Yorkshire and Humber region also accounted for the largest share of heat generated from CHP in 2016. However, its position was less dominant for heat generation than for power generation, and this is reflection of significantly lower than average heat to power ratios registered at some of the very large power generating schemes in this region.

Chart 1: CHP generation by area in 2016

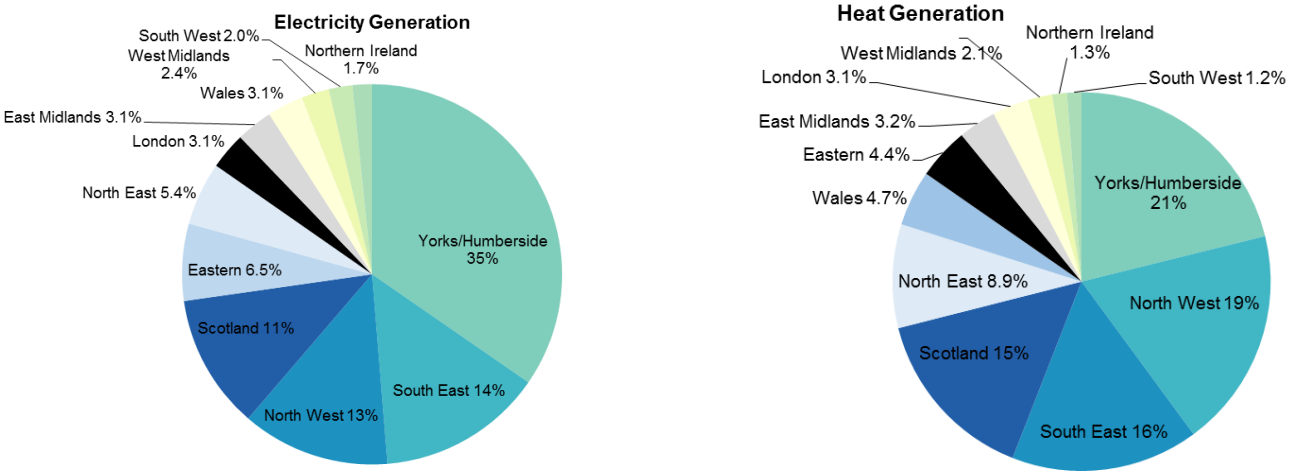


Table 2 shows an overview of CHP plant data broken down between the English regions and devolved administrations. CHP capacity utilisation can be expressed by the Load Factor (LF). LF is the actual generation as a proportion of the theoretical maximum power that can be generated for a given total installed capacity (TPC). The power output that is actually generated is the total power output (TPO). For 2016, the TPC was 8,324 MWe[5] and the TPO was 43,761 GWh, giving a LF of 60.1 per cent. This is a significant increase on the revised value for 2015 (50.9 per cent), and this is substantially due to a notable increase in the LF at a number of large power generating sites in the Yorkshire and Humber and South East regions.

Higher LF values tend to be found in industrial uses where the demand for heat extends over a greater proportion of the year than is the case for space heating applications, where the heat demanded from the CHP is mostly confined to the heating season. This is especially well illustrated by the fact that the region with the highest ratio of industrial to non-industrial installed capacity (Yorkshire and the Humber) has the highest LF (68 per cent) while the region with the lowest ratio of industrial to non-industrial installed capacity (London) has the lowest LF (39 per cent).

The downward trend in LF in industry, seen until 2015, came to an end in 2016. The increase in LF between 2015 and 2016 can be substantially explained by an increase in LF at some very large industrial sites. It remains to be seen whether these higher industrial LF values will be sustained over time.

[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 2016

	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	**1,849**	**4,778**	**7,286**	**16,123**	**67,013**	**16,824**	**38,486**	**31,892**	60.3%
East Midlands	116	132	174	607	2,817	623	1,023	1,310	67.0%
Eastern	174	323	323	890	4,258	1,314	1,365	1,789	48.2%
London	319	247	281	1,046	2,588	627	960	1,262	38.9%
North East	112	333	360	877	6,204	1,080	1,565	3,580	49.7%
North West	292	695	837	4,172	13,101	2,527	3,949	7,588	53.9%
South East	309	808	2,011	3,092	12,957	2,826	10,369	6,483	58.9%
South West	149	120	120	285	1,489	403	497	498	47.4%
West Midlands	181	114	129	510	2,153	474	632	838	55.9%
Yorkshire/Humberside	197	2,007	3,050	4,643	21,445	6,949	18,126	8,544	67.8%
Scotland	140	528	682	2,534	11,742	2,298	3,447	6,104	57.7%
Wales	117	184	275	827	3,920	615	1,472	1,918	61.1%
Northern Ireland	76	81	81	189	1,450	332	356	509	50.2%
UK Total	**2,182**	**5,571**	**8,324**	**19,673**	**84,125**	**20,070**	**43,761**	**40,423**	**60.0%**

∗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 2016 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, 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. With the exception of London and the South West, the fall in overall capacity (discussed above) has led to CHP playing a less important role in the economies of all regions. The largest falls were in the North East and South East regions. The most important instances of loss in capacity, leading to these falls in capacity per unit GVA, were discussed above.

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

	Heat capacity per unit GVA kWth/ (£million)*	Electrical capacity per unit GVA kWe/ (£million)*
Yorkshire/Humberside	42.32	18.29
North West	26.59	4.43
Scotland	19.91	4.15
North East	**17.66**	**6.71**
Wales	14.83	3.29
South East	**12.41**	**3.24**
England	**11.25**	**3.33**
Eastern	6.11	2.22
East Midlands	6.21	1.35
Northern Ireland	5.49	2.35
West Midlands	**4.26**	**0.95**
London	2.76	0.65
South West	2.26	0.95
UK total	**11.81**	**3.34**

*GVA is provisional gross value added in 2015 (workplace based)[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 well established patterns of CHP deployment by economic sector, which are defined by long term investments in industrial CHP capacity, remain. Over 84 per cent of all capacity installed in the Chemicals sector is to be found in just three regions of the UK: Yorkshire and Humber, North West and North East. Sixty-two per cent of capacity in the oil refineries and oil and gas terminals

[6] www.ons.gov.uk/economy/grossvalueaddedgva/bulletins/regionalgrossvalueaddedincomeapproach/december2015

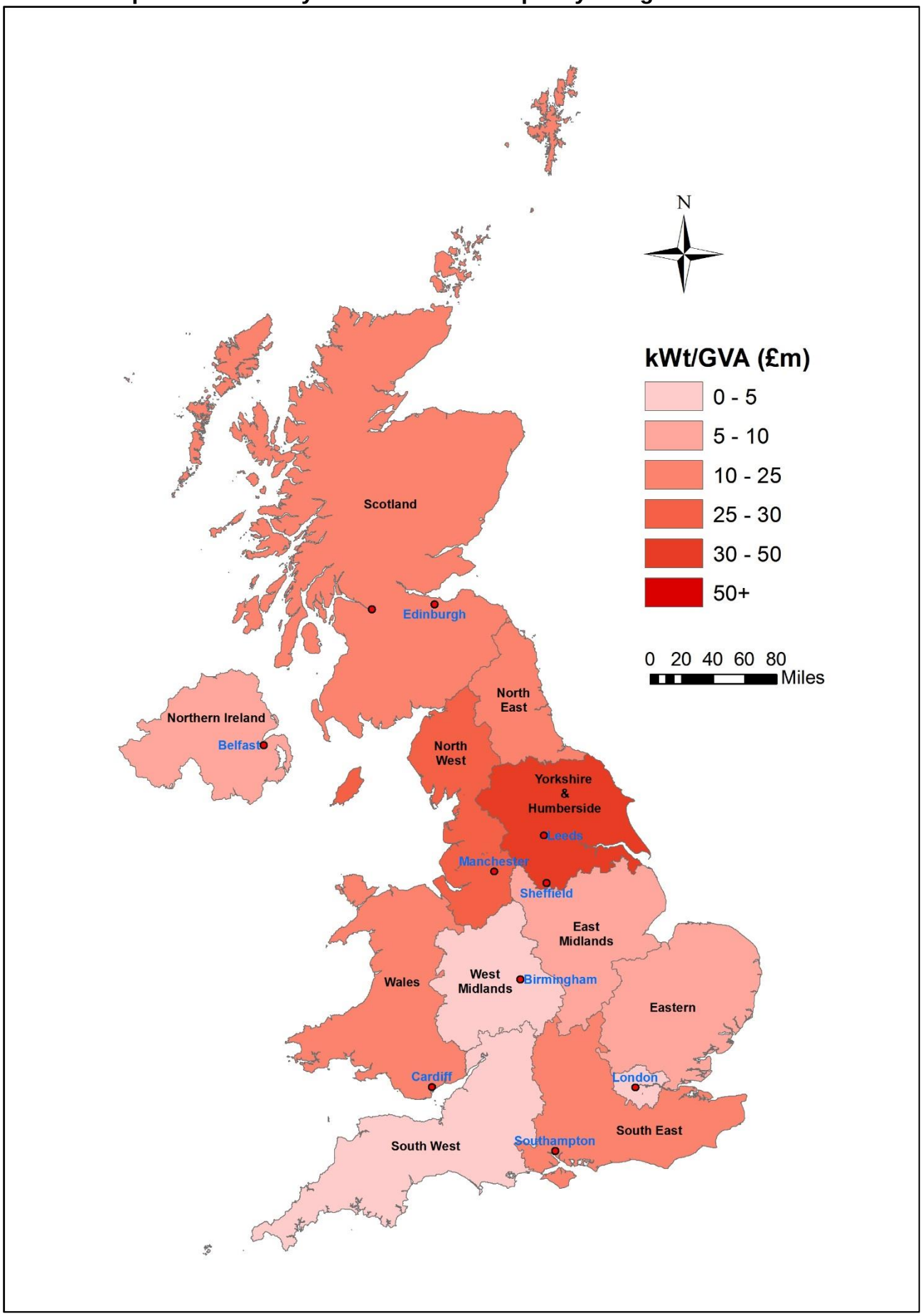
sector can be found in the Yorkshire and Humber region. The most notable changes to the geographic distribution of CHP capacity by economic sector over the past year are within the Iron and Steel and Paper sectors. In 2015 over half of the capacity in the Iron and Steel sector was located in the North East region. With the closure of the integrated steel works at Redcar there is now no capacity in this region in the Iron and Steel sector. The share of capacity installed in the paper sector in the South East has fallen from over half to 38 per cent, mainly due to the closure of one large newsprint works in that region.

The large proportion of capacity installed in the Food and Drink sector in the Eastern region (44 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 2016

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%	88.9%	85.9%	72.4%	89.2%	80.7%	100.0%	76.6%	84.7%	92.8%
East Midlands	0.0%	1.2%	0.0%	0.0%	6.5%	0.0%	6.7%	7.1%	6.0%	7.4%
Eastern	14.6%	1.4%	0.0%	0.0%	44.4%	0.0%	0.0%	11.3%	4.9%	7.9%
London	7.3%	1.1%	0.0%	0.0%	6.0%	14.3%	0.0%	15.9%	15.4%	16.4%
North East	0.0%	23.1%	0.0%	0.0%	0.0%	0.0%	24.6%	3.9%	7.6%	1.9%
North West	0.0%	23.9%	4.9%	31.0%	17.3%	5.6%	48.1%	7.5%	10.3%	4.4%
South East	0.0%	0.2%	19.3%	36.8%	4.8%	6.5%	0.0%	12.1%	13.0%	25.9%
South West	0.0%	0.7%	0.0%	0.0%	1.8%	6.5%	20.5%	5.1%	9.5%	6.2%
West Midlands	0.0%	0.2%	0.0%	2.6%	0.1%	47.7%	0.0%	8.5%	8.2%	3.3%
Yorkshire and Humber	38.1%	37.1%	61.7%	1.9%	8.4%	0.0%	0.0%	5.1%	9.8%	19.4%
Scotland	0.0%	6.9%	12.0%	19.2%	4.6%	0.8%	0.0%	9.1%	9.1%	4.3%
Wales	36.4%	3.1%	2.1%	8.4%	1.0%	9.2%	0.0%	8.2%	3.6%	1.0%
Northern Ireland	3.5%	1.0%	0.0%	0.0%	5.2%	9.4%	0.0%	6.1%	2.6%	1.8%
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 2016, gas turbine based schemes accounted for 69 per cent of total CHP capacity but only 6 per cent of the total number of CHP schemes.

- 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). The region with the largest number of reciprocating engine schemes is London, followed by the South East and the North West. This is explained by the high number of leisure centres, hotels and retail outlets to be found in these regions, for which reciprocating engines are suited.

Table 5: CHP electrical capacity (MWe) by area and prime mover in 2016

	Gas Turbines*	Steam Turbines	Gas and Steam Turbines Subtotal	Reciprocating Engines	Total
England	**3,361**	**335**	**3,696**	**1,082**	**4,778**
East Midlands	-	-	59	72	132
East of England	-	-	197	127	323
London	-	-	53	194	247
North East	-	-	270	63	333
North West	-	-	567	128	695
South East	592	3	594	213	808
South West	18	26	43	76	120
West Midlands	-	-	16	98	114
Yorkshire and The Humber	1,838	58	1,896	111	2,007
Scotland	382	81	463	65	**528**
Wales	-	-	141	43	**184**
Northern Ireland	-	-	33	48	**81**
Grand Total	**3,848**	**485**	**4,333**	**1,238**	**5,571**

*Includes Combined Cycle Gas Turbines (CCGT)

The CHP market continues to be dominated by large-scale (>10MWe) plant, with 75 per cent of all installed capacity being in this size range. However, this proportion is lower than in previous years and is a continuation of a longer term trend for a decreasing share of capacity to fall above 10 MWe. This is explained by the closure, over time, of a number of larger industrial based CHP.

