

Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2012

Background

This article updates the one published in the September 2012 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.

A regional breakdown of non-Feed in Tariff micro-wind schemes has been included in the tables for the first time this year as part of the Wind and Wave data, with such schemes apportioned according to the regional breakdown of FIT schemes. Figures in Tables 2 and 3 correspond to the totals shown in Table 6.4 of the Digest of United Kingdom Energy Statistics 2013 (DUKES). Thus the data in this article cover 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.

What the figures show

Table 1 and Chart 1 show that there were 3,752 non-PV sites in England generating electricity from renewable sources, with 2,648 non-PV sites in Scotland, 493 in Wales and 203 in Northern Ireland. In addition there were 311,192 PV sites reported for England with 27,173 for Wales and 24,360 for Scotland. PV uptake for Northern Ireland (531) was based on data from the Micro-generation Certification Scheme and the Renewables Obligation. No geographical information was available for a further 38,084 PV schemes.

In capacity terms, including PV, England had 29 per cent more renewable electricity capacity than Scotland (Table 2 and Chart 3). This is because of England's considerable bioenergy resource (88 per cent of the UK's total bioenergy capacity), resulting from the conversion of Tilbury B power station to dedicated biomass during 2011. Hydro accounted for 33 per cent of generation from renewables in Scotland (Table 3 and Chart 7). However, because bioenergy based capacity was used more intensively than hydro (which is subject to seasonal precipitation variation in the catchment areas) generation from renewable sources in England during 2012 was 56 per cent higher than generation in Scotland.

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

Special feature – Sub-national renewable electricity

Table 1: Number of sites generating electricity from renewable sources, 2012¹

	Hydro	Wind and wave ²	Landfill gas	Sewage gas	Other bioenergy ³	Total excluding PV	Solar PV	Total
England	206	2,816	358	162	210	3,752	311,192	314,944
East Midlands	22	267	39	15	22	365	35,258	35,623
East	5	682	69	14	28	798	39,788	40,586
North East	8	196	19	8	6	237	14,490	14,727
North West	41	332	53	25	37	488	31,940	32,428
London	-	30	1	4	9	44	10,332	10,376
South East	12	104	68	32	28	244	55,074	55,318
South West	77	539	39	19	26	700	63,874	64,574
West Midlands	16	128	30	21	30	225	27,465	27,690
Yorkshire and the Humber	25	538	40	24	24	651	32,971	33,622
Wales	103	341	23	16	10	493	27,173	27,666
Scotland	305	2,265	45	8	25	2,648	24,360	27,008
Northern Ireland	55	123	6	3	16	203	531	734
Other Sites							38,084	38,084
UK Total	669	5,545	432	189	261	7,096	401,340	408,436

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, 2012¹

	Hydro	Wind and wave ²	Landfill gas	Sewage gas	Other bioenergy	Solar PV	MW Total
England	32.1	3,899.5	864.9	177.2	1,825.2	1,369.6	8,168.6
East Midlands	4.8	355.6	65.4	17.6	50.2	159.4	653.1
East	0.1	1,233.2	203.6	26.3	936.8	170.1	2,570.0
North East	7.6	232.9	41.2	15.6	93.9	47.2	438.4
North West	7.1	919.6	147.4	23.7	111.4	111.4	1,320.4
London	-	4.4	0.3	20.6	167.0	39.7	232.1
South East	0.3	782.8	169.3	27.4	267.5	250.6	1,497.8
South West	8.9	161.8	96.1	13.7	19.8	355.5	655.8
West Midlands	0.9	3.1	61.3	23.4	107.7	110.7	307.2
Yorkshire and the Humber	2.4	206.1	80.3	9.1	70.9	125.1	493.9
Wales	149.9	605.6	45.2	13.1	18.5	97.2	929.4
Scotland	1,495.8	3,933.5	115.2	8.2	161.1	87.2	5,801.0
Northern Ireland	8.4	456.7	10.7	0.2	11.3	5.5	492.9
Other Sites						146.1	146.1
Total	1,686.2	8,895.3	1,036.0	198.7	2,016.1	1,705.5	15,537.9
UK Total	1,686.2	8,895.3	1,036.0	198.7	2,016.1	1,705.5	15,537.9
Co-firing ⁴					203.5		203.5

