

Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2014

Background

This article updates that published in the September 2014 edition of *Energy Trends* on the amount of electricity from renewable sources, disaggregated below UK level. As before, it has been necessary to combine some renewable sources into categories so that information about individual sites provided to Ricardo-AEA and the Department of Energy and Climate Change (DECC) in confidence is not disclosed.

Figures in Tables 2 and 3 correspond to the totals shown in Table 6.4 of the Digest of United Kingdom Energy Statistics 2015 (DUKES). Thus the data in this article covers all renewables, including renewables that are not eligible for the Renewables Obligation (RO) or Feed in Tariff (FiT), such as large-scale hydro commissioned before 1 April 2002. Offshore wind has been allocated to the region to which its output is connected¹.

For the first time this year, statistics are now available² at Local Authority level. These include a breakdown by number of sites, capacity and generation. Where disclosure of confidential generation data was likely at the site level, this has been addressed, where possible, by replacing commercially sensitive data with that from publicly available sources. Where this is not possible, the affected values have been set to zero and added to the unallocated row at the bottom of the Local Authority listings.

What the figures show

Table 1 and Chart 1 show that there were 4,468 non-PV sites in England generating electricity from renewable sources, with 3,207 non-PV sites in Scotland, 662 in Wales and 821 in Northern Ireland. In addition there were 496,086 PV sites reported for England, 39,582 for Scotland, 38,914 for Wales and 11,879 for Northern Ireland. No geographical information was available for a further 63,848 PV schemes, 561 wind schemes, 89 hydro schemes and 46 other bioenergy (including anaerobic digestion) schemes.

In capacity terms, including PV, England had almost twice (98 per cent higher) renewable electricity capacity than Scotland (Table 2 and Chart 3). This is mainly because of England's considerable bioenergy (90 per cent of the UK's bioenergy capacity) and PV capacity levels (83 per cent of the UK's PV capacity). Despite having the majority of the UK's solar PV (which accounted for almost nine per cent of English renewable generation), England's share of bioenergy capacity (typically used more intensively than other technologies), resulted in generation from renewable sources in England during 2014 being more than double that of Scotland.

¹ With the exception of Robin Rigg which comes ashore at Seaton, Cumbria but whose generation is associated with Scotland.

² Part of the tables published by DECC that show a range of renewable electricity data for the devolved administrations and the regions of England: www.gov.uk/government/statistics/regional-renewable-statistics

Special feature – Sub-national renewable electricity

Table 1: Number of sites generating electricity from renewable sources, 2014¹

	Hydro	Wind ²	Wave and tidal	Landfill gas	Sewage gas	Other bioenergy ³	Total excluding PV	Solar PV	Total
England	241	3,400	2	360	163	302	4,468	496,086	500,554
East Midlands	24	342	-	40	13	35	454	58,305	58,759
East of England	6	803	-	69	13	37	928	68,029	68,957
North East	9	230	-	19	8	10	276	29,295	29,571
North West	41	419	-	54	24	46	584	54,583	55,167
London	-	29	-	1	4	14	48	15,630	15,678
South East	15	102	-	70	35	31	253	77,998	78,251
South West	96	660	1	39	21	43	860	89,650	90,510
West Midlands	18	151	-	29	20	50	268	46,483	46,751
Yorkshire and the Humber	32	664	1	39	25	36	797	56,113	56,910
Wales	142	468	-	24	16	12	662	38,914	39,576
Scotland	377	2,736	9	46	7	32	3,207	39,582	42,789
Northern Ireland	65	713	1	12	2	28	821	11,879	12,700
Other Sites	89	561	-	-	-	46	696	63,848	64,544
UK Total	914	7,878	12	442	188	420	9,854	650,309	660,163

Components may not add exactly to totals because of rounding.

For notes to Table 1 see below Table 3.