The regional distribution of CHP by capacity tranche is given in Table 6. Over 45 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 a reflection of the tendency for sites in the industrial sectors of oil refineries, chemicals and paper, which have large demands for heat, to be found in these locations.

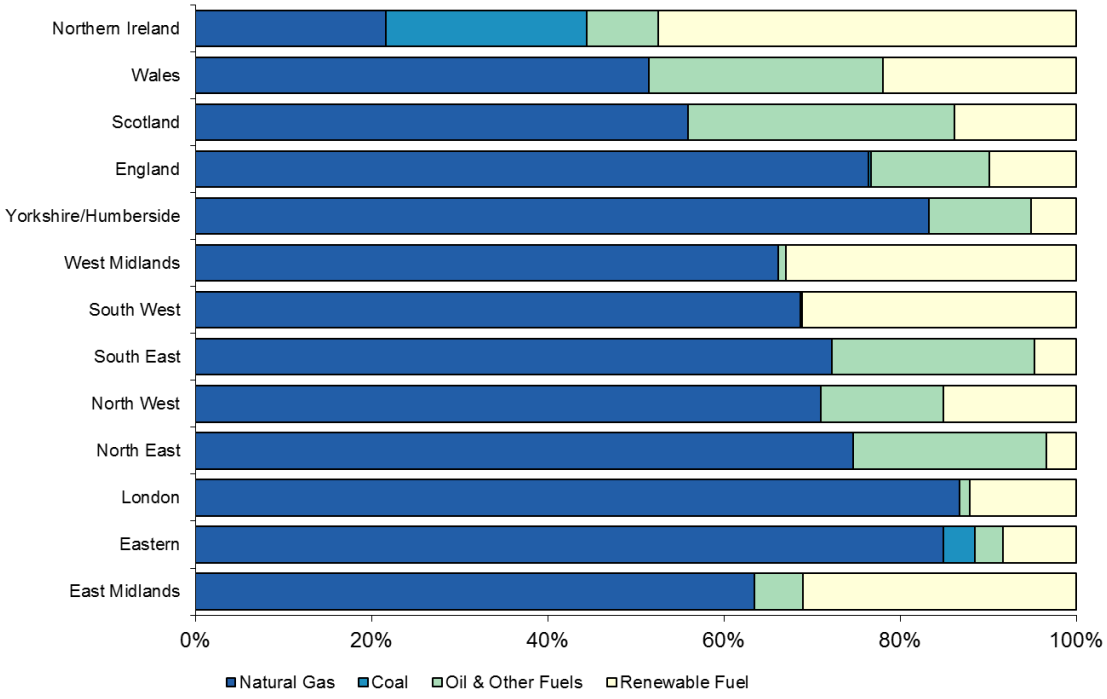
Table 6: CHP electrical capacity (MWe) by area and size in 2016

	<= 100 kWe	> 100 kWe to 1 MWe	>1 MWe to 2 MWe	> 2 MWe to 10 MWe	> 10 MWe +	Total
England	**35**	**255**	**192**	**705**	**3,591**	**4,778**
East Midlands	2	15	22	-	-	132
East of England	3	25	20	-	-	323
London	6	46	19	-	-	247
North East	3	9	8	49	264	333
North West	5	42	32	101	514	695
South East	5	43	34	135	590	808
South West	3	24	15	-	-	120
West Midlands	3	26	18	-	-	114
Yorkshire and The Humber	4	26	24	77	1,876	2,007
Scotland	2	16	20	65	426	528
Wales	3	15	-	-	123	184
Northern Ireland	1	16	-	-	-	81
Grand Total	**40**	**303**	**218**	**824**	**4,185**	**5,571**

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



Natural gas represented 71 per cent of all fuel burned in CHP in 2016, which is slightly higher than in 2015 when the share was 70 per cent (revised). Natural gas makes up more than half of the overall fuel consumption in every region except Northern Ireland. The low levels of natural gas consumption in Northern Ireland are a reflection of the under-developed nature of the gas distribution network in that region. Over the last five years the proportion of total CHP fuel consumption in Northern Ireland that is natural gas has not exceeded 36 per cent and was only 22 per cent in 2016.

In 2016 coal was only burned in Northern Ireland and the Eastern region and was confined to a very small number of schemes. The proportion of fuel that was renewable was higher in 2016 (12 per cent) than in 2015 (11 per cent, revised). The region with the largest share of fuel inputs to CHP that are renewable is Northern Ireland (48 per cent), followed by the West Midlands (33 per cent) and then the South West and East Midlands regions (both on 31 per cent) The North East had the lowest share of renewable fuel input to CHP. In 2016, biogas and biomass constituted roughly equal quantities of total renewable fuel consumed (39 and 38 per cent respectively), with the majority of the remainder being in the form of renewable waste fuels.

Summary

The well established patterns concerning the regional distribution of CHP in the UK remain. Nevertheless, these patterns have been undergoing subtle changes over time. In the main these changes are caused by the closure of industrial CHP which, because they are usually large, produce noticeable effects in the patterns of the data.

Over the period 2014 to 2016, the number of CHP schemes has increased in all regions of the UK, apart from Wales. However, over the same period, the installed capacity decreased in five of the twelve separate regions and devolved administrations observed in this article. This is invariably caused by closures in industrial CHP capacity and there have been notable losses of capacity in the chemicals and paper sectors in recent years, affecting the regions in which these industries tend to cluster. The CHP capacity in the Iron and Steel sector has also fallen by an appreciable amount, due to the closure of the integrated steelworks at Redcar, leading to a further fall in the installed capacity in the North East.

The use of renewable fuels in CHP has increased again and renewable fuels make up large proportions of the total CHP fuel consumed in Northern Ireland, West Midlands and East Midlands. Natural gas continues to be main fuel used in CHP, and makes up more than half of all CHP fuel consumed in all but one of the twelve regions, the exception being Northern Ireland. Overall 71 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 2016

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 2016: Norway (producing over 7 times its indigenous demand), Canada, and Mexico. All other OECD countries had to meet their demand through imports with some 11 countries producing no crude oil indigenously.

The majority 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. The United Kingdom and Denmark were the top two scorers for diversity of imports within the OECD.

Most OECD countries were not able to support their diesel consumption by indigenous production alone, with only a third self-sufficient again. Greece, Finland, and Korea scored highest for self-sufficiency within the OECD, with Greece producing over three times the amount it consumed.

The UK could have met over three quarters of its demand for crude oil through indigenous production and ranked sixth overall 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, whilst it was below the median value for diesel. However, it had the highest diversity of imports for jet fuel and was fourth for diesel.

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 2016 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

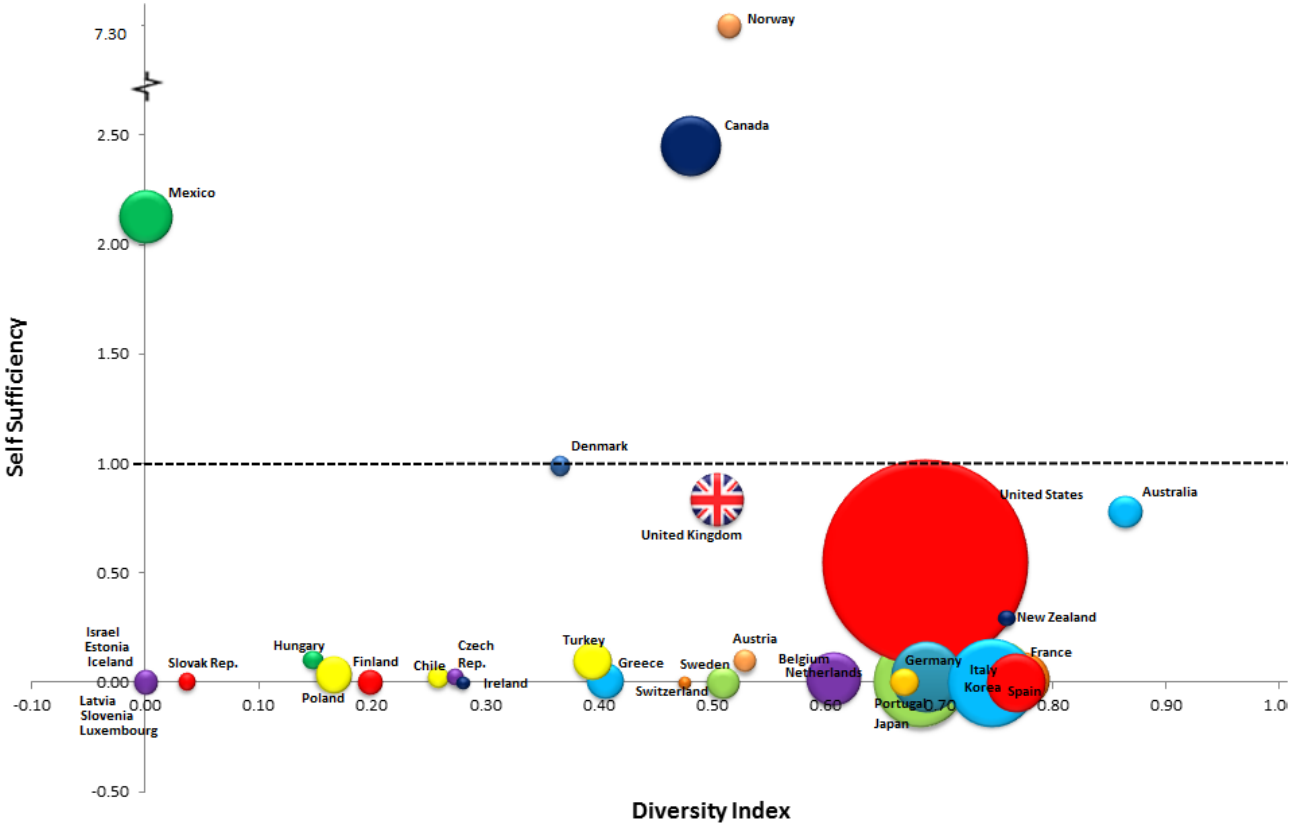
These maps indicate a visual representation of the source countries and quantities of each product's exports. A darker shade represents that a high proportion of the world's exports originated from that particular country, whereas lighter shades indicate that fewer exports originated in that country.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

Results

Crude

Only three OECD countries were self-sufficient for crude oil in 2016 (Chart 1). Norway had by far the highest self-sufficiency score, producing over 7 times its own consumption of crude oil. With a self-sufficiency score of 0.83, the UK was above the OECD average of 0.53. Similarly, the UK's diversity score of 0.50 was above the average score of 0.40.