Table 3: Generation of electricity from renewable sources, 2012¹

	Hydro	Wind and wave ²	Landfill gas	Sewage gas	Other bioenergy ⁵	Solar PV	GWh Total
England	83.3	8,894.7	4,330.7	645.1	8,038.2	983.1	22,975.2
East Midlands	12.9	853.8	331.5	77.8	388.7	111.5	1,776.2
East	0.2	2,887.2	996.9	59.5	2,945.7	122.4	7,011.9
North East	23.3	421.3	174.7	54.8	366.1	31.6	1,071.7
North West	16.5	2,728.9	690.5	93.5	266.3	75.9	3,871.5
London	-	10.8	1.3	46.0	679.7	29.2	767.0
South East	0.8	1,300.3	958.5	102.4	1,075.5	183.4	3,620.8
South West	21.9	313.0	457.2	57.6	107.5	266.4	1,223.7
West Midlands	2.4	5.1	320.7	120.5	482.3	76.1	1,007.1
Yorkshire and the Humber	5.2	374.4	399.4	33.2	1,726.5	86.6	2,625.2
Wales	336.8	1,443.3	214.3	38.3	173.3	70.8	2,276.8
Scotland	4,843.6	8,205.3	548.6	35.4	1,064.8	58.3	14,756.1
Northern Ireland	20.8	1,043.7	60.2	0.7	48.5	3.5	1,177.4
Other Sites						72.2	72.2
Total	5,284.4	19,587.1	5,153.8	719.6	9,324.8	1,187.9	41,257.7
UK Total	5,284.4	19,587.1	5,153.8	719.6	9,324.8	1,187.9	41,257.7

Notes to Tables 1 to 3

- Nil or less than half the final digit shown.

1 At the 31 December 2012.

2 Wind Offshore is allocated to regions/countries according to where the cabling comes ashore. Non-FiTs micro-wind has been included in the tables this year as part of the Wind and Wave data, apportioned according to the regional breakdown of FIT schemes

3 12 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.

In England the number of sites (excluding PV) in each region varies from 44 in London to 798 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 the North West (Table 2 and Chart 4). In the East of England, 48 per cent of capacity is from wind (most from offshore wind farms) and 36 per cent is from other bioenergy; in the South East, 52 per cent of capacity is from wind and 18 per cent from other biomass. In the North West, 70 per cent of capacity is from wind and 11 per cent from landfill gas. The East of England has 20 per cent of the UK's landfill gas capacity, 13 per cent of the UK's sewage gas capacity and 46 per cent from other bioenergy. 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 51 per cent of UK generation from landfill gas.

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Chart 1: Number of sites by country¹

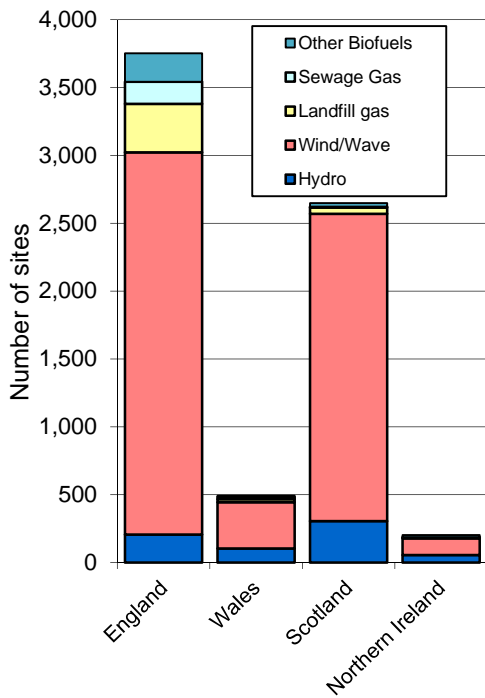
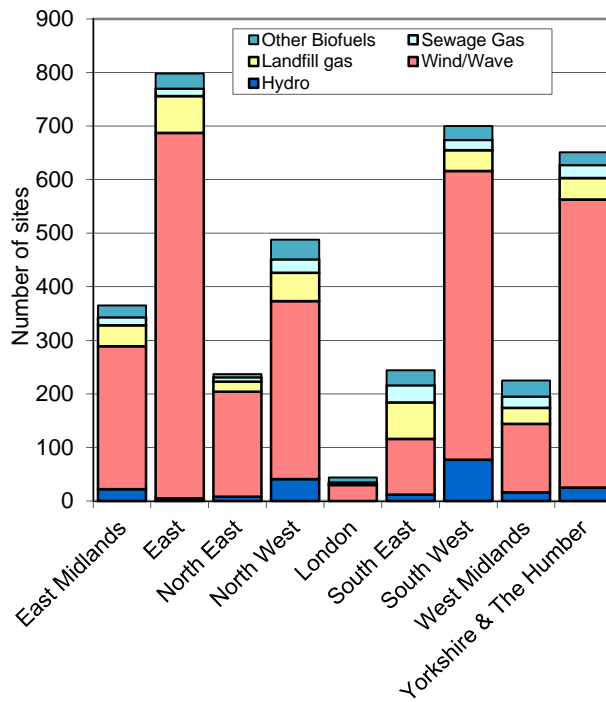