Table 2: Installed capacity of sites generating electricity from renewable sources, 2014¹

	Hydro	Wind ²	Wave and tidal	Landfill gas	Sewage gas	Other bioenergy	Solar PV	MW Total
England	32.0	5,792.6	0.1	874.7	189.5	2,940.3	4,469.5	14,298.8
East Midlands	4.6	723.8	-	68.5	17.5	121.9	471.1	1,407.4
East of England	0.1	1,401.5	-	201.6	26.3	153.0	896.6	2,679.2
North East	7.6	405.7	-	44.6	11.6	135.7	97.2	702.4
North West	6.2	1,392.3	-	149.6	27.0	135.5	202.1	1,912.7
London	-	11.2	-	0.3	23.4	172.4	60.7	268.0
South East	0.7	1,104.4	-	172.1	29.2	255.7	855.4	2,417.5
South West	9.7	230.4	-	96.1	15.1	45.7	1,419.4	1,816.5
West Midlands	0.8	4.7	-	60.3	23.1	501.7	230.1	820.8
Yorkshire and the Humber	2.3	518.6	0.1	81.5	16.2	1,418.7	236.9	2,274.3
Wales	157.8	1,172.2	-	45.5	13.1	45.9	375.8	1,810.3
Scotland	1,507.6	5,215.8	7.4	116.3	5.6	226.1	155.6	7,234.3
Northern Ireland	8.5	689.0	1.2	14.3	0.2	20.6	62.2	796.0
Other Sites	17.3	117.9	0.0	0.0	0.0	34.0	314.3	483.5
UK Total	1,723.2	12,987.5	8.7	1,050.9	208.4	3,266.8	5,377.3	24,622.9
Co-firing ⁴						15.5	-	15.5

Components may not add exactly to totals because of rounding.

Table 3: Generation of electricity from renewable sources, 2014¹

	Hydro	Wind ²	Wave and tidal	Landfill gas	Sewage gas	Other bioenergy ⁵	Solar PV	GWh Total
England	98.8	16,429.1	0.1	4,256.7	773.4	15,080.3	3,447.1	40,085.4
East Midlands	13.7	1,952.0	-	319.9	77.8	407.2	353.9	3,124.5
East of England	0.3	4,343.9	-	1,014.1	66.3	812.9	665.8	6,903.3
North East	32.9	875.5	-	163.6	53.2	576.1	78.6	1,779.9
North West	17.0	4,110.4	-	627.5	133.3	535.5	167.1	5,590.8
London	-	14.5	-	2.6	53.1	560.3	53.3	683.8
South East	1.8	3,547.0	-	958.6	125.4	718.7	611.1	5,962.6
South West	24.6	466.7	-	474.3	71.3	187.1	1,139.4	2,363.4
West Midlands	2.3	7.5	-	335.5	128.3	2,238.5	181.8	2,893.9
Yorkshire and the Humber	6.3	1,111.6	0.1	360.6	64.5	9,044.0	196.0	10,783.1
Wales	275.7	2,331.6	-	193.5	43.6	330.5	234.3	3,409.3
Scotland	5,435.8	11,664.1	2.1	533.5	28.2	1,166.5	131.7	18,961.9
Northern Ireland	28.2	1,454.3	0.0	61.3	0.7	104.4	45.7	1,694.6
Other Sites	46.4	136.5	-	-	-	129.1	191.0	503.0
UK Total	5,884.9	32,015.7	2.2	5,045.0	845.9	16,810.8	4,049.7	64,654.1

Components may not add exactly to totals because of rounding.

Notes to Tables 1 to 3

- Nil or less than half the final digit shown.

1 At the 31 December 2014.

2 Wind Offshore is allocated to regions/countries according to where the cabling comes ashore. Wave & Tidal has been separated out this year