Chart 1: Diversity and self-sufficiency of crude oil for OECD countries, 2016



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, 2016

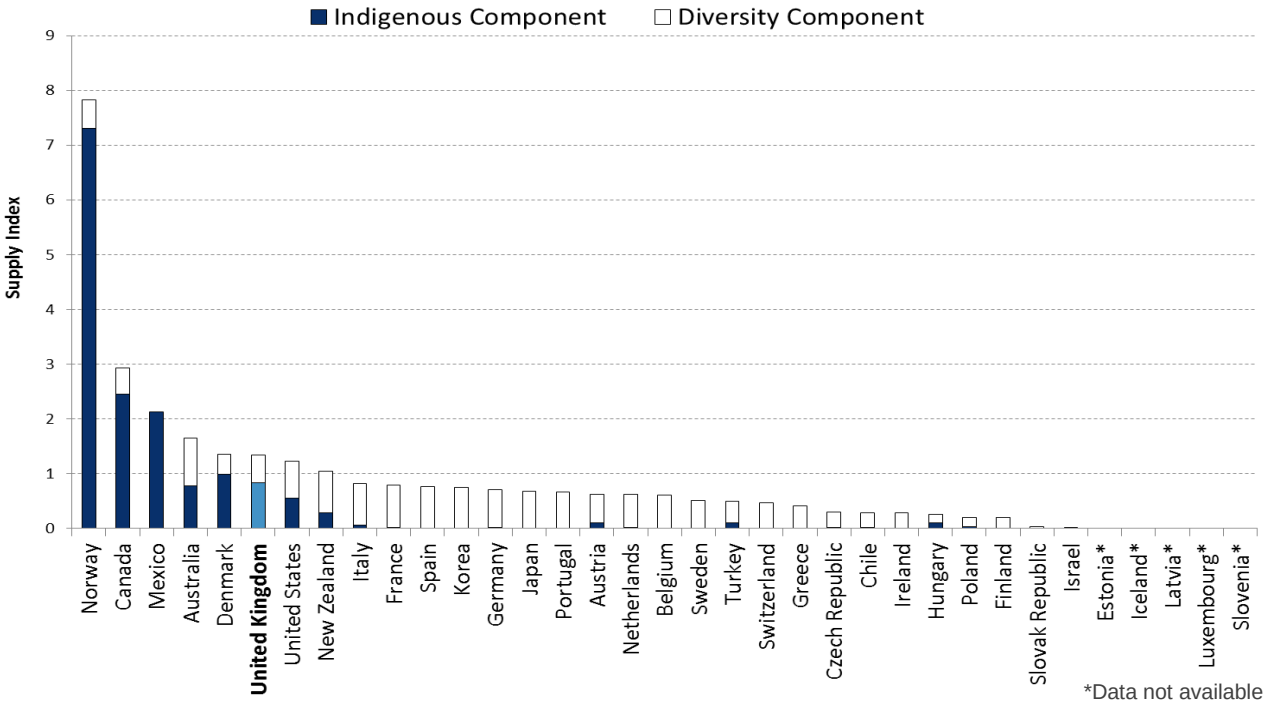
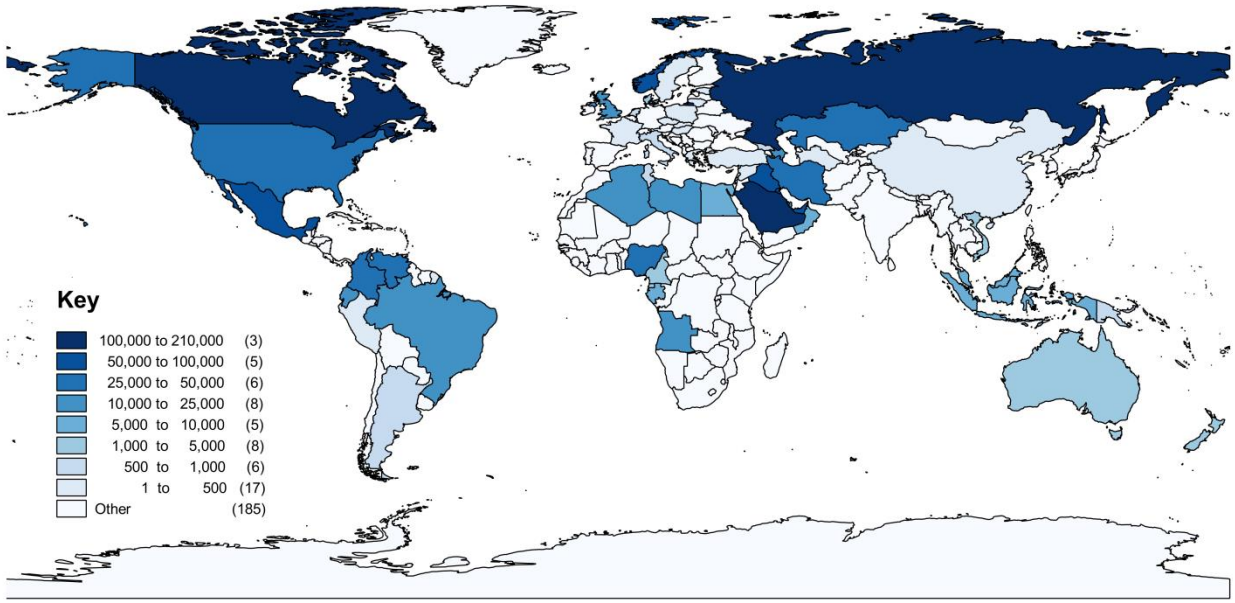


Chart 3 is an illustration of where crude oil exports originated in 2016. Currently Saudi Arabia, Russia and Canada are by far the biggest exporters of crude in the world. The UK was the 5th biggest OECD exporter and placed 15th overall. Although the United States produce almost three times as much as 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 February 2017 saw the highest quantity of crude exported from the US on EIA records[2]. In the period to June 2017 the United States exported 1.5 times more barrels per day compared to the same period in 2016; since February exports in each month in 2017 were higher than May 2016 (previously the month with the highest record).

Chart 3: Worldwide Crude Oil Exports (kt), 2016

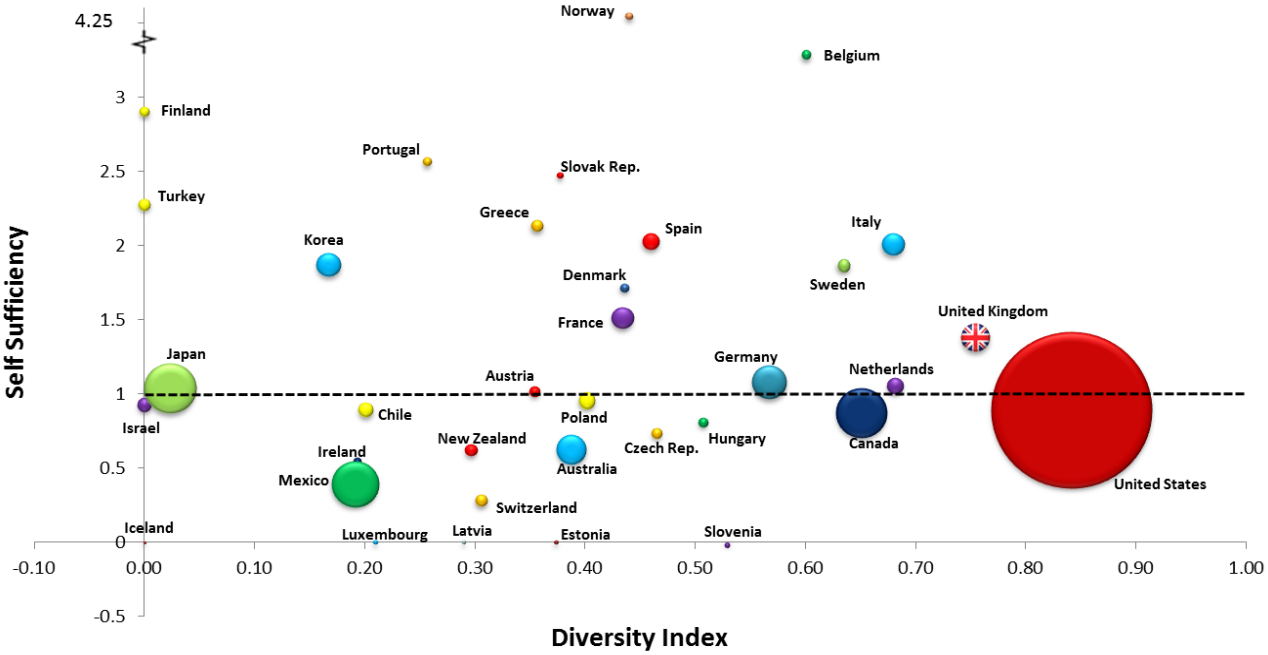


[2] www.eia.gov/dnav/pet/pet_move_exp_dc_NUS-Z00_mbblpd_m.htm

Motor Gasoline

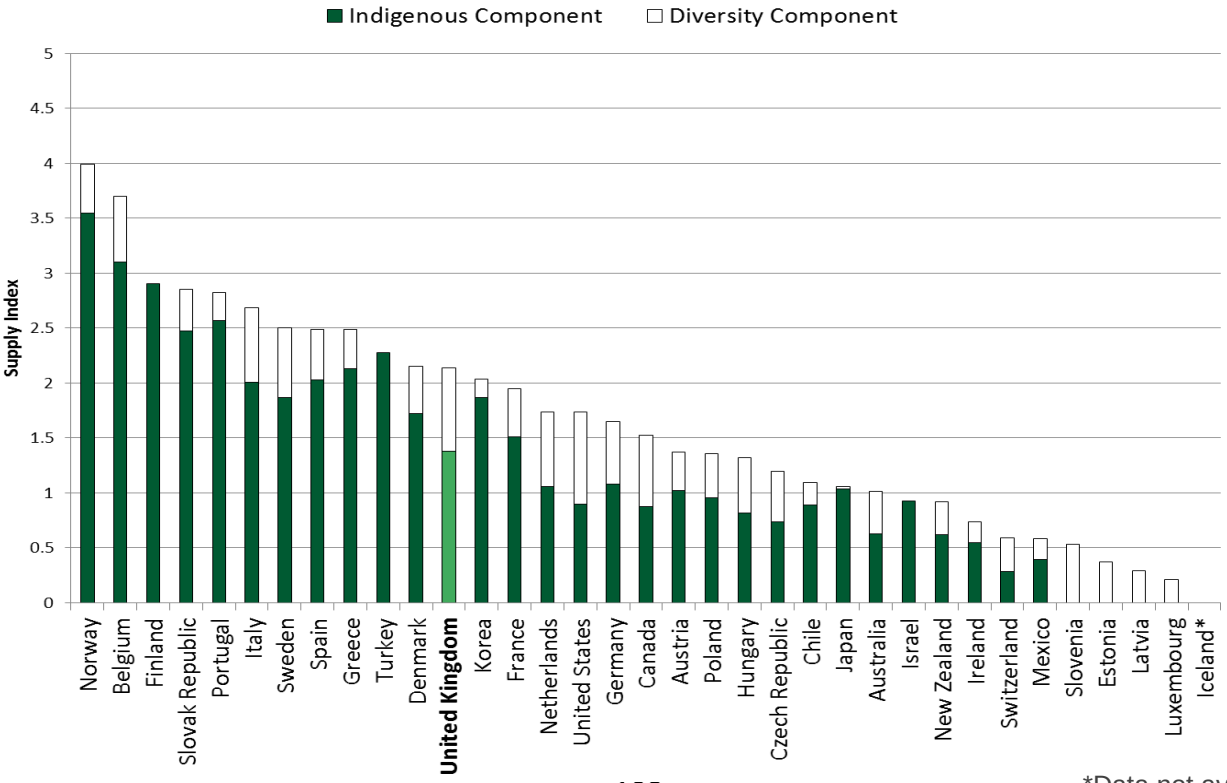
The profiles for motor gasoline are different to that of crude. More than 50 per cent of the 35 OECD countries were self-sufficient in 2016 (Chart 4). Consumption in the US dwarfs that of other OECD countries, equal to nearly 65% of the OECD total. The UK had a self-sufficiency score of 1.38, which was above the 1.29 average across all OECD countries. The UK's diversity score of 0.75 was also higher than the OECD average of 0.37.

Chart 4: Diversity and self-sufficiency of motor gasoline for OECD countries, 2016



Our simplified security of supply index (Chart 5) 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.

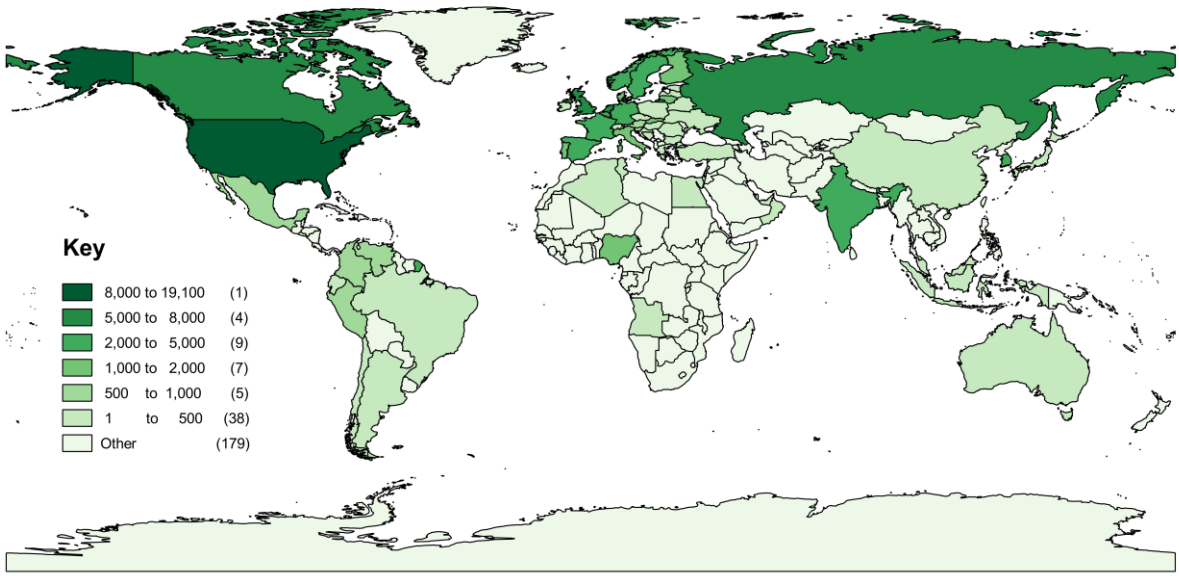
Chart 5: Security of supply of motor gasoline for OECD countries, 2016



*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.

