

## Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2013

### Background

This article updates the one published in the September 2013 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 2014 (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 connected<sup>1</sup>. Wave and Tidal has been separated out for the first time this year from wind.

### What the figures show

Table 1 and Chart 1 show that there were 4,031 non-PV sites in England generating electricity from renewable sources, with 2,843 non-PV sites in Scotland, 568 in Wales and 629 in Northern Ireland. In addition there were 390,650 PV sites in England, 33,065 in Wales and 31,427 in Scotland. PV uptake for Northern Ireland (5,046) is based on data from the Microgeneration Certification Scheme and the Renewables Obligation. No geographical information was available for a further 48,128 PV schemes, 291 wind schemes and four other bioenergy schemes.

In capacity terms, including PV, England had 69 per cent more renewable electricity capacity than Scotland (Table 2 and Chart 3). This is because of England's considerable bioenergy resource (93 per cent of the UK's total bioenergy capacity). Hydro accounted for 26 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 2013 was 91 per cent higher than generation in Scotland.

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<sup>1</sup> 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, 2013<sup>1</sup>**

	Hydro	Wind <sup>2</sup>	Wave and tidal	Landfill gas	Sewage gas	Other bioenergy <sup>3</sup>	Total excluding PV	Solar PV	Total
<b>England</b>	<b>228</b>	<b>3,032</b>	<b>1</b>	<b>358</b>	<b>160</b>	<b>252</b>	<b>4,031</b>	<b>390,650</b>	<b>394,681</b>
East Midlands	22	305	-	39	13	27	406	45,769	46,175
East	5	760	-	69	13	31	878	50,618	51,496
North East	9	205	-	20	8	11	253	21,194	21,447
North West	43	353	-	54	24	42	516	41,279	41,795
London	-	27	-	1	4	12	44	12,759	12,803
South East	15	101	-	69	34	29	248	64,695	64,943
South West	89	562	-	39	20	33	743	74,604	75,347
West Midlands	16	136	-	29	20	37	238	36,191	36,429
Yorkshire and the Humber	29	583	1	38	24	30	705	43,541	44,246
<b>Wales</b>	<b>129</b>	<b>388</b>	<b>-</b>	<b>24</b>	<b>16</b>	<b>11</b>	<b>568</b>	<b>33,065</b>	<b>33,633</b>
<b>Scotland</b>	<b>358</b>	<b>2,398</b>	<b>8</b>	<b>45</b>	<b>7</b>	<b>27</b>	<b>2,843</b>	<b>31,427</b>	<b>34,270</b>
<b>Northern Ireland</b>	<b>55</b>	<b>541</b>	<b>1</b>	<b>8</b>	<b>2</b>	<b>22</b>	<b>629</b>	<b>5,046</b>	<b>5,675</b>
Other Sites	-	291	-	-	-	4	295	48,128	48,423
<b>UK Total</b>	<b>770</b>	<b>6,650</b>	<b>10</b>	<b>435</b>	<b>185</b>	<b>312</b>	<b>8,366</b>	<b>508,316</b>	<b>516,682</b>

Components may not add exactly to totals because of rounding.

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

**Table 2: Installed capacity of sites generating electricity from renewable sources, 2013<sup>1</sup>**

	Hydro	Wind <sup>2</sup>	Wave and tidal	Landfill gas	Sewage gas	Other bioenergy	Solar PV	MW Total
<b>England</b>	<b>31.7</b>	<b>5,154.6</b>	<b>0.1</b>	<b>869.5</b>	<b>179.1</b>	<b>2,565.9</b>	<b>2,336.7</b>	<b>11,137.7</b>
East Midlands	4.6	678.0	-	65.4	17.3	57.1	266.3	<b>1,088.6</b>
East	0.1	1,361.9	-	201.6	26.3	125.6	338.9	<b>2,054.3</b>
North East	7.6	403.1	-	43.9	11.6	118.6	69.4	<b>654.1</b>
North West	6.3	981.8	-	149.6	25.5	99.9	152.6	<b>1,415.7</b>
London	-	4.4	-	0.3	23.4	169.5	49.1	<b>246.8</b>
South East	0.7	1,104.4	-	171.7	28.5	230.2	423.7	<b>1,959.2</b>
South West	9.5	194.4	-	96.1	14.0	33.3	698.2	<b>1,045.5</b>
West Midlands	0.8	3.5	-	60.3	23.1	1,011.4	165.8	<b>1,264.9</b>
Yorkshire and the Humber	2.3	423.2	0.1	80.5	9.5	720.3	172.7	<b>1,408.5</b>
<b>Wales</b>	<b>151.3</b>	<b>771.0</b>	<b>-</b>	<b>45.5</b>	<b>13.1</b>	<b>38.4</b>	<b>143.6</b>	<b>1,162.9</b>
<b>Scotland</b>	<b>1,501.0</b>	<b>4,701.2</b>	<b>5.9</b>	<b>114.3</b>	<b>5.6</b>	<b>143.1</b>	<b>119.1</b>	<b>6,590.1</b>
<b>Northern Ireland</b>	<b>8.5</b>	<b>579.3</b>	<b>1.2</b>	<b>12.4</b>	<b>0.2</b>	<b>14.5</b>	<b>28.2</b>	<b>644.3</b>
Other Sites	0.0	2.9	0.0	0.0	0.0	0.0	152.3	<b>155.2</b>
<b>Total</b>	<b>1,692.6</b>	<b>11,209.0</b>	<b>7.2</b>	<b>1,041.7</b>	<b>198.0</b>	<b>2,761.9</b>	<b>2,779.8</b>	<b>19,690.2</b>
<b>UK Total</b>	<b>1,692.6</b>	<b>11,209.0</b>	<b>7.2</b>	<b>1,041.7</b>	<b>198.0</b>	<b>2,761.9</b>	<b>2,779.8</b>	<b>19,690.2</b>
Co-firing <sup>4</sup>						35.2		<b>35.2</b>