3 Eight of these sites are sites that co-fire renewables with fossil fuels (see also note 4, below).

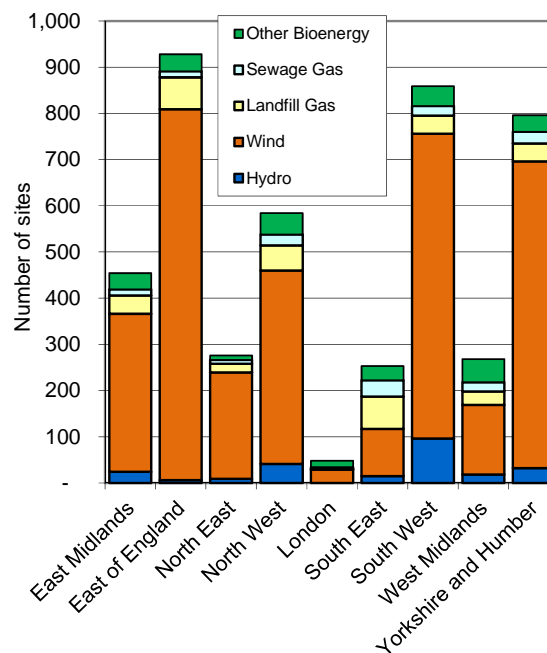
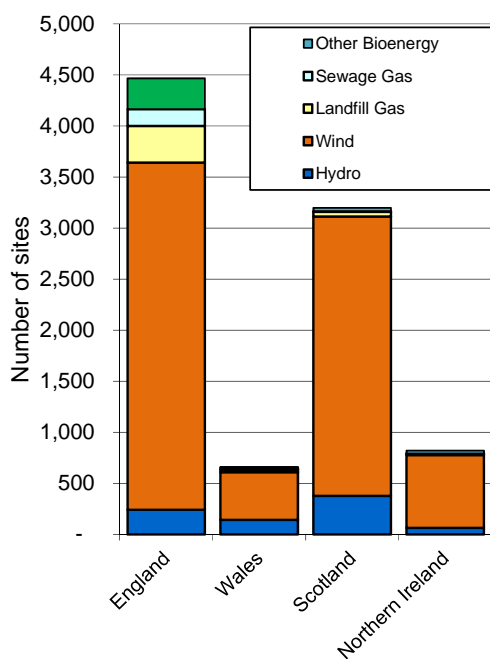
4 This is the proportion of non-fossil fuelled capacity used for co-firing of renewables based on the proportion of generation accounted for by the renewable source. This estimate has not been disaggregated into region values because to do so could disclose data that relate to individual companies.

5 Includes bioenergy sources co-fired with fossil fuels.

6 Generation data for wave and tidal schemes are from publicly available monthly Renewables Obligation Certificates data (or DECC estimates where this is not available); therefore, where there are regions with less than three sites, no company data are being disclosed.

In England, the number of sites (excluding PV) in each region varies from 48 in London to 928 in the East of England (Table 1 and Chart 2). The highest capacity in England (including PV) is in the East of England, followed by the South East and Yorkshire and the Humber (Table 2 and Chart 4). In the East of England, 52 per cent of capacity is from wind (most from offshore), 33 per cent is from PV and 8 per cent from landfill gas. In the South East, 46 per cent of capacity is from wind, 35 per cent from PV and 11 per cent from other biomass. In Yorkshire and the Humber, 23 per cent of capacity is from wind, 62 per cent from other biomass and 10 per cent from PV. The East of England has 19 per cent of the UK's landfill gas capacity, 13 per cent of the UK's sewage gas capacity and 12 per cent of the PV. The South East (with 16 per cent of the UK's landfill gas capacity), and the North West (with 14 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 52 per cent of UK generation from landfill gas.

Chart 1: Number of sites by country¹ **Chart 2: Number of sites by English region¹**



1. Excludes Solar PV schemes, due to the large numbers involved, and – given the size of these - would misrepresent its overall contribution to UK renewables.

In 2014, Scotland had 40 per cent of the UK’s wind capacity and produced 36 per cent of the output (Tables 2 and 3; Charts 5 and 9). The East has the next largest wind share (10.8 per cent of capacity and 14 per cent of generation) followed closely by the North West (10.7 per cent of the capacity and 13 per cent of the output), then Wales (9 per cent of capacity and 7 per cent of generation) and the South East (8.5 per cent of capacity and 11 per cent of generation (Tables 2 and 3; Charts 3 to 10)³. England as a whole accounts for 45 per cent of wind capacity and 51 per cent of generation.

³ A map of wind farm installed capacities in the UK at the end of 2014 was published in the renewables chapter of the 2015 edition of the Digest of UK Energy Statistics www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