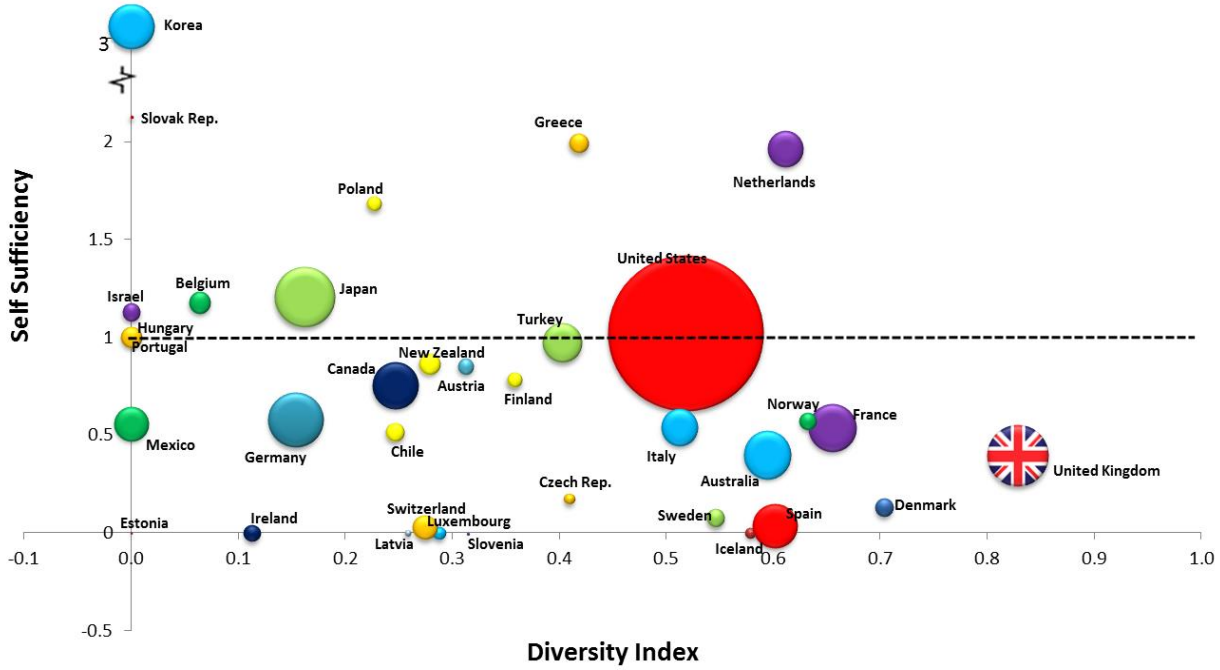
Chart 6: Worldwide Motor Gasoline Exports (kt), 2016



Jet Fuel

Chart 7 shows that, with a score of 0.39, the UK was below both the self-sufficient threshold of 1 and the OECD average 0.75 for jet fuel. However the UK's import diversity score of 0.83 was more than double the average for all OECD countries of 0.32 and was the highest of all OECD countries.

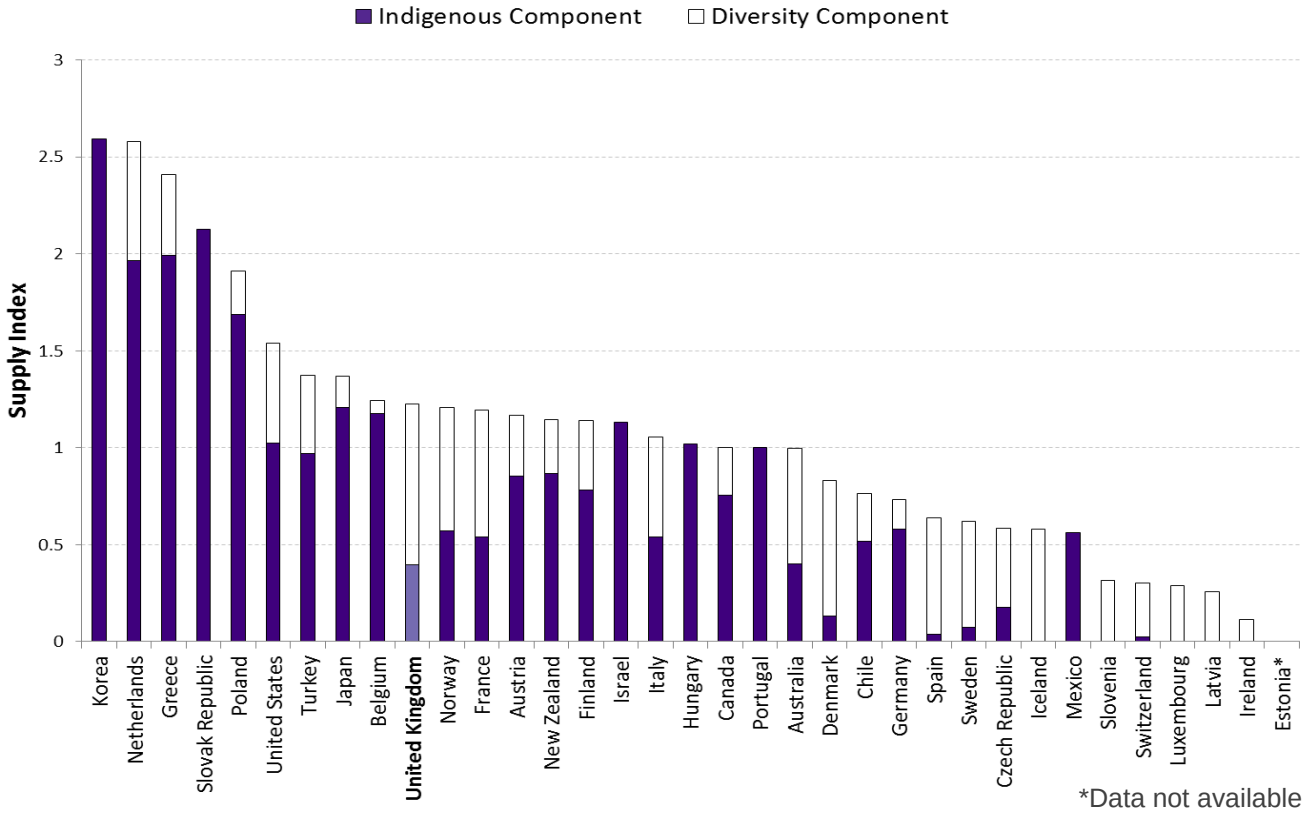
Chart 7: Diversity and self-sufficiency of jet fuel for OECD countries, 2016



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 2016 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), caused the UK to have the second highest demand for jet fuel behind the United States. Despite only having the ability to meet 39% of demand, the UK was 8th out of the 35 countries for total production of jet fuel. Furthermore, this low self-sufficiency score was compensated by having the most diverse and stable import sources within the OECD as seen in Chart 7.

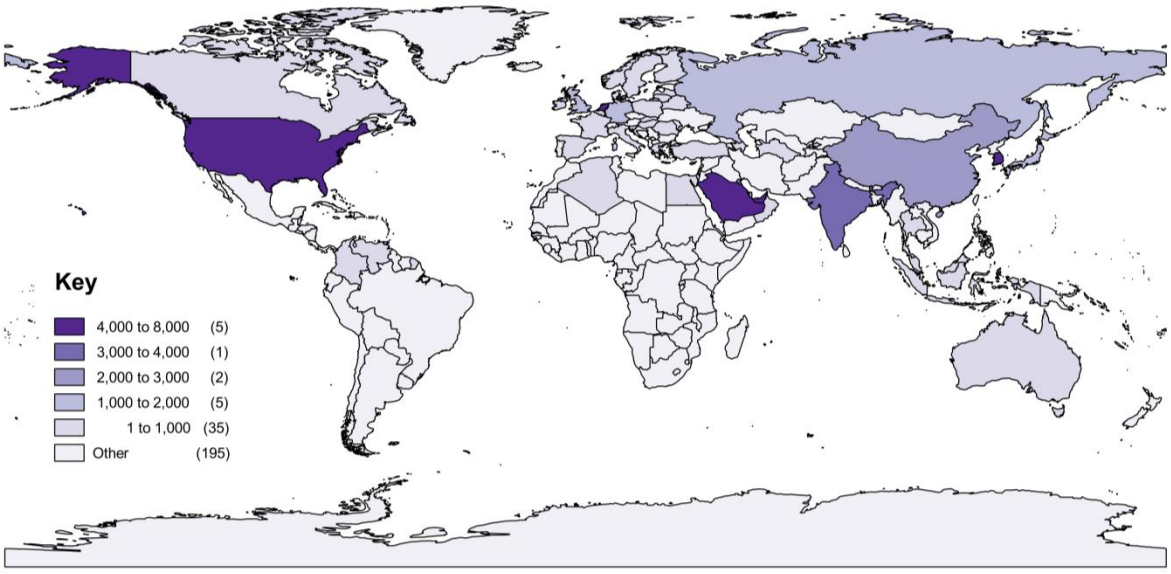
Chart 8: Security of supply of jet fuel for OECD countries, 2016



*Data not available

Jet fuel is only exported in significant quantities in a few countries around the world with Korea, the Netherlands, Saudi Arabia, the United States and the United Arab Emirates 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.

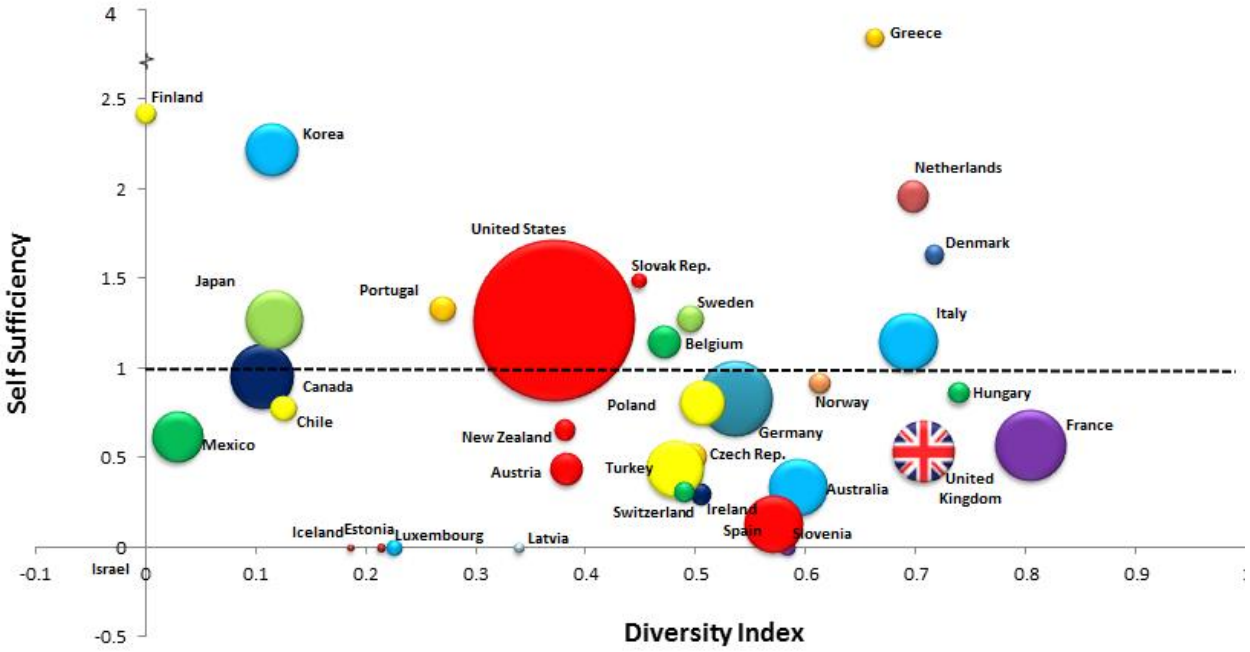
Chart 9: Worldwide Jet Fuel Exports (kt), 2016



Diesel Road Fuel

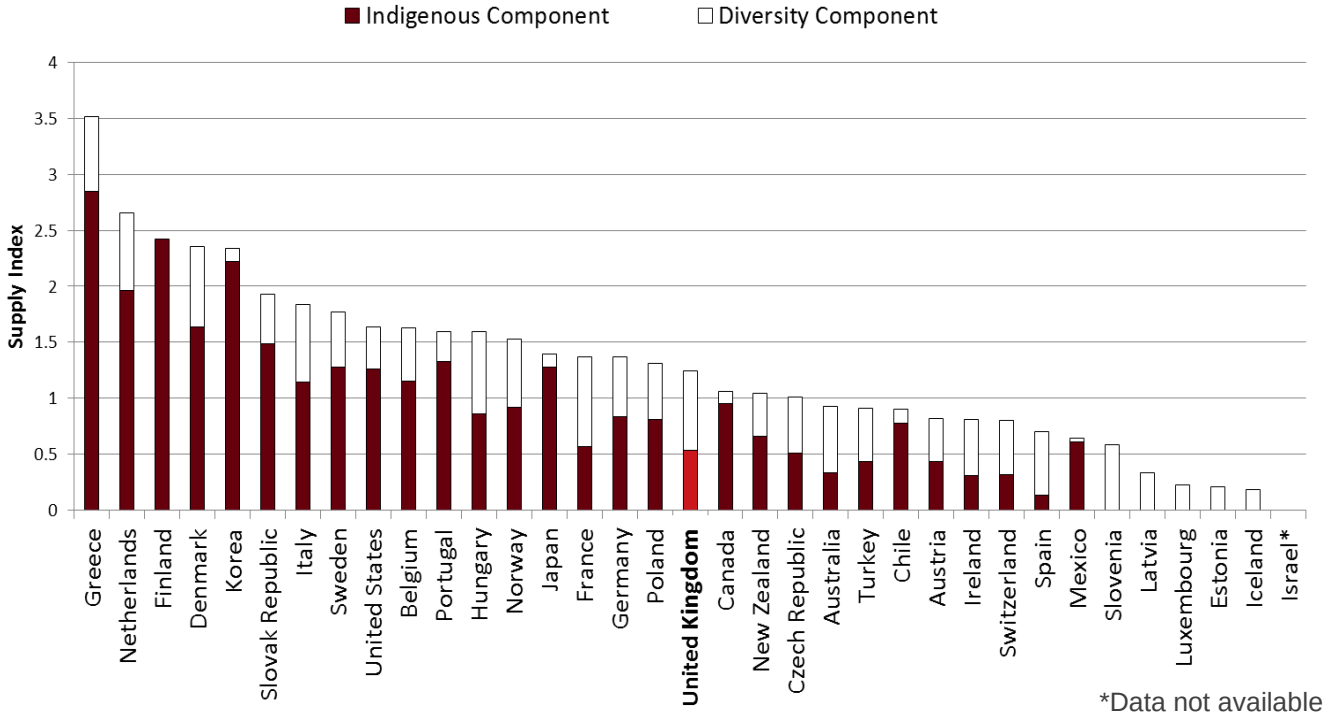
At 0.54 on the self-sufficiency axis the UK was below the average OECD self-sufficiency score of 0.91 in 2016, producing just over half of the diesel it consumed. However the UK is in a favourable position in terms of diversity and political stability of imports; the UK's diversity score of 0.71 was higher than the OECD average of 0.42 (Chart 10) and was the fourth highest out of all 35 OECD countries.