Chart 2: Number of sites by English region¹



¹ Excludes the large numbers of small Solar PV schemes as the inclusion of these would swamp all other technologies and misrepresent its overall contribution to UK renewables

In 2012, Scotland had 44 per cent of the UK’s wind capacity and produced 42 per cent of the output (Tables 2 and 3; Charts 5 and 9). The East has the next largest wind share (14 per cent of capacity and 15 per cent of generation) followed by the North West (10 per cent of the capacity and 14 per cent of the output), the South East (9 per cent of capacity and 7 per cent of generation) and Wales (7 per cent of capacity and 7 per cent of generation (Tables 2 and 3; Charts 3 to 10)². England as a whole accounts for 44 per cent of wind capacity and 45 per cent of generation.

² A map of wind farm installed capacities in the UK at the end of 2012 was published in the renewables chapter of the 2013 edition of the Digest of UK Energy Statistics, and is also available on the RESTATS web site (<https://restats.decc.gov.uk/>).
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Chart 3: Renewable capacity by country

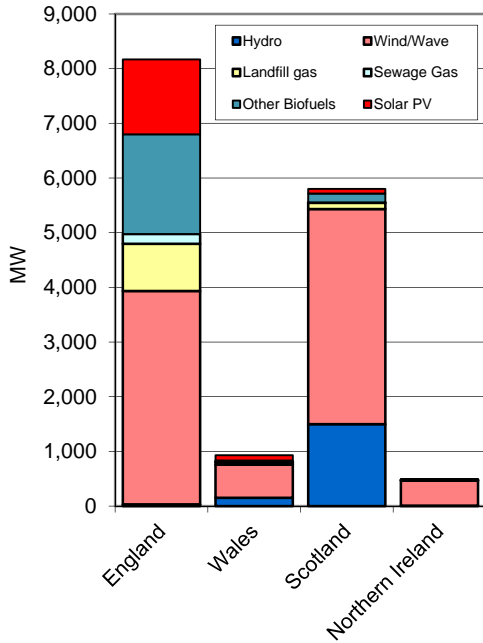


Chart 4: Renewable capacity by English region

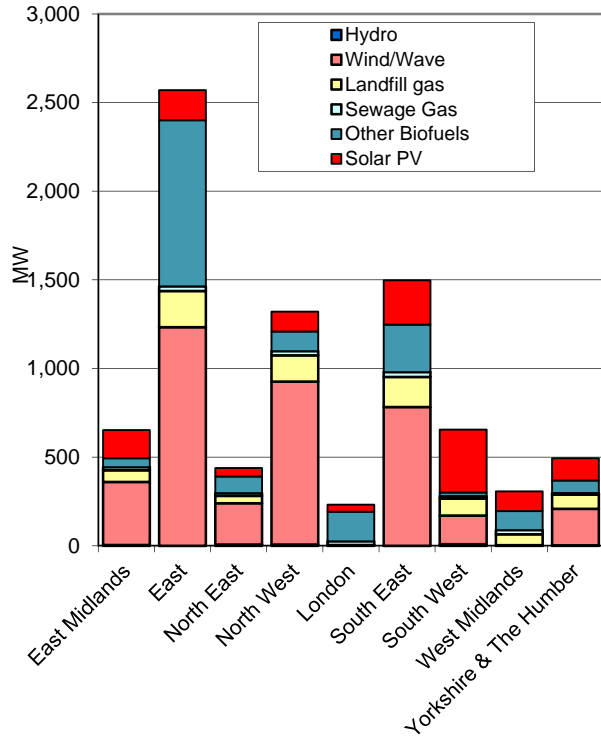


Chart 5: Wind capacity by country

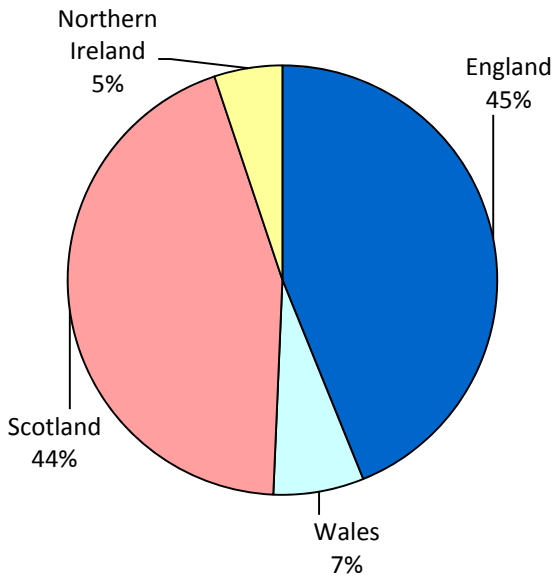


Chart 6: Wind capacity by English region

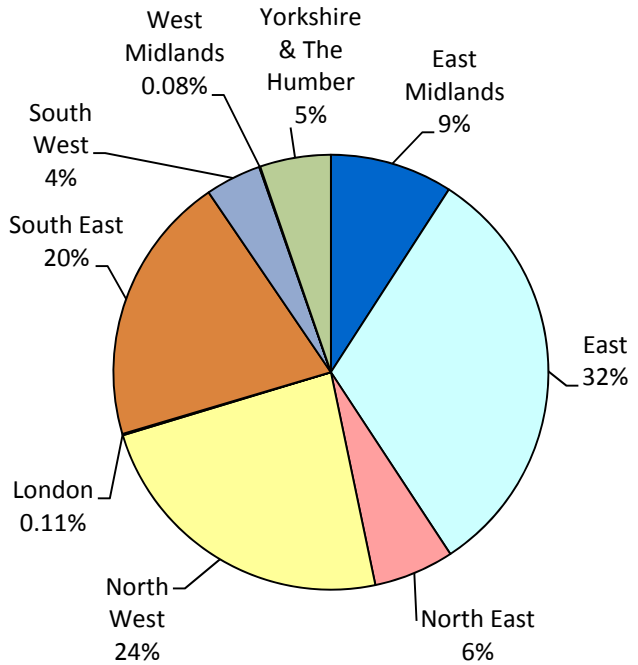


Chart 7: Renewable generation by country

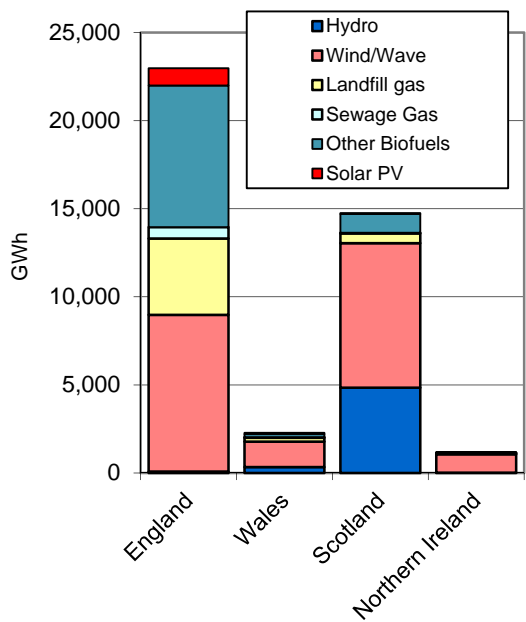


Chart 8: Renewable generation by English region

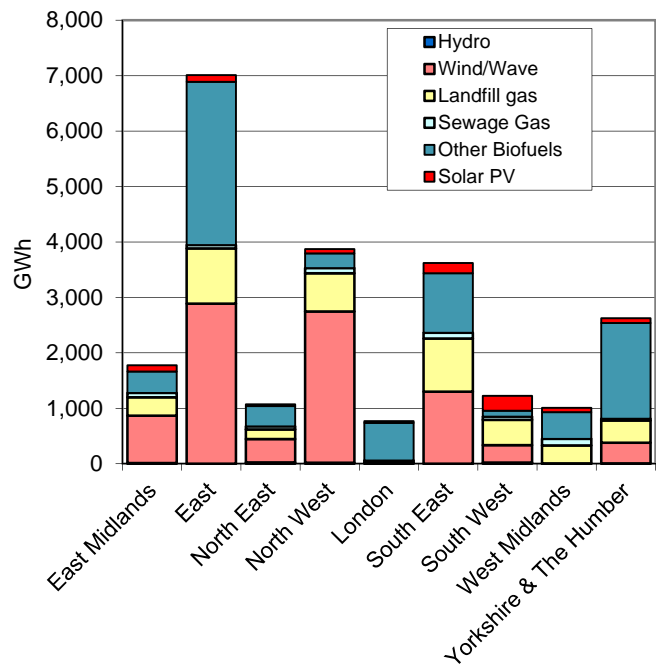


Chart 9: Wind generation by country

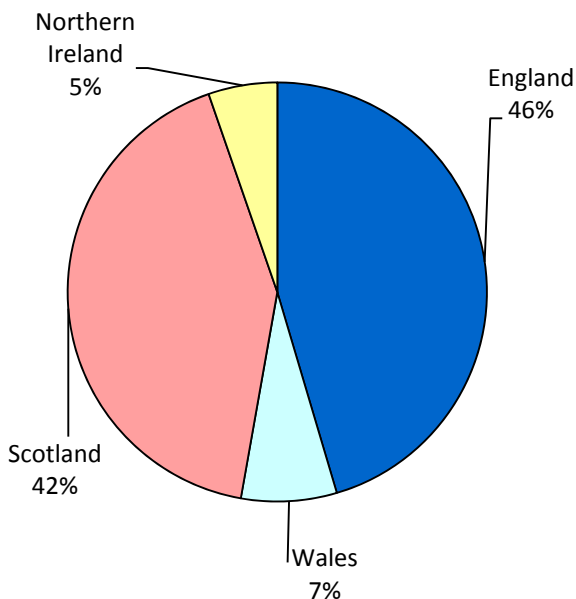
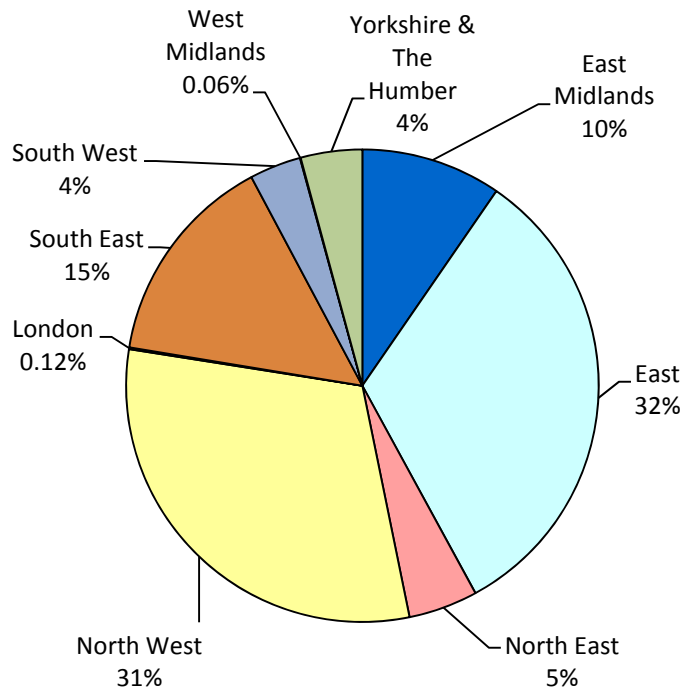


Chart 10: Wind generation by English region



Ninety per cent of the generation from sewage and 86 per cent of the generation from other bioenergy (including that used for co-firing) took place in England. The West Midlands (17 per cent), South East (14 per cent) and North West (13 per cent each) and East Midlands (11 per cent) were the major sewage gas areas, whilst in the other bioenergy category, East of England (32 per cent) was the largest, followed by Yorkshire and the Humber (19 per cent), the South East (12 per cent) followed by Scotland (11 per cent). Excluding bioenergy sources used for co-firing (which cannot be allocated to regions – see note 4 to Table 2), the East of England has the largest capacity to generate from bioenergy (46 per cent of the UK total) followed by the South East (13 per cent) and jointly London (8 per cent) and Scotland (8 per cent).

In terms of change to total renewables generating capacity, Scotland (+1,003 MW) the East of England (+760 MW), the South East (+423 MW), the North West (+296 MW), Yorkshire and the Humber (+141 MW) and the South West (+135 MW) have all shown considerable growth this year. This growth has primarily come from wind in Scotland (+932 MW), wind and solar in the East of England (+678 MW and +75 MW, respectively), the South East (+314 MW and +89 MW, respectively), the North West (+215 MW and +52 MW, respectively) and Yorkshire and the Humber (+87 MW and +53 MW, respectively) and solar in the South West (+115 MW).