Chart 3: Renewable capacity by country

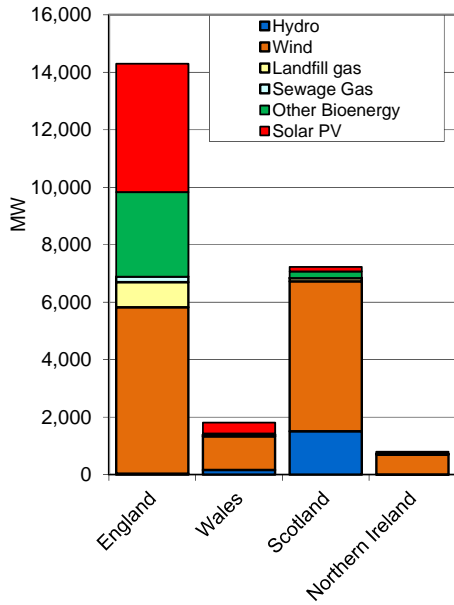


Chart 4: Renewable capacity by English region

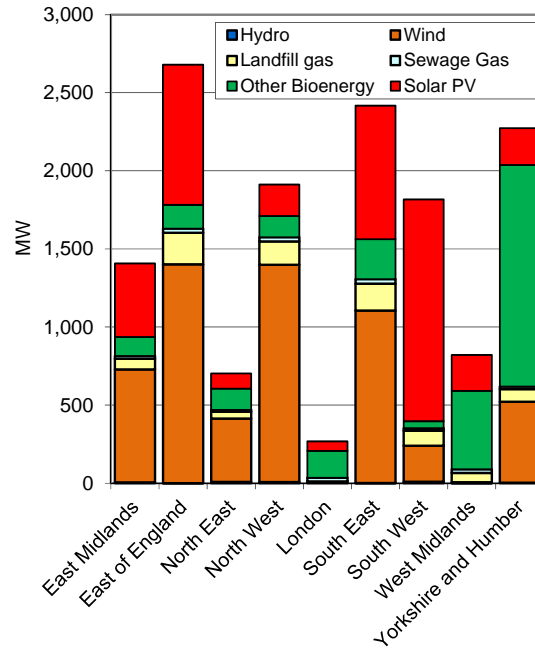


Chart 5: Wind capacity by country

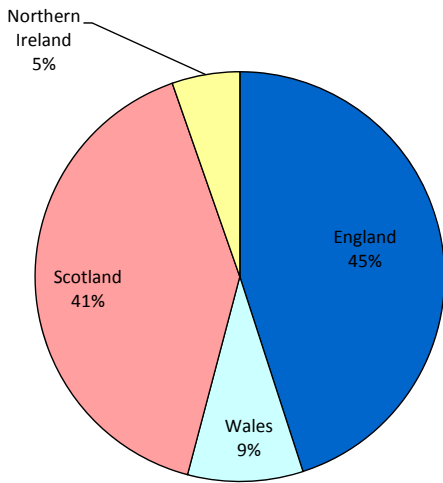


Chart 6: Wind capacity by English region

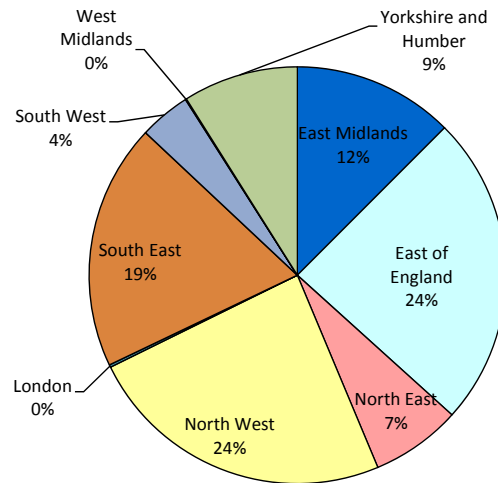


Chart 7: Renewable generation by country

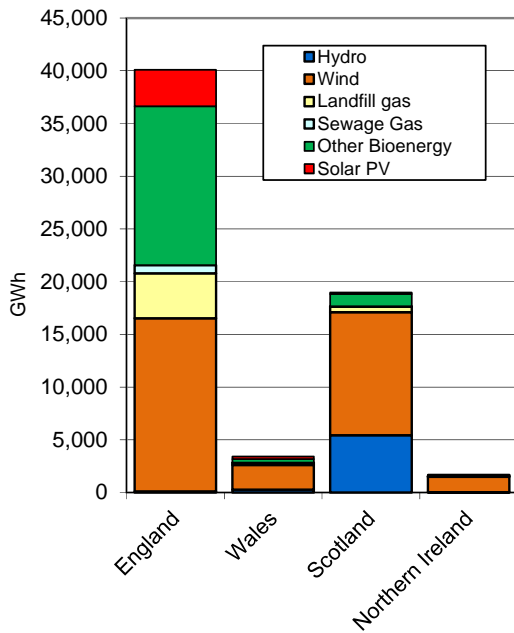


Chart 8: Renewable generation by English region

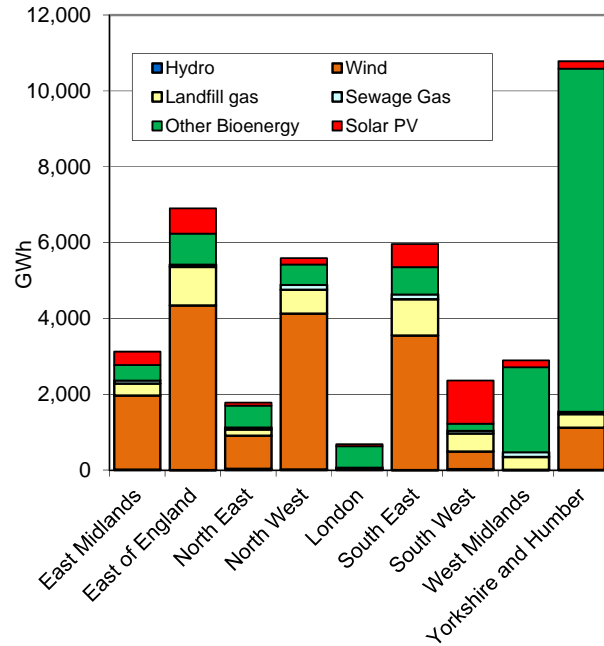


Chart 9: Wind generation by country

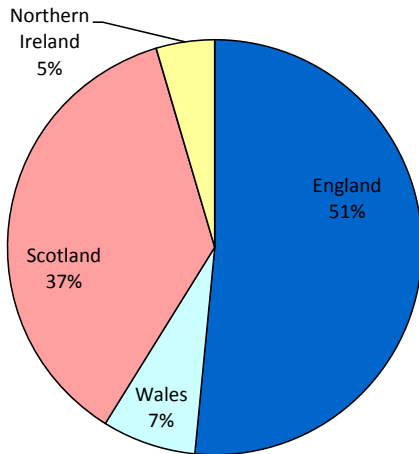
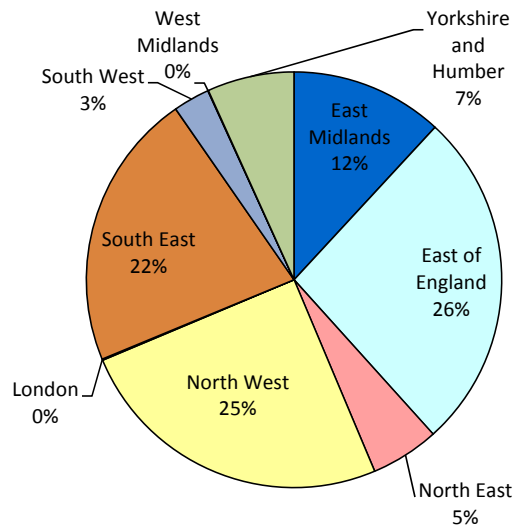


Chart 10: Wind generation by English region



Ninety one per cent of the generation from sewage and 90 per cent of the generation from other bioenergy (including that used for co-firing) took place in England. The North West (16 per cent), the South East jointly with the West Midlands (15 per cent each) and East Midlands (9 per cent) were the major sewage gas areas. In the other bioenergy category, Yorkshire and the Humber (54 per cent) had the largest share (mostly from Drax, where – in addition to a first unit converted in 2013 to biomass - a second 645 MW biomass unit became operational in 2014), followed by West Midlands (13 per cent) and Scotland (7 per cent).

Special feature – Sub-national renewable electricity

Excluding bioenergy sources used for co-firing (which cannot be allocated to regions – see note 4 to Table 2), the Yorkshire and the Humber has the largest capacity to generate from bioenergy (43 per cent of the UK total), mostly from the two 645 MW converted units at Drax followed by West Midlands (15 per cent), mostly from the 360 MW Ironbridge biomass conversion, and the South East (8 per cent).

In terms of change to total renewables generating capacity, Yorkshire and the Humber (+874 MW), South West (+741 MW), Wales (+636 MW), Scotland (+626 MW), East of England (+618 MW), North West (+490 MW) and South East (+446 MW) have all shown considerable growth this year but the West Midlands shows a net decrease of 447 MW as a result of the reduction in capacity of the Ironbridge biomass conversion from 900 to 360 MW.