Chart 10: Diversity and self-sufficiency of diesel for OECD countries, 2016



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 the median value of all of the OECD countries' scores (Chart 11).

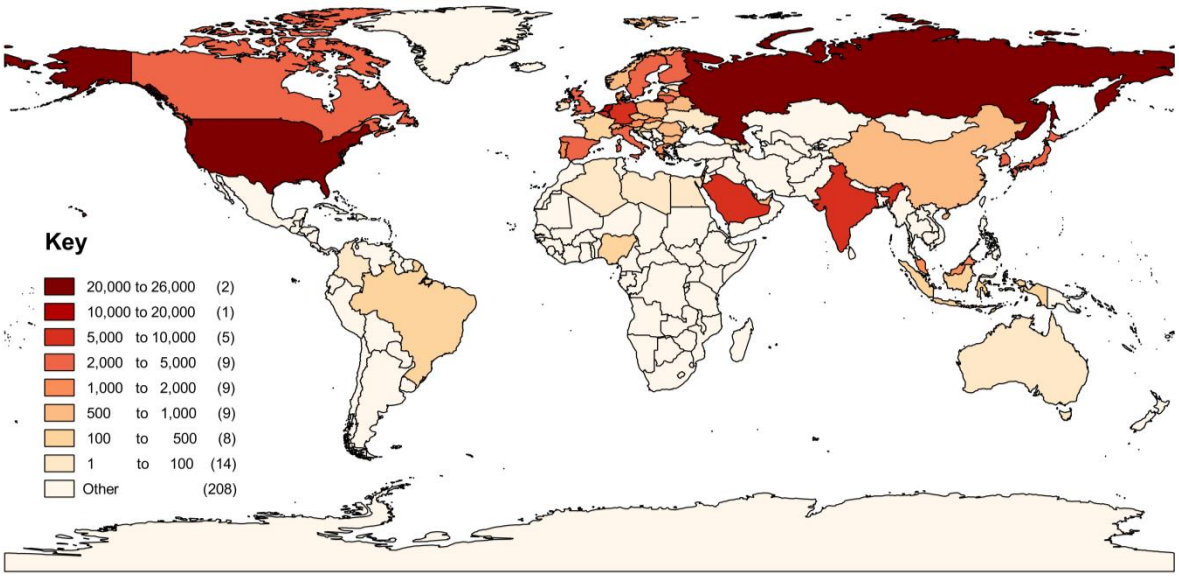
Chart 11: Security of supply of diesel for OECD countries, 2016



*Data not available

Chart 12 below 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 12th largest exporter out of all 35 OECD countries.

Chart 12: Worldwide Diesel Exports (kt), 2016



Summary

Self-Sufficiency and Import Diversity of OECD Countries in 2016

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 0.53, OECD countries are very much dependent on imports of crude oil to meet refinery demand, compared to average scores of 1.29, 0.75 and 0.91 for motor gasoline, jet fuel and diesel respectively. This is reflected by 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% lower than consumption in OECD countries. However, 18 of these 35 countries were self-sufficient; particularly notable were Norway and Belgium, 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 1% higher than production, with an average self-sufficiency score of 0.91. Around a third of OECD countries were self-sufficient in 2016, with Greece producing over three times the amount it consumed. This, along with an average diversity and political stability score of 0.42, 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 0.32 amongst OECD countries. This being the lowest diversity score out of the four products, combined with a below average self-sufficiency

score of 0.75, 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 2016

The UK compares well with other OECD countries for both self-sufficiency and diversity, scoring slightly better for diversity by ranking top for jet fuel, second for motor gasoline, fourth for diesel, and in the top half for crude oil. The UK could meet around three quarters of its crude oil consumption via indigenous production and ranks fifth out of all OECD countries. The UK meets its needs for motor gasoline from indigenous production, depending on its offshore fields for some of the crude oil and the production profiles of its refineries. Conversely, the UK relies on imports to meets its requirements for jet fuel and diesel road fuel as its refineries do not meet demand from increasing air movements and the shift towards diesel for road transport.

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Appendix 1 – Provisional Data for 2016

	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	0.86	0.78	19,716	0.39	0.63	13,717	0.59	0.40	6,763	0.59	0.34	22,210
Austria	0.53	0.10	8,195	0.35	**1.02**	1,634	0.31	0.85	765	0.38	0.44	6,731
Belgium	0.60	0	31,978	0.60	**3.29**	1,460	0.06	**1.18**	1,415	0.47	**1.15**	7,071
Canada	0.48	**2.45**	64,471	0.65	0.88	36,237	0.25	0.75	5,963	0.11	0.95	25,073
Chile	0.26	0.02	8,572	0.20	0.89	3,313	0.25	0.52	1,078	0.13	0.78	4,030
Czech Republic	0.27	0.02	5,422	0.46	0.73	1,605	0.41	0.17	344	0.50	0.51	4,650
Denmark	0.36	0.99	6,994	0.44	**1.72**	1,282	0.70	0.13	984	0.72	**1.64**	2,508
Estonia	0	-	0	0.37	0	251	0	0	18	0.21	0	486
Finland	0.20	0	11,274	0	**2.90**	1,504	0.36	0.78	729	0	**2.42**	2,495
France	0.77	0.01	56,005	0.43	**1.51**	7,332	0.66	0.54	6,899	0.80	0.57	34,544
Germany	0.69	0.03	94,220	0.57	**1.08**	18,231	0.15	0.58	9,179	0.53	0.83	37,231
Greece	0.41	0.01	23,186	0.36	**2.13**	2,424	0.42	**1.99**	1,168	0.66	**3.78**	2,308
Hungary	0.15	0.10	6,631	0.51	0.81	1,345	0	**1.02**	195	0.74	0.86	3,170
Iceland	0	-	0	0	0	141	0.58	0	324	0.19	0	341
Ireland	0.28	0	3,194	0.19	0.55	1,003	0.11	0	837	0.50	0.31	2,852
Israel	0	0.01	10,885	0	0.93	2,941	0	**1.13**	951	0	-	0
Italy	0.75	0.06	64,906	0.68	**2.01**	7,850	0.51	0.54	4,043	0.69	**1.15**	22,307
Japan	0.68	0	155,748	0.02	**1.04**	38,095	0.16	**1.21**	10,332	0.12	**1.28**	20,972
Korea	0.75	0	145,603	0.17	**1.87**	9,284	0	**3.26**	6,220	0.11	**2.22**	18,450
Latvia	0	-	0	0.29	0	212	0.26	0	120	0.34	0	678
Luxembourg	0	-	0	0.21	0	312	0.29	0	489	0.22	0	1,594
Mexico	0	**2.13**	52,417	0.19	0.39	34,472	0	0.56	3,490	0.03	0.61	17,095
Netherlands	0.61	0.02	54,225	0.68	**1.05**	3,942	0.61	**1.97**	3,810	0.70	**1.96**	6,390
New Zealand	0.76	0.29	5,366	0.30	0.62	2,371	0.28	0.87	1,336	0.38	0.66	2,749
Norway	0.51	**7.31**	10,928	0.44	**4.27**	882	0.63	0.57	826	0.61	0.92	2,900
Poland	0.17	0.04	25,788	0.40	0.96	4,124	0.23	**1.69**	686	0.50	0.81	13,500
Portugal	0.67	0	13,804	0.26	**2.57**	1,062	0	**1.00**	1,253	0.27	**1.33**	4,351
Slovak Republic	0.04	0	5,774	0.38	**2.47**	596	0	**2.13**	48	0.45	**1.49**	1,660
Slovenia	0	-	0	0.53	0	424	0.31	0	17	0.58	0	1,481
Spain	0.77	0	64,988	0.46	**2.03**	4,707	0.60	0.04	5,894	0.57	0.13	22,475
Sweden	0.51	0	19,719	0.63	**1.87**	2,638	0.55	0.07	972	0.49	**1.28**	4,898
Switzerland	0.48	0	2,938	0.31	0.28	2,439	0.27	0.02	1,713	0.49	0.32	2,744
Turkey	0.39	0.10	26,574	0	**2.28**	2,240	0.40	0.97	4,620	0.48	0.43	21,595
United Kingdom	0.50	0.83	53,060	0.75	**1.38**	12,554	0.83	0.39	11,321	0.71	0.54	25,271
United States	0.69	0.55	801,340	0.84	0.89	401,567	0.52	**1.02**	74,176	0.37	**1.27**	173,829
OECD Average	0.40	0.53	52,969	0.37	**1.29**	17,834	0.32	0.75	4,828	0.42	0.91	14,875

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.

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.

After 2000 the number of companies supplying gas decreased by more than 50 per cent from its peak, driven by company mergers. BEIS analyse the data using four 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.

Table 1: Number of companies supplying gas

	1998	2000	2002	2004	2006	2008	2010	2012	2013	2014	2015	2016
Domestic sector	9	14	12	7	6	6	7	7	8	9	12	12
Commercial sector	12	10	10	10	7	6	8	8	9	9	9	12
Industrial sector	15	15	15	10	9	8	8	7	10	11	12	12

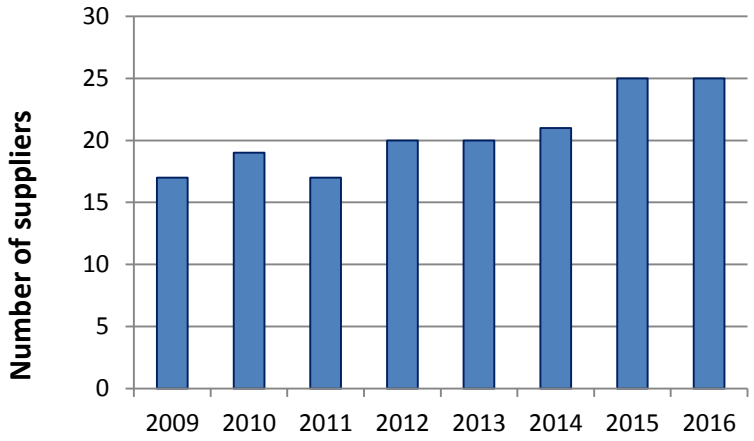
(1) Companies can supply into more than one market and are counted in each market they supply. Companies who supply less than 1,750 GWh within each sector are excluded. In August 2017 Ofgem data indicate that 153 suppliers were licensed to supply gas to domestic customers but some suppliers have more 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 commercial sector in 2016, with the Domestic and Industrial sectors remaining the same.

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 43 new licensed suppliers became active in the domestic segment and one in the non-domestic segment over the last year. 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 25 in 2015 and 2016.

Chart 1: Total number of companies supplying over 1,750GWh of gas, 2009 to 2016



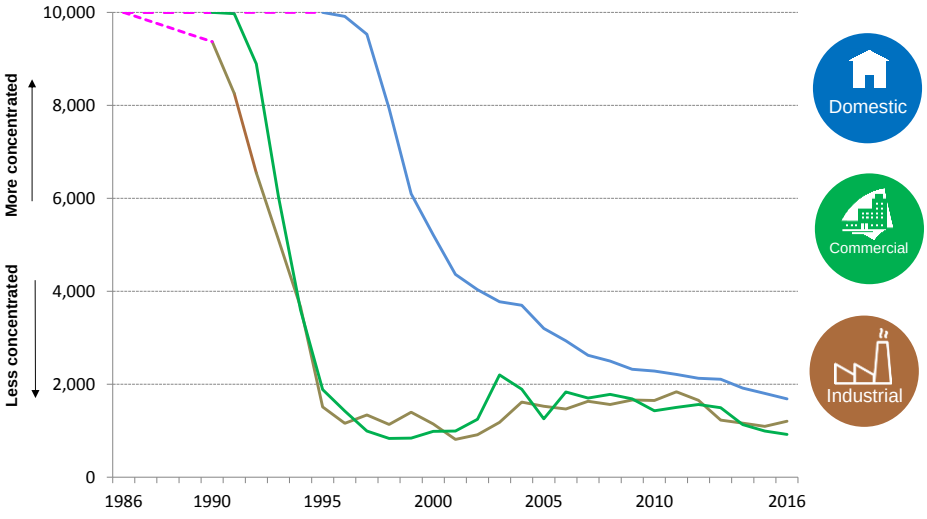
In addition, smaller suppliers continue to enter the market. BEIS collects information from companies licenced to supply gas through two surveys, one a mandatory return for companies supplying more than 1,750 GWh a year of gas (~ 0.5 per cent of final consumption), the other a voluntary return for companies 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 58 per cent in 2016, as many registered suppliers do not yet supply gas. In 2016 there were 37 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 2016

Continuing the trend of recent years, concentration in the domestic and commercial markets has decreased in comparison with 2015. 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 market concentration has increased slightly on last year.