Components may not add exactly to totals because of rounding.

**Table 3: Generation of electricity from renewable sources, 2013<sup>1</sup>**

	Hydro	Wind <sup>2</sup>	Wave and tidal	Landfill gas	Sewage gas	Other bioenergy <sup>5</sup>	Solar PV	GWh Total
<b>England</b>	<b>83.5</b>	<b>14,233.9</b>	<b>0.2</b>	<b>4,344.8</b>	<b>685.3</b>	<b>11,349.1</b>	<b>1,720.6</b>	<b>32,417.4</b>
East Midlands	12.4	1,551.4	-	319.5	70.8	289.0	191.9	2,435.0
East	0.2	4,126.6	-	1,031.9	56.1	3,878.1	225.8	9,318.9
North East	24.5	785.1	-	172.5	52.2	418.2	50.1	1,502.5
North West	15.1	3,201.7	-	658.3	115.5	317.5	118.1	4,426.2
London	-	11.5	-	2.3	60.2	706.3	39.7	820.1
South East	1.4	3,335.7	-	965.2	115.8	813.7	317.9	5,549.7
South West	20.9	405.0	-	465.8	64.3	151.9	521.2	1,629.0
West Midlands	2.5	7.2	-	331.3	118.4	1,125.6	124.5	1,709.6
Yorkshire and the Humber	6.4	809.7	0.2	397.9	31.9	3,648.8	131.4	5,026.4
<b>Wales</b>	<b>227.5</b>	<b>1,702.0</b>	<b>-</b>	<b>200.5</b>	<b>45.1</b>	<b>373.4</b>	<b>115.3</b>	<b>2,663.8</b>
<b>Scotland</b>	<b>4,366.0</b>	<b>11,145.3</b>	<b>2.5</b>	<b>562.8</b>	<b>30.2</b>	<b>768.2</b>	<b>92.4</b>	<b>16,967.4</b>
<b>Northern Ireland</b>	<b>21.1</b>	<b>1,345.2</b>	<b>3.1</b>	<b>60.5</b>	<b>0.7</b>	<b>73.3</b>	<b>26.9</b>	<b>1,530.7</b>
Other Sites	-	7.2	-	-	-	-	80.5	87.7
<b>Total</b>	<b>4,698.1</b>	<b>28,433.6</b>	<b>5.9</b>	<b>5,168.5</b>	<b>761.2</b>	<b>12,564.1</b>	<b>2,035.6</b>	<b>53,666.9</b>
<b>UK Total</b>	<b>4,698.1</b>	<b>28,433.6</b>	<b>5.9</b>	<b>5,168.5</b>	<b>761.2</b>	<b>12,564.1</b>	<b>2,035.6</b>	<b>53,666.9</b>

## Notes to Tables 1 to 3

- Nil or less than half the final digit shown.

1 At 31 December 2013.

2 Offshore wind is allocated to regions/countries according to where the cabling comes ashore. Wave and Tidal has been separated out from wind for the first time 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.