The growth in overall renewables capacity has primarily come from the following regions:

- Yorkshire and the Humber - biomass (+692 MW, mostly from the 645 MW second Drax unit conversion) and wind (+109 MW);
- South West - solar (+692 MW);
- Wales - wind (+401 MW – with 428 MW from the new Gwynt y Mor offshore site) and solar (229 MW);
- Scotland - wind (+512 MW, including the following new onshore wind sites: Harestanes (136 MW), Mid Hill (76 MW), 69 MW Lochluichart Windfarm, Berry Burn (67 MW) and Beinn an Tuirc 2 (44 MW);
- East of England - solar (+547 MW);
- North West - wind (+406 MW, mostly from the new 389 MW West of Duddon Sands offshore site);
- South East - solar (+420 MW).

The rapid uptake of solar has been a feature of the last four years, driven by the financial support being given to, and decreasing cost of, the technology.

Comparison with economic activity

Economic activity in each country or region can be measured in terms of Gross Value Added (GVA). Table 4 shows that Scotland continues to show the largest generating capacity from renewables in terms of capacity per unit of GVA and generation per unit of GVA. Among the English regions, Yorkshire and the Humber is highest in generating capacity per unit of GVA terms followed by the East of England and the South West with the East Midlands and the North East very close behind. In terms of Generation/GVA, Yorkshire and the Humber is the highest followed by East of England and the North West.

Table 4: 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	11.02	30,890
East Midlands	15.84	35,172
East of England	20.55	52,948
North East	15.48	39,228
North West	13.51	39,478
London	0.79	2,020
South East	10.64	26,240
South West	15.96	20,767
West Midlands	7.45	26,249
Yorkshire and the Humber	22.36	106,027
Wales	34.77	65,474
Scotland	61.77	161,907
Northern Ireland	24.24	51,600
UK average	15.83	42,058

1. GVA is Gross Value Added as published as Total GVA in Regional Gross Value Added (Income Approach), December 2014 at: <http://www.ons.gov.uk/ons/rel/regional-accounts/regional-gross-value-added--income-approach-/december-2014/index.html>

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

Comparison with earlier years

DECC and Ricardo-AEA have compiled, for each year from 2003, data on the number, installed capacity and generation, comparable to that shown in Tables 1 to 3. These data are available as Excel spreadsheets at: www.gov.uk/government/statistics/regional-renewable-statistics. The *Energy Trends* articles in previous editions were snapshots of the position as seen at the time and so the headline data in those articles do not constitute a time series. This is because in each year there have been revisions due to an improved statistical base as well as later information on generation and capacity.

Between 2003 and 2014, there was a 510 per cent increase in generation from renewables in the UK, but faster rates of growth were recorded in Yorkshire and the Humber (1,556 per cent), Northern Ireland (1,525 per cent), South East (652 per cent), East Midlands (622 per cent), North East (591 per cent) and North West (551 per cent) (see charts 11 and 12). For the individual technology groups some of the very large percentage increases are because in 2003 there was very little use of some of the technologies in various regions.

Within the England regions there are several notable spikes in the data. In East of England, generation in 2012 and 2013 increased by 121 per cent and 33 per cent respectively, before falling by 26 per cent in 2014. This is primarily due to the effects of Tilbury power station, which converted to biomass at the end of 2011, closing for a few months (due to a fire) in 2012, before closing in August 2013. In Yorkshire and the Humber, generation almost doubled in 2013, and more than doubled in 2014, due to the successive conversions of the two units at Drax to biomass. Meanwhile, generation in the South East increased by more than half in 2013, with the opening of London Array offshore wind farm