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 2016



Over the last few years the market concentration has consistently decreased in all three sectors, as smaller companies joined the markets. In 2016 this pattern continued for the domestic and commercial markets, but the industrial market saw its first increase in concentration since 2011.

The domestic market has become less concentrated due to increasing number of small suppliers taking an increasing percentage of the market share. In 2016 the total number of companies supplying gas to the market was 36, up from 30 in 2015. Table 1 shows that the number of companies who supplied more than 1,750 GWh remained at 12 in 2016; previously this figure had been increasing since 2008 as new companies took an increasing market share.

The commercial market has seen the number of companies supplying more than 1,750 GWh since 2015 increase from 9 to 12 (see Table 1). This, coupled with the fact that smaller companies have also joined the market (35 companies in total supplying the market in comparison to 31 in 2015), has led to the market becoming less concentrated.

In contrast the industrial market has become more concentrated in 2017 despite the fact that the number of suppliers over the threshold has remained stable on last year. This was because the largest companies have taken a larger market share. The total number of companies supplying gas to the market and the number supplying over 1,750 GWh have remained the same as 2015, at 27 and 12 respectively.

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 tending to lose market share to the medium sized and smaller companies. In 2012 the top 9 accounted for 81 per cent of the market, which is down to 77 per cent in 2016. 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	2012	2013	2014	2015	2016
Aggregated share of top 3 suppliers	46.9	45.5	43.7	42.3	40.8
Aggregated share of next 3 suppliers	20.2	21.1	20.8	20.6	20.5
Aggregated share of next 3 suppliers	14.3	14.9	15.5	14.3	15.4
Aggregated share of top 9 suppliers	**81.4**	**81.5**	**80.0**	**77.2**	**76.7**
Other suppliers	18.6	18.5	20.0	22.8	23.3

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 35 in 2016.
- 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 2.7% in 2010 to 14.2% in 2016, as new and smaller suppliers took market share from the large companies.
- Major power producers (MPPs) increased in number from 6 in 1989 to 57 in 2016.
- The top nine MPPs' share of generation decreased from 87% in 2012 to 75% in 2016. Their share of capacity decreased from 82% in 2012 to 65% in 2016 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 up to competition in March 1990. Next, the 100 kW to 1 MW tier (15 per cent of the market) was opened up 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 almost 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 26 in 2005. The concentration measure levelled off between 2000 and 2008 as although new power producers entered the market, others were either taken over or bought additional power stations to add to their portfolios. There were 35 electricity suppliers in 2016.

(1) In this article electricity supplier refers to major suppliers surveyed by BEIS, covering approximately 95% of all UK electricity sales in 2016. Please see the BEIS Electricity statistics data sources and methodologies for more details.

Table 1 shows the number of supplying companies to the domestic, commercial and industrial sectors, 1996 to 2016.[1]

Table 1: Number of companies supplying electricity (1)

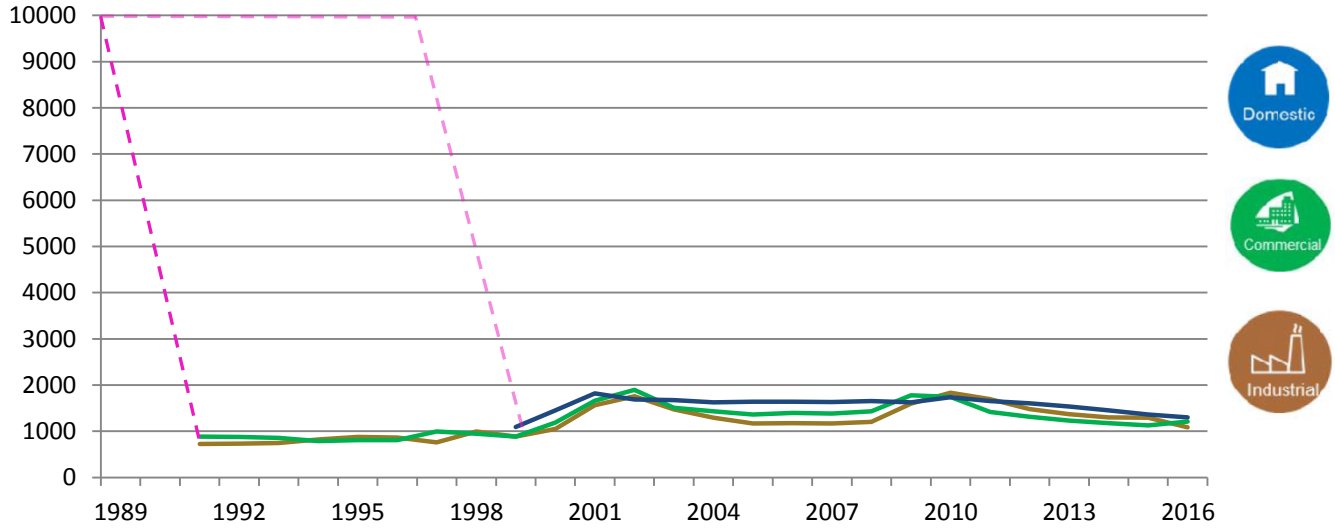
	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2015	2016
Domestic Sector	1	1	11	7	11	10	11r	13r	17r	23r	22	20
Commercial Sector	17	16	14	14	18	15r	15r	15	21	28r	27r	26
Industrial Sector	18	22	20	18	30	22r	20r	20r	24r	27r	28r	26

(1) Companies can supply into more than one market and are counted in each market they supply to.
Source: BEIS

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.

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 as the number of industrial and commercial suppliers increased but by 2010 it had increased again as a result of a number of closures. Since 2010, electricity market concentration has slowly declined year-on-year across the domestic, commercial and industrial sectors, as the market became more competitive. This was due to increasing numbers of smaller suppliers entering the market and taking share from bigger companies. Overall, however, market concentration in 2016 is similar to that seen in 1999,

Chart 1: Herfindahl-Hirschman Index for electricity sales market concentration, 1989 to 2016



The domestic market was a regional monopoly before 1998, dominated by the Regional Electricity Company (REC). From 1999 to 2002 electricity sales to the domestic sector, as with industry and commercial sales, became more concentrated, with mergers between former RECs, and with other suppliers/generators. Since 2002, there has been less merger activity and the concentration measure has been fairly constant. In 2013 though there were five entrants to the market; however, the low level of customers acquired had little impact on the index.

In 2016, two suppliers to the domestic sector exited the market, decreasing the total to 20. The commercial market had 18 commercial electricity suppliers in 2004/05 but this fell to 15 in 2010, causing an increase in market concentration. Since 2010 the number of suppliers has increased to

[1] Following a review (principally relating to the rules of ownership of companies) we have made some revisions to this table this year. Details of the impact are shown in the Annex.

26 in 2016, with an accompanying decrease in concentration. With 26 industrial electricity suppliers in 2016, the industrial market has become 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 shares of the largest companies have changed over the last five years. The market share of the top nine suppliers peaked in 2009 and 2010 but since has steadily fallen to 85.8% in 2016. The share of those outside of the top nine rose from 4.0% in 2010 to 14.2% in 2016, due to the addition of new suppliers and other small suppliers taking market share from the large companies.

Table 2: Percentage of total electricity supplied to all consumers

	Market Share (%)						
Electricity Suppliers	2010	2011	2012	2013	2014	2015	2016
Aggregated share of top 3 suppliers	50.9%	48.9%	47.2%	46.3%	37.0%	45.1%	43.1%
Aggregated share of next 3 suppliers	36.4%	35.2%	36.7%	35.4%	27.0%	32.7%	31.7%
Aggregated share of next 3 suppliers	8.8%	8.5%	8.0%	8.1%	21.0%	10.1%	10.9%
Aggregated share of top 9 suppliers	96.0%	92.6%	91.8%	89.8%	85.0%	87.8%	85.8%
Other suppliers	4.0%	7.4%	8.2%	10.2%	14.9%	12.2%	14.2%

Source: BEIS

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 a 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 and the addition of new generators saw the number of companies increase to 57 in 2016.

Table 3: Number of Major Power Producers (1)

Year	Number	Year	Number	Number producing at least 5% of total generation
1989	6	2000	34	7
1990	6	2001	36	6
1991	11	2002	36	7
1992	14	2003	34	6
1993	20	2004	32	7
1994	23	2005	30	7
1995	25	2006	29	7
1996	26	2007	34	8
1997	27	2008	34	9
1998	29	2009	34	8
1999	30	2010	39	8
		2011	41	7
		2012	44	7
		2013	44	7
		2014	47	7
		2015	53	7
		2016	57	6

Source:BEIS

Table 4 shows the MPPs aggregated share of generation and aggregated share of capacity for 2012 to 2016. The market share of the top 9 generators in this period peaked in 2013 at 87% but has since declined to 75% in 2016 as new companies entered the market and increased generation. The top 9 generators held a lower share of capacity (65% in 2016) 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	2012	2013	2014	2015	2016
Aggregated share of top 3 companies	51.7	50.9	48.5	48.6	48.9	46.7	41.9	43.5	32.5	32.4
Aggregated share of next 3 companies	23.8	24.0	25.6	21.6	15.5	23.4	24.9	24.2	27.8	18.1
Aggregated share of next 3 companies	11.1	11.8	10.7	12.7	10.5	12.1	12.6	13.1	15.2	14.6
Aggregated share of top 9 companies	**86.6**	**86.7**	**84.8**	**83.0**	**74.9**	**82.2**	**79.4**	**80.9**	**75.5**	**65.1**
Other major power producers	13.4	13.3	15.2	17.0	25.1	17.8	20.6	19.1	24.5	34.9

(1) Of the same companies in each band in generation terms
Source: BEIS

User feedback

We welcome all feedback from users; therefore, if you have any comments or queries regarding this analysis, please contact either Stephen Ashcroft or Nick Jesson using the contact details below.

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Annex

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.

Table 5: Revisions to the 2015 number of companies supplying electricity as reported in 2016

	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2015
Domestic Sector	0	0	0	0	0	0	1	2	2	3	0
Commercial Sector	0	0	0	0	0	-2	1	0	0	2	-1
Industrial Sector	0	0	0	0	0	1	1	-1	-1	1	-1

Table 6: Revisions to the 2015 percentage of total electricity supplied to all consumers as reported in 2016

	Market Share (%)				
Electricity Suppliers	2011	2012	2013	2014	2015
Aggregated share of top 3 suppliers	-2.4%	-1.9%	-1.4%	-10.4%	0.0%
Aggregated share of next 3 suppliers	-0.8%	0.0%	0.0%	-6.5%	0.0%
Aggregated share of next 3 suppliers	1.9%	1.8%	1.5%	12.1%	0.0%
Aggregated share of top 9 suppliers	-1.2%	-0.2%	0.1%	-4.8%	0.0%
Other suppliers	1.2%	0.2%	-0.1%	4.7%	0.0%

International energy price comparisons

Introduction

This article looks at international comparisons in the EU for gas and electricity prices to both the non-domestic and the domestic sectors. It differs from Section 5 of Quarterly Energy Prices (QEP) as comparisons are also made in Purchasing Power Standard per kWh, whereas QEP only compares energy prices in pence per kWh.

The purchasing power standard (PPS) is an artificial currency unit which attempts to remove the effects of exchange rate variations and place comparisons on an equal footing. Theoretically, one PPS can buy the same amount of goods and services in each country, despite, price differences across borders meaning that different amounts of national currency units are needed to purchase the same goods and services. PPS are derived by dividing any economic aggregate of a country in national currency by its respective purchasing power parities[(1)].

Energy prices in Western European countries are generally lower when in PPS per kWh (PPS/kWh) than in pence per kWh (pence/kWh). The generally higher GDP in Western Europe offsets the typically higher cost of living in western European countries, with higher energy costs seen when data presented in a pence/kWh format.

All data used in this article are sourced from Eurostat, the statistical office of the EU. Data are available at http://ec.europa.eu/eurostat/web/energy/data/database.

Summary

There are some signficiant differences between countries when moving from the simple price £/kWh basis to the PPS basis. For the UK, and when compared to the EU 28:

- For non-domestic gas, the UK moves from the eighth lowest cost on a £/kWh basis to the second lowest cost on a PPS/kWh basis;
- For non-domestic electricity, the UK moves from the third most expensive on a £kWh basis to the twelvth lowest on a PPS/kWh basis;
- For domestic gas, the UK moves from the eleventh lowest cost on a £kWh basis to the second lowest on a PPS/kWh basis; and
- For domestic electricity, the UK moves from the tenth highest cost on a £kWh basis to the seventh cheapest on a PPS/kWh basis.

When comparing prices across the EU28 using market exchange rates, the UK prices are generally below the median for gas and above the median for electricity. When the comparisons correct for differences between countries using the PPS, the UK is below the median for both gas and electricity. UK rankings, when measured using market exchange rates, improved between 2015 and 2016. This is due to the depreciation of the pound.