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. Looking at these two measures, on aggregate England was below the UK average, whilst Wales, Scotland and Northern Ireland were above. Among the English regions the East of England is highest in generating capacity per unit of GVA terms followed by the North West then very closely by the North East. In terms of Generation/GVA, East of England is the highest followed by the, North West, Yorkshire and the Humber and the North East.

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	7.26	20,425
East Midlands	8.01	21,773
East	22.52	61,445
North East	10.54	25,764
North West	10.66	31,244
London	0.82	2,711
South East	7.79	18,824
South West	6.46	12,060
West Midlands	3.20	10,508
Yorkshire and the Humber	5.38	28,584
Wales	19.63	48,095
Scotland	53.66	136,506
Northern Ireland	16.50	39,418
UK average	11.48	30,721

1. GVA is Gross Value Added as published as Total GVA in Regional Gross Value Added (Income Approach), December 2012 at: www.ons.gov.uk/ons/dcp171778_291684.pdf

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

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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 for download as Excel spreadsheets from the following location:

<https://restats.decc.gov.uk/cms/historic-regional-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 2012 there was a 290 per cent increase in generation from renewables in the UK, but faster rates of growth were recorded in Northern Ireland (1,029 per cent), Eastern (360 per cent), South East (357 per cent), North West (351 per cent), North East (316 per cent), East Midlands (311 per cent), Yorkshire and The Humber (303 per cent) and Scotland (296 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.

Chart 11: Trends in generation from renewables by country

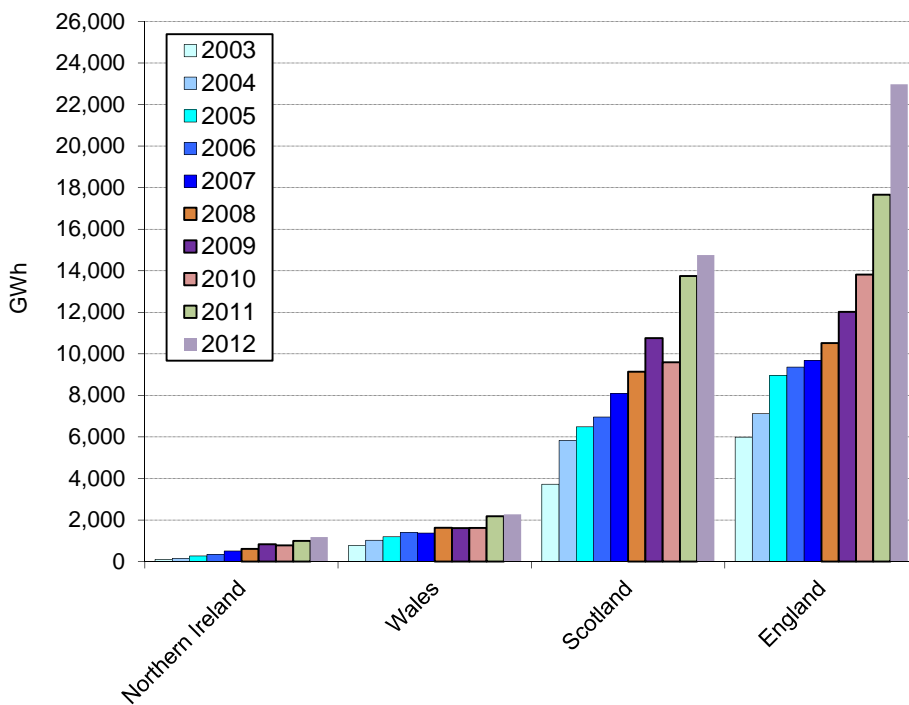
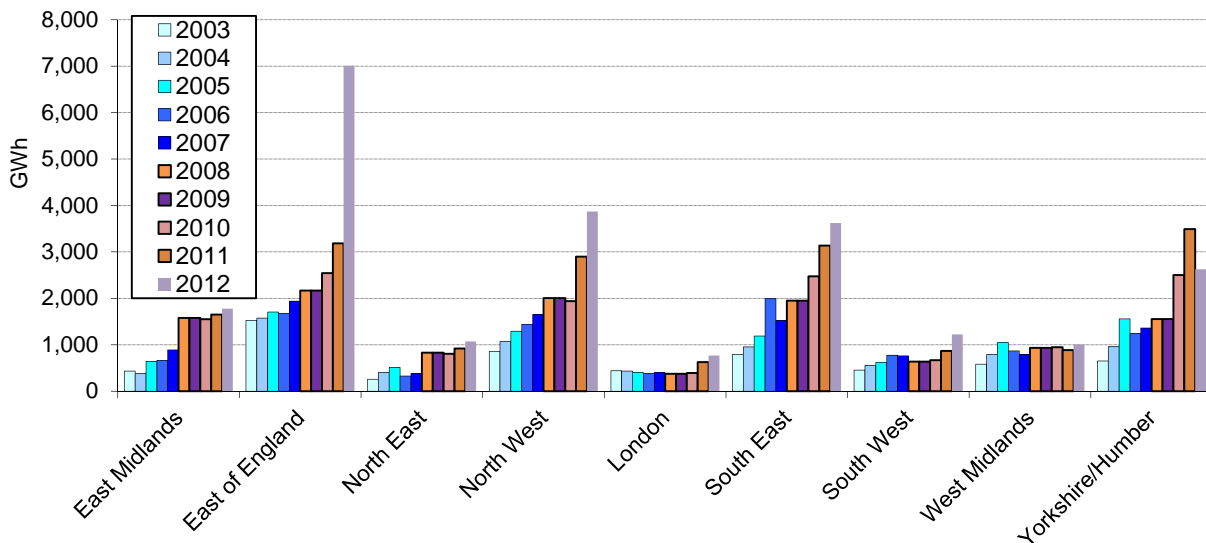