Chart 11: Trends in generation from renewables by country

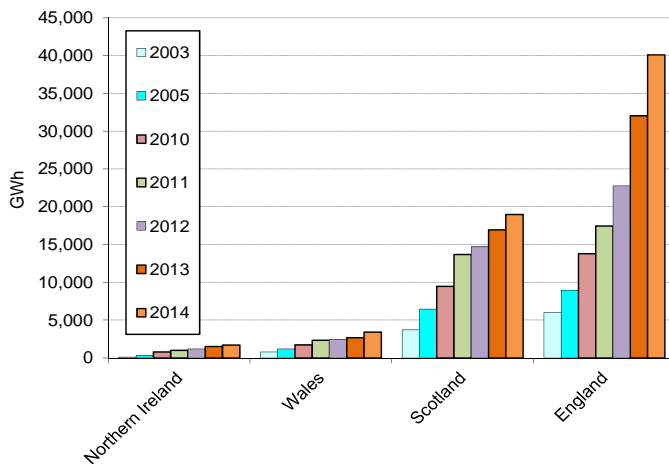
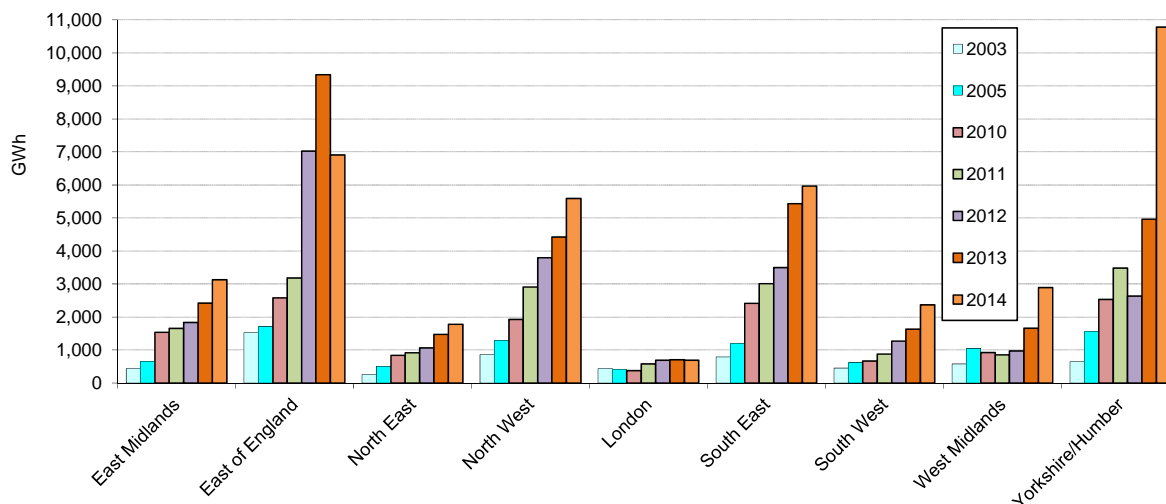


Chart 12: Trends in generation from renewables by English region



Load factors

Load factors for the various technologies are shown in Table 5 from data provided in Tables 2 and 3 of this article. These are presented on an unchanged configuration basis.

Previously, load factors were presented in terms of installed capacity and express 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 take into account the impact of new schemes being constructed but not operating fully in the year. This can result in a distorted picture of the load factors being given, depending on the timing and magnitude of new capacity coming on stream, and can even result in values greater than 100 per cent. 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:

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

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.

These data show that, for onshore wind, the unchanged configuration load factors range from 18.9 per cent in London, to 28.5 per cent in the North West, with Yorkshire and the Humber occupying the median position at 26.6 per cent⁴. For offshore wind, load factors varied from 22.5 per cent

⁴ Regional wind speed data are aggregated according to wind electricity generating capacity. It is recognised that one of the shortcomings of the differences in the reporting periods for the data contained in the Digest of UK Energy Statistics and in this article (end of calendar year) and Ofgem’s finalised ROCs data (end of financial year), is that the finalised Ofgem figures are not available for use during the compilation process for the former analysis. The Digest and this article utilise ROCs data as reported in April 2015, when 2014 data were still provisional. In particular this can have an impact on the schemes included in the unchanged configuration definition as new data could include or remove particular schemes. This should be kept in mind if users wish to reanalyse these.

(largely due to problems at Blyth Offshore Wind Farm WTG 1 + WTG2) in the North East to 42.5 per cent in the North West.

Table 5: Regional load factors on an unchanged configuration basis, 2014

	Wind Offshore	Wind Onshore	Landfill gas	Sewage gas	Other bioenergy (ex cofiring, sewage, LFG)	Hydro (large scale)	Hydro (small scale)	Hydro
England	38.2%	26.6%	55.6%	50.6%	69.8%	43.5%	35.6%	38.3%
East Midlands	34.8%	25.9%	53.2%	50.1%	58.8%		40.1%	40.1%
East of England	38.6%	27.1%	57.5%	42.3%	73.5%			
North East	22.5%	25.4%	41.9%	52.7%	73.2%	43.5%	71.0%	47.5%
North West	42.5%	28.5%	47.7%	56.5%	55.1%		37.8%	37.8%
London		18.9%	89.6%	27.9%	73.1%			
South East	37.4%	27.9%	63.4%	49.0%	60.1%		5.9%	5.9%
South West		25.0%	56.9%	55.4%	47.4%		27.8%	27.8%
West Midlands			63.5%	63.5%	57.5%			
Yorkshire and the Humber		26.6%	52.5%	44.9%	75.8%		24.7%	24.7%
Wales	32.2%	26.8%	48.5%	37.4%	64.8%	17.8%	32.4%	19.7%
Scotland	34.0%	26.2%	56.1%	58.0%	70.6%	40.8%	41.3%	40.8%
Northern Ireland		27.5%	52.7%		75.5%		40.1%	40.1%
UK AVERAGE	37.8%	26.4%	55.3%	49.9%	69.8%	38.8%	39.6%	38.8%
MEDIAN	34.8%	26.6%	54.6%	50.1%	67.7%	40.8%	37.8%	37.8%