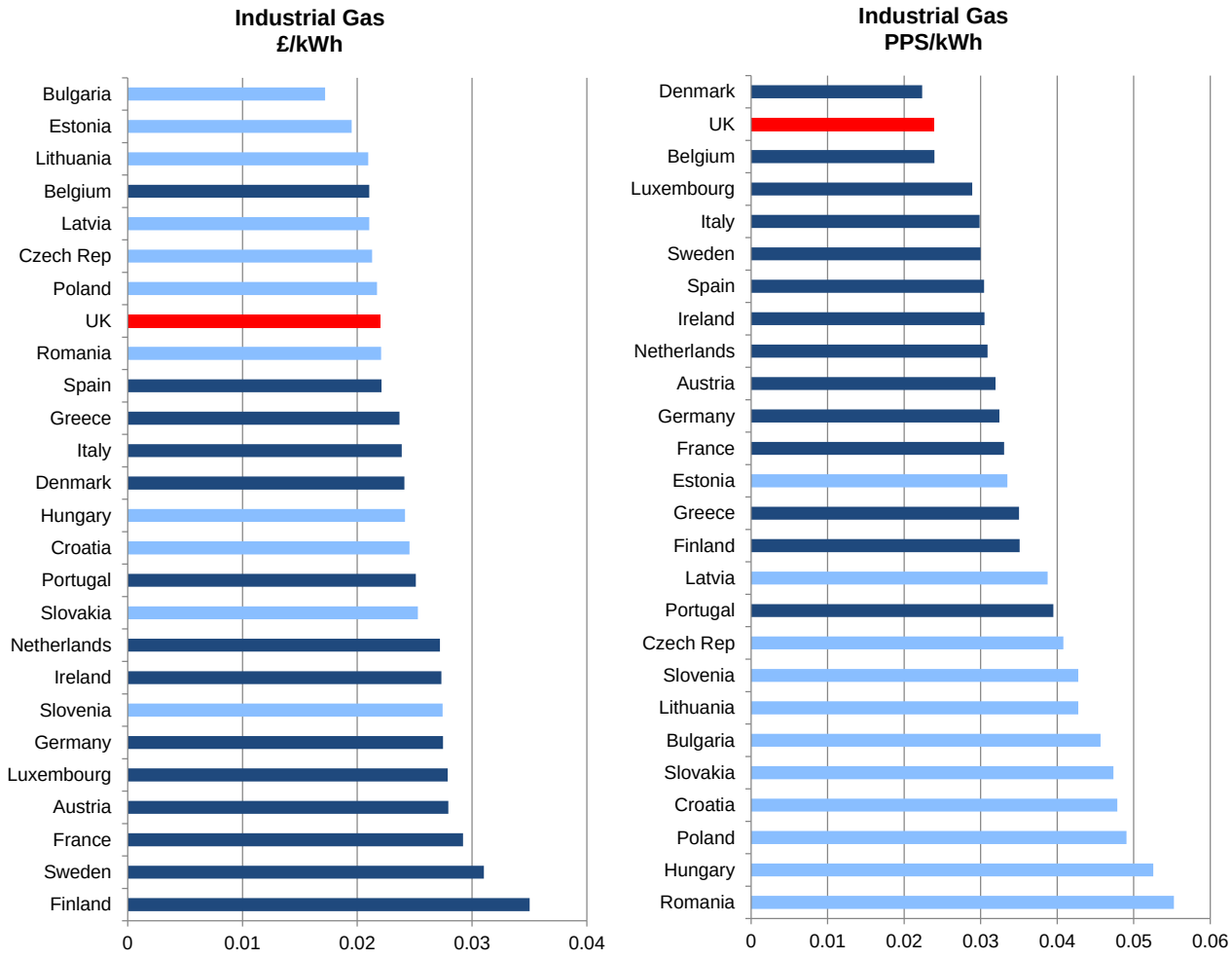
[1] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Purchasing_power_parities_(PPPs)

International non-domestic price comparisons

1.1 Non-domestic gas price comparisons in 2016 [2], [3], [4], [5]

The UK ranks eighth lowest within the EU28 for non-domestic gas prices for medium sized consumers, measured in £/kWh. However, when measured in PPS/kWh UK gas prices are the second lowest in the EU28, 30 per cent below the median.

The charts below shows the relative prices in pounds, sterling, converted using market exchange rates and prices converted using PPS. Different shades have been used to differentiate between EU15 and the additional EU28 member states. When comparing the prices in pounds, the more expensive end of the scale is dominated by countries within the EU15 with the cheapest prices found in countries from the EU28. However, when measured using PPS, of those with prices at or below the median, all but one are EU15 countries.



When comparing prices over time, changes in the market exchange rates must be considered. Between 2015 and 2016, when measured using market exchange rates, UK prices fell by 14 per cent from 2.57p/kWh to 2.20p/kWh. The median price of the remaining EU countries, excluding the UK, fell by just 6.5 per cent from 2.58p/kWh to 2.42p/kWh. However, this is was due to the depreciation of the pound, moving from an average Euro/sterling rate of 1.38 in 2015, to an average of 1.22 in 2016 (an 11 per cent depreciation).

[2] Gas prices for non-domestic medium consumers: consuming 2,778 – 27,777 MWh per annum.
[3] Prices include all taxes where not refundable on purchase.
[4] Source: Eurostat Statistics in Focus and database for all data in this article.
[5] Data are not published by Eurostat for Cyprus and Malta – there is limited gas use by non-domestic consumers in both these countries

When the year-on-year changes in prices are compared in Euros rather than in pounds, the median price of the EU fell by 17 per cent. This is much greater than the 6.5 per cent fall seen when converted to pounds, as seen in table 1 below. This is because the rate that has been used to convert the price from Euros to pounds is 11 per cent lower than in 2015.

Table 1: Prices in the UK and EU in 2015 and 2016 in pounds and Euros

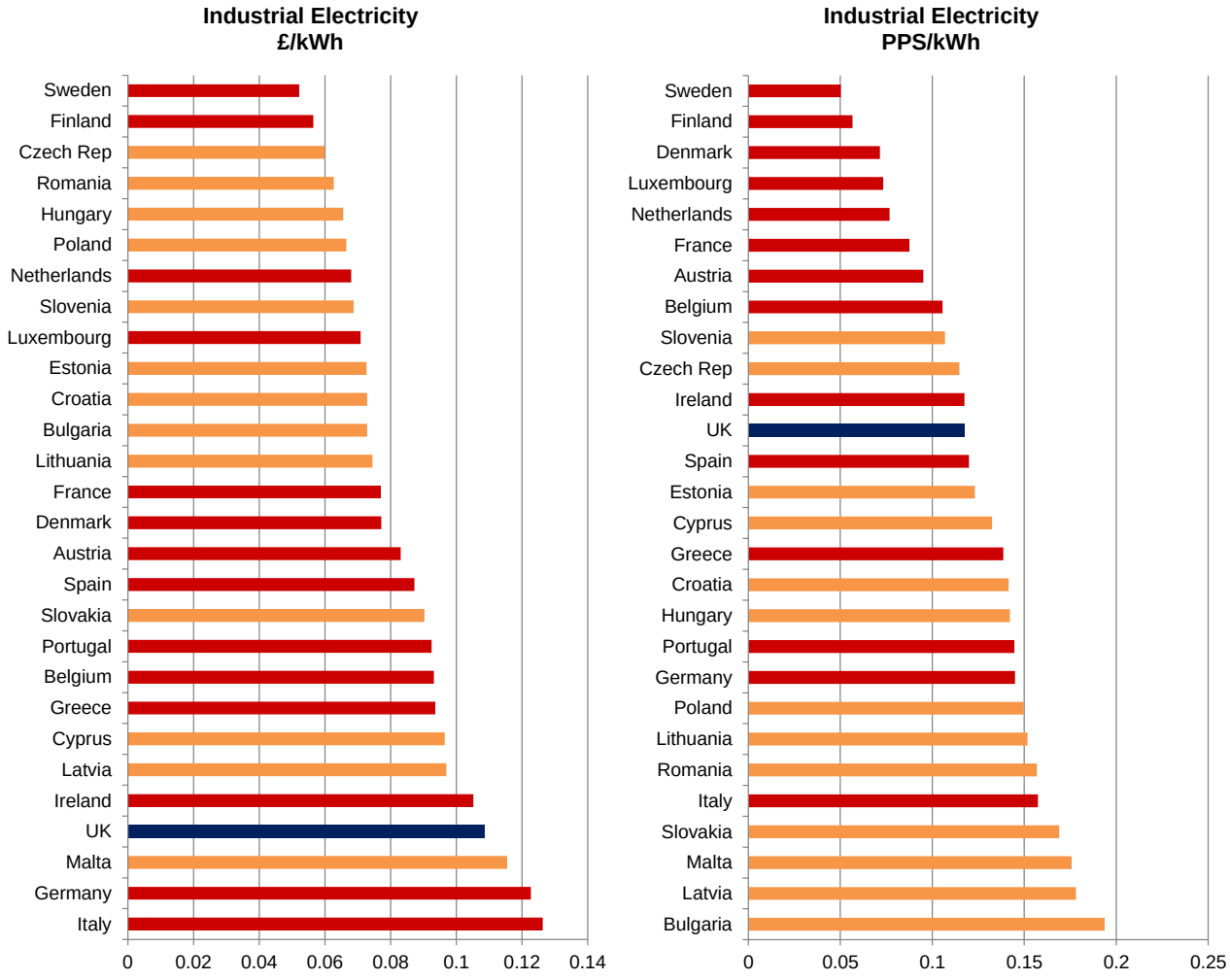
	UK			Rest of the EU		
	2015	2016	% change	2015	2016	% change
£	2.57p/kWh	2.20p/kWh	**-14.3%**	2.58p/kWh	2.42p/kWh	-6.5%
Euro	3.54c/kWh	2.70c/kWh	-23.7%	3.56c/kWh	2.96c/kWh	**-16.9%**

When measured using PPS, the changes in market exchange rate do not affect the prices as the PPS measurement is comparable across each country. Using this measurement, the UK price fell by 13 per cent and the median price of the remaining EU countries, excluding the UK, fell by 14 per cent. This shows that the UK prices fell by a broadly similar rate to the rest of the EU once the changes in the market exchange rates have been eliminated.

1.2 Non-domestic electricity price comparisons in 2016 [6], [7]

For non-domestic electricity prices for medium sized consumers, measured in pence/kWh, the UK ranks fourth highest within the EU28, 41 per cent above the EU28 median. However, when measured in PPS/kWh UK electricity prices are twelfth lowest in the EU28, 8.0 per cent below the median.

As can be seen from the charts below, when measured using PPS, the lowest priced energy comes from mainly countries within the EU15.



Between 2015 and 2016, when measured using market exchange rates UK prices fell by 0.6 per cent. This contrasts with an increase in the median price of the remaining EU countries of 7.3 per cent. However, as with the industrial gas prices, the EU prices when converted to pounds are impacted by the market exchange rates. When measured using PPS, the impact of changes in the market exchange rates are exclude. The UK prices fell by 0.6 per cent whilst the median price of the remaining EU countries actually fell, rather than increased, by 8.0 per cent.

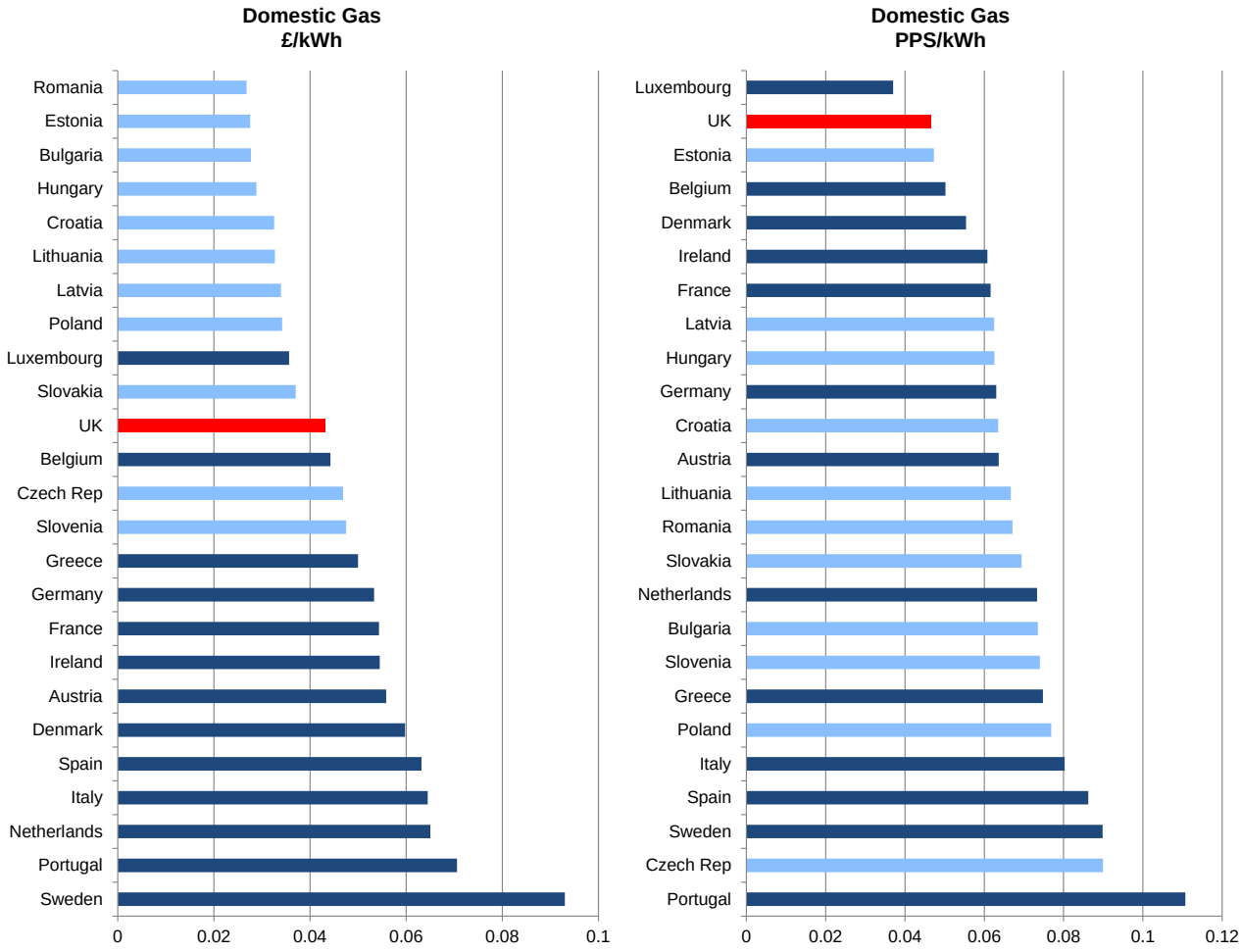
[6] Electricity prices for non-domestic medium consumers: consuming 2,000 – 19,999 MWh per annum
[7] Prices include all taxes where not refundable on purchase

International domestic price comparisons

2.1 Domestic gas price comparisons in 2016 [8], [9]

For domestic gas prices for medium sized consumers, measured in pence/kWh, the UK ranks eleventh lowest within the EU28, 8.2 per cent below the EU28 median. However, when measured in PPS/kWh UK gas prices are second lowest in the EU28, 30 per cent below the median.