Chart 12: Trends in generation from renewables by English region



Load factors

Load factors for the various technologies are shown in Table 5 from data provided in Tables 2 and 3 of this article.

Table 5: Load factors, 2012

	Wind Offshore	Wind Onshore	Landfill gas	Sewage Gas	Other bioenergy (ex-cofiring & sewage)	Hydro (large-scale)	Hydro (small-scale)	Hydro
England	35.4%	25.0%	56.5%	41.4%	40.9%		28.8%	30.1%
East Midlands	32.1%	24.2%	56.5%	50.4%	54.0%		30.4%	30.4%
East of England	39.3%	24.6%	55.5%	25.8%	36.0%		34.7%	34.7%
North East	18.7%	24.8%	47.6%	40.0%	50.5%	35.6%	32.5%	35.0%
North West	43.0%	25.5%	51.6%	45.0%	30.2%		27.3%	27.3%
London		30.4%	44.9%	25.5%	48.5%			
South East	23.1%	27.7%	64.6%	42.6%	44.7%		29.9%	29.9%
South West		23.0%	54.3%	48.0%	73.5%		28.0%	28.0%
West Midlands		27.5%	59.8%	58.5%	52.1%		34.9%	34.9%
Yorkshire and the Humber		26.2%	55.9%	41.4%	46.0%		27.6%	27.6%
Wales	36.0%	25.0%	54.0%	34.8%	59.8%	24.9%	29.0%	25.6%
Scotland	32.0%	26.7%	54.7%	49.4%	78.6%	36.9%	37.9%	37.0%
Northern Ireland		27.7%	63.7%	36.5%	68.1%		28.5%	28.5%
UK AVERAGE	35.2%	26.2%	56.2%	41.3%	44.2%	35.8%	35.4%	35.8%
MEDIAN	32.1%	25.8%	55.1%	42.0%	51.3%	35.6%	29.9%	29.9%

The load factors for hydro range from 37.0 per cent in Scotland to 25.6 per cent in Wales, with UK average (mean) and median values for the UK overall of 35.8 and 29.9 per cent, respectively. For landfill, the load factors vary from 64.6 per cent for the South East to 44.9 per cent in London, with UK mean and median values of 56.2 and 55.1 per cent, respectively.

For offshore wind, load factors varied from 18.7 per cent in the North East to 43.0 per cent in the North West. For onshore wind, load factors varied from 23.0 per cent in the South West to 30.4 per cent in London. This load factor measure does not take into account the impact of new

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schemes being constructed but not operating fully in the year. A better measurement of load factors is discussed below.

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.