The load factors for hydro range from 43.5 per cent in the North East to 17.8 per cent in Wales, with UK average (mean) and median values for the UK overall of 38.8 and 40.8 per cent, respectively. For landfill gas, the load factors vary from 89.6 per cent for London to 41.9 per cent in the North East, with UK mean and median values of 55.3 and 54.6 per cent, respectively.

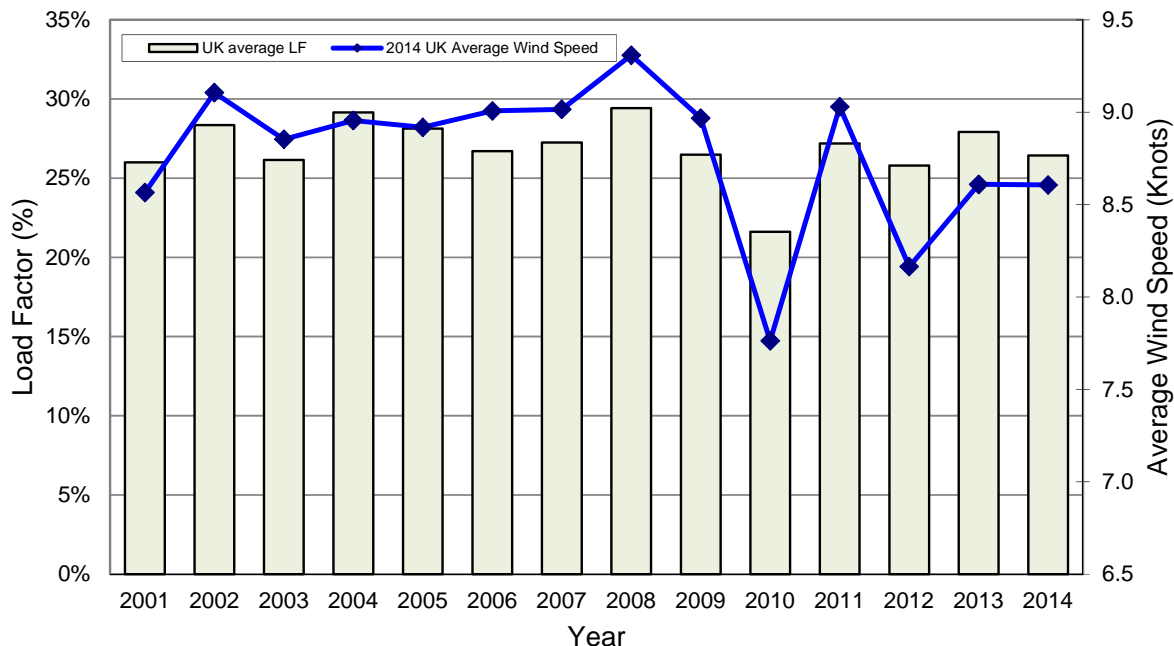
Chart 13 also shows the annual variation in onshore wind load factor and wind speed. This uses a wind speed index⁵ that provides an indication of the mean wind speed relative to that of the long-term average across the UK.

Over the 14-year period from 2001 to 2014, 2008 was the windiest year, with 2010 being the least windy year. Average wind speeds remained virtually unchanged in 2014 compared with the previous year, making it the fourth windiest year in the period, together with 2013.

⁵ Based on data provided by the Meteorological Office:
www.gov.uk/government/uploads/system/uploads/attachment_data/file/437814/et7_2.xls

Regional wind speed data are aggregated according to wind electricity generating capacity. Further information on the methodology used is given in Energy Trends Special feature article, March 2006, page 28.

Chart 13: Annual variation in onshore wind load factor on an unchanged configuration basis, and wind speed



Further information

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