As can be seen from the charts below, 8 of the 12 countries whose prices rank below the EU28 Median, when measured using PPS, are in the EU15. This is only true of three EU15 countries when measured in GBP, Luxembourg, Belgium and the UK.



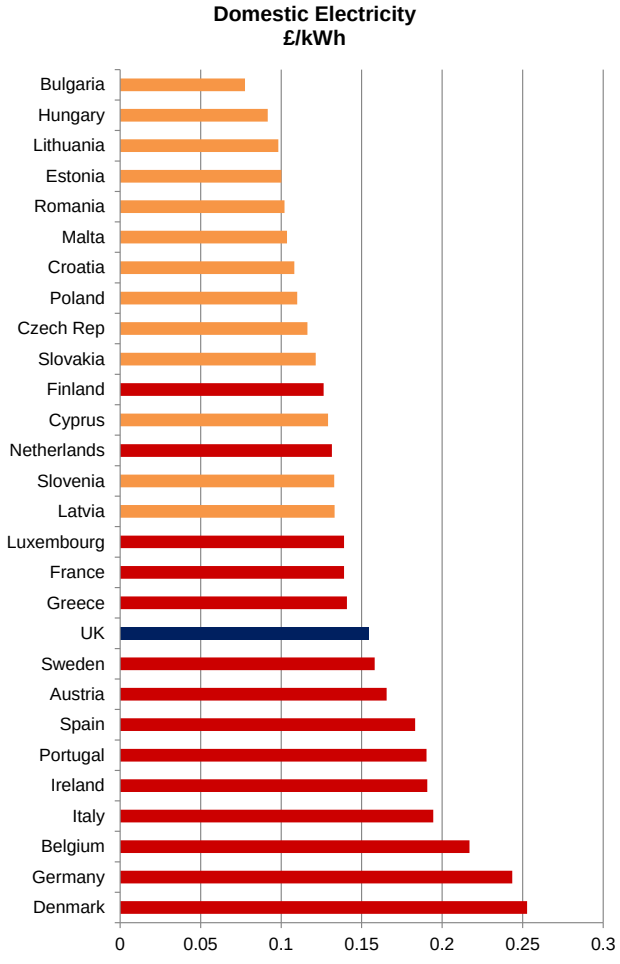
The UK prices fell by 8.9 per cent in 2016 compared to 2015 when in pounds. The median price of the rest of the EU countries increased by 6.5 per cent over the same time period. This difference is due to the depreciation of the pound between 2015 and 2016 as discussed in the industrial gas section. When measured using PPS to eliminate the impact of the changes in the market exchange rates, the UK price again fell by 8.9 per cent whereas the EU median excluding the UK fell by a 7.0 per cent.

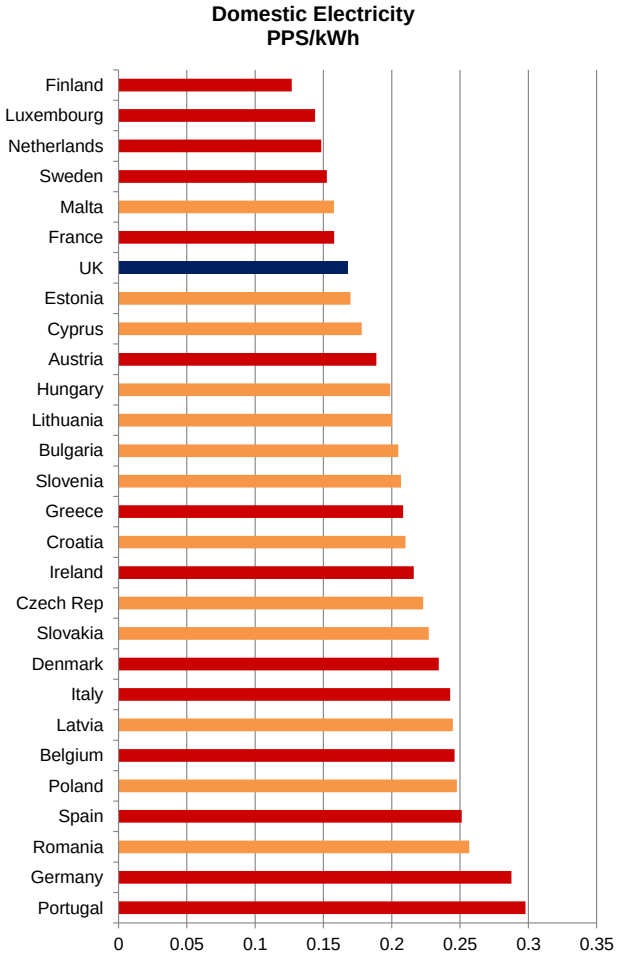
[8] Gas prices for domestic medium consumers: consuming 5,557 – 55,557 kWh per annum
[9] Prices include all taxes

2.2 Domestic electricity price comparisons in 2016 [10], [11]

For domestic electricity prices for medium sized consumers, measured in pence/kWh, the UK ranks tenth highest within the EU28, 16 per cent above the EU28 median. However, when measured in PPS/kWh UK electricity prices are seventh cheapest in the EU28, 19 per cent below the median.

When measured in pence per kWh, the majority of the EU15 prices are above the median price. However, when measured in PPS, the prices for the EU15 countries are distributed more evenly with 5 of the 6 lowest from the EU15.





Similarly to domestic gas, when comparing prices using the market exchange rate, UK prices have fallen (by 1.1 per cent) whereas the median of all other EU countries actually increased (by 9.1 per cent) in 2016 compared to 2015. By comparing in PPS, the impact of the change in exchange rates are excluded and UK prices fell again by 1.1 per cent whilst the median remained broadly similar with a slight increase of 0.5 per cent.

[10] Electricity prices for domestic medium consumers: consuming 2,000 – 19,999 kWh per annum
[11] Prices include all taxes

Conclusion

Using Purchasing Power Standards allows an alternative method of making international comparisons of energy prices. Using PPS, for both non-domestic and domestic, energy prices in the UK are ranked more favourably amongst the EU28 compared to the ranking based on pence per kWh.

Gas prices, for both UK non-domestic and domestic, move from being ranked around the EU median when measured in pence per kWh, to one of the lowest in PPS. Similarly, electricity prices for the UK move from being amongst the highest, to being below the EU median when PPS are used to convert currencies.

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Aggregated energy balances showing proportion of renewables in supply and demand

Introduction

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

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

Summary Table

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

Table 1: 2016 Energy balance, showing proportion of renewables (ktoe)[3]

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

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

[1] https://unstats.un.org/unsd/energy/ires/IRES_edited2.pdf
[2] The key differences are that the RED basis uses net calorific values and a normalisation process to smooth out the effects of extreme weather years for hydro and wind generation.
[3] Note that for a number of rows, the tables do not show the proportion of biofuels. For transformation for instance, the total in the energy balance is the net loss of the transformation process. A renewable component of this can be calculated but it is in itself fairly meaningless.

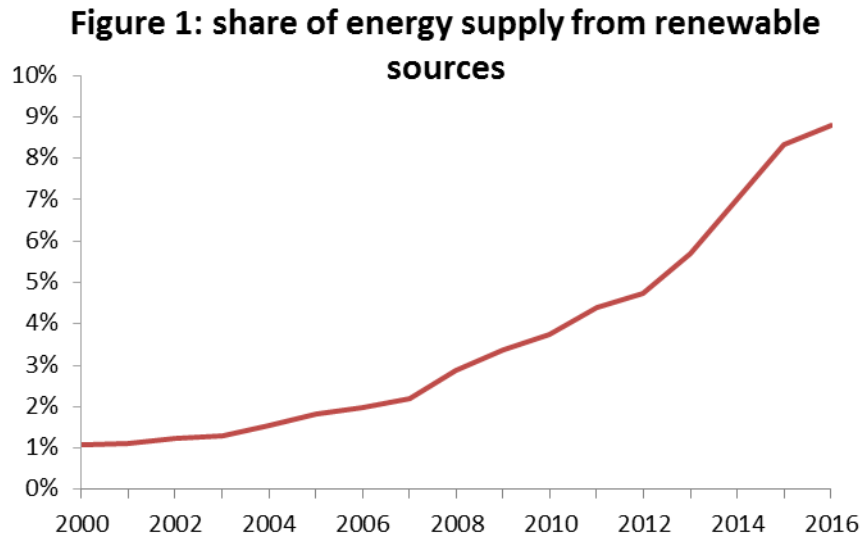
Table 2: Energy balance 2014 to 2016, showing proportion of renewables (ktoe)

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

Trends

- Over time, the proportion of renewables in energy supply has been steadily increasing over the years, rising from 1.1 per cent in 2000 to 8.8 per cent in 2016

Figure 1: share of energy supply from renewable sources



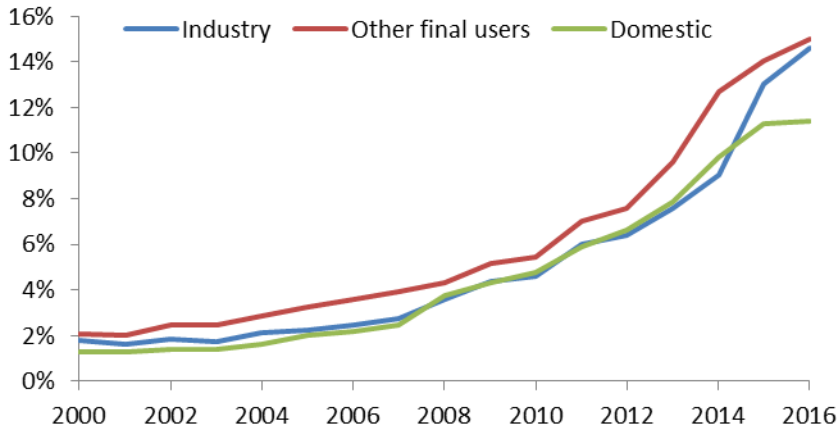
- This is in line with the 8.9 per cent progress against the RED as reported in DUKES 2017. As the two measures are calculated on a different basis, they do not match exactly.

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

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

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

Figure 2: Final consuming sectors; proportion of renewables



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

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

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

Development of the statistics

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

For further information, please contact:

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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 2016.

Table A.1. worked example (ktoe)

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

Notes for renewable data

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

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

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

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

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 2017, was published on 31 August 2017 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 21 September 2017 at:
www.gov.uk/government/collections/household-energy-efficiency-national-statistics

Sub-national consumption of other fuels, 2015

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 2015. 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 28 September 2017 at:
www.gov.uk/government/collections/sub-national-consumption-of-other-fuels

Sub-national total final energy consumption, 2015

This factsheet 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 2015. The release was published on 28 September 2017 at:
www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level

Sub-national electricity consumption in Northern Ireland, 2015

This publication presents estimates of the latest analysis of electricity consumption in Northern Ireland at District Council level, for the period covering 1 January to 31 December 2015. The release was published on 28 September 2017 at:
www.gov.uk/government/collections/sub-national-electricity-consumption-in-northern-ireland.

Energy Trends and Energy Prices: December 2017

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 28 December, will fall between Christmas and New Year it has been decided that the release date for the December 2017 editions will be brought forward to Thursday 21 December 2017.

Sub-national electricity consumption, 2016

This factsheet 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 factsheet 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 26 January 2016 and 25 January 2017. These data follow on from the results produced from similar exercises carried out for 2005 to 2015. The latest release will be published on 21 December 2017, at:
www.gov.uk/government/collections/sub-national-electricity-consumption-data.

Sub-national gas consumption, 2016

This factsheet 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 1 October 2015 and 30 September 2016 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 2015. The latest release will be published on 21 December 2017, 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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