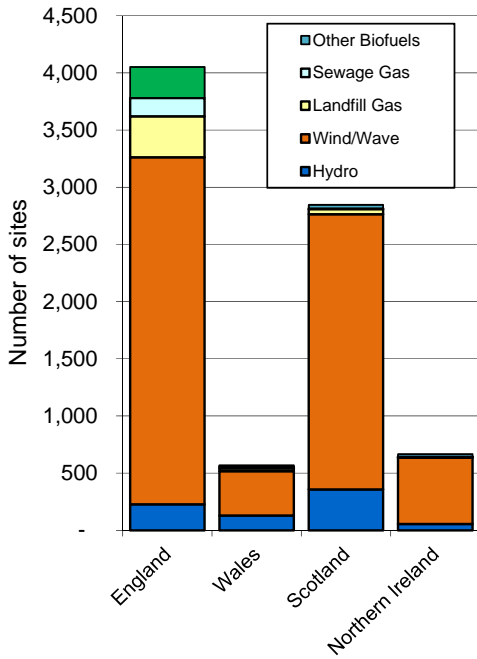
5 Includes bioenergy sources co-fired with fossil fuels.

6 Generation data for wave and tidal schemes are from publically 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.

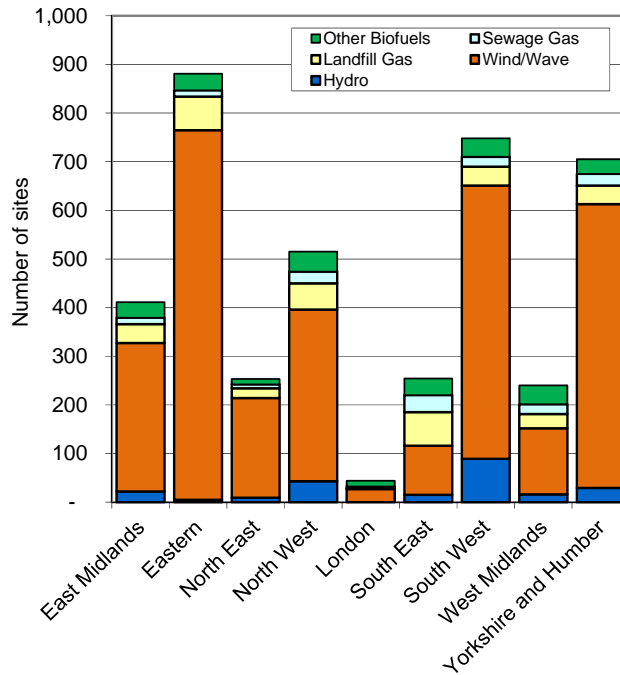
In England the number of sites (excluding PV) in each region varies from 44 in London to 878 in the East of England (Table 1 and Chart 2). The highest capacity in England (including PV) is in the East of England, followed by the South East, the North West followed closely by Yorkshire and the Humber (Table 2 and Chart 4). In the East of England, 66 per cent of capacity is from wind (most from offshore wind farms), 10 per cent is from landfill and 16 per cent from PV. In the South East, 56 per cent of capacity is from wind and 12 per cent from other biomass and 22 per cent from PV. In the North West, 69 per cent of capacity is from wind and 11 per cent from landfill gas and 11 per cent from PV. In Yorkshire and the Humber, 30 per cent of capacity is from wind, 51 per cent from other biomass and 12 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 South West has 25 per cent of UK PV capacity, and is the only region where PV has the largest share of its capacity, at 67 per cent. The East of England, North West and the South East regions together accounted for 51 per cent of UK generation from landfill gas.

Special feature – Sub-national renewable electricity

**Chart 1: Number of sites by country<sup>1</sup>**



**Chart 2: Number of sites by English region<sup>1</sup>**

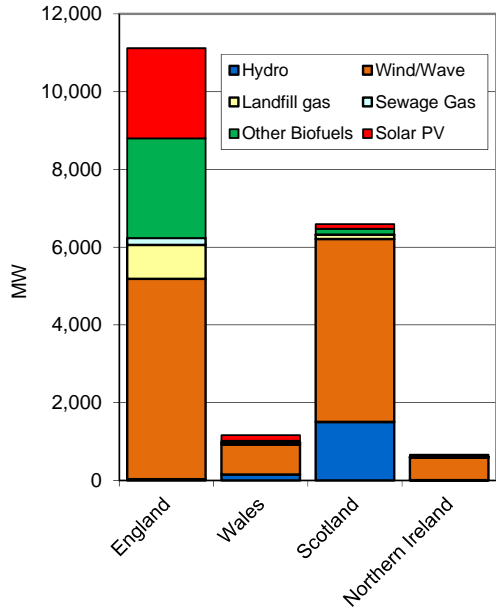


1. Excludes the large numbers of small Solar PV schemes as the inclusion of these would swamp all other technologies and misrepresent its overall contribution to UK renewables