Table 6: Regional load factors on an unchanged configuration basis, 2012

	Wind Offshore	Wind Onshore	Landfill gas	Sewage gas	Other bioenergy (ex cofiring & sewage)	Hydro (large scale)	Hydro (small scale)	Hydro
England	33.7%	24.2%	58.2%	47.8%	65.3%	35.6%	32.0%	32.9%
East Midlands	32.2%	23.3%	56.7%	51.2%	61.1%		31.7%	31.7%
East of England	33.8%	23.0%	55.6%	29.6%	66.8%			
North East	18.7%	23.6%	52.0%	44.1%	54.1%	35.6%	78.0%	41.8%
North West	36.2%	25.5%	55.5%	54.9%	49.1%		26.6%	26.6%
London		32.0%	44.9%	27.3%	72.9%			
South East	31.3%	27.1%	65.1%	47.1%	66.7%		7.5%	7.5%
South West		24.0%	53.7%	54.9%	61.5%		28.7%	28.7%
West Midlands			59.7%	60.2%	74.5%		42.5%	42.5%
Yorkshire and the Humber		23.2%	63.6%	46.6%	54.8%		22.8%	22.8%
Wales	36.0%	25.1%	56.5%	30.4%	57.9%	24.9%	24.1%	24.8%
Scotland	32.0%	26.1%	60.6%	47.1%	77.9%	36.3%	38.1%	36.4%
Northern Ireland		27.5%	61.5%	36.5%	61.9%		41.4%	41.4%
UK AVERAGE	33.7%	25.6%	58.6%	48.0%	67.1%	35.3%	36.0%	35.3%
MEDIAN	32.2%	25.1%	56.6%	46.8%	61.7%	35.6%	30.2%	30.2%

These data show that for onshore wind, the unchanged configuration load factors range from 23.0 per cent in the East of England to 32.0 per cent in London with Wales occupying the median position at 25.1 per cent³.

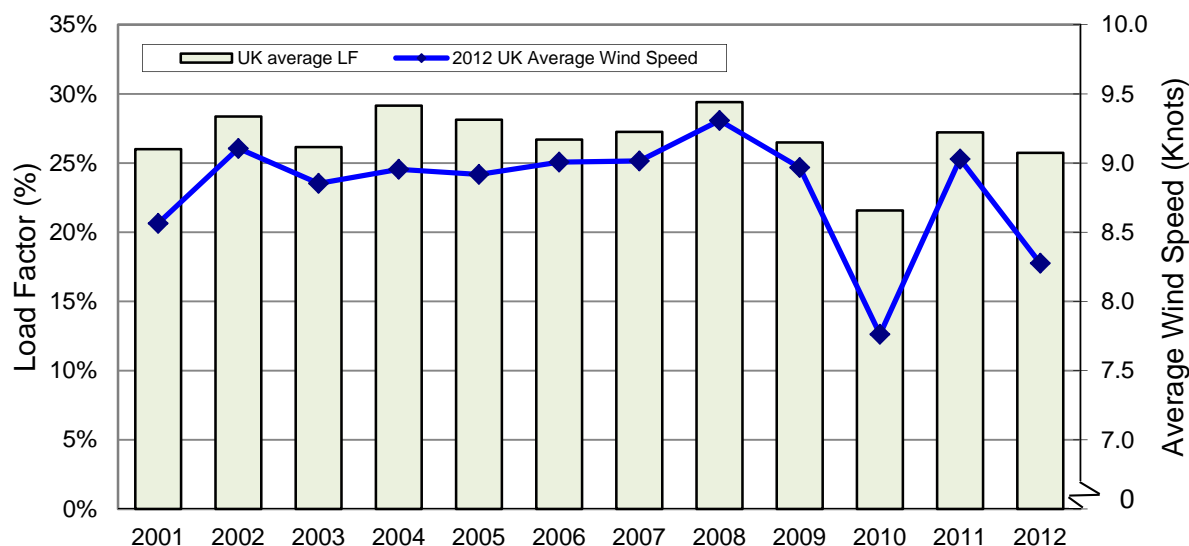
Chart 13 also shows the annual variation in load factor and wind speed. This uses a wind speed index⁴ that provides an indication of the mean wind speed relative to that of the long-term average across the UK.

³ 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 2013, when 2012 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 results.

⁴ Based on data provided by the Meteorological Office. Regional wind speed data are aggregated according to wind electricity generating capacity. Further information on the methodology used is given in Energy Trends, September 2008, page 44: www.gov.uk/government/statistical-data-sets/december-2012-energy-trends-weather-data

Over the 12-year period from 2001 to 2012, 2008 was the windiest year with 2010 being the least windy year. Average wind speeds dropped in 2012 making it the second least windy year after 2010.

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



Further information

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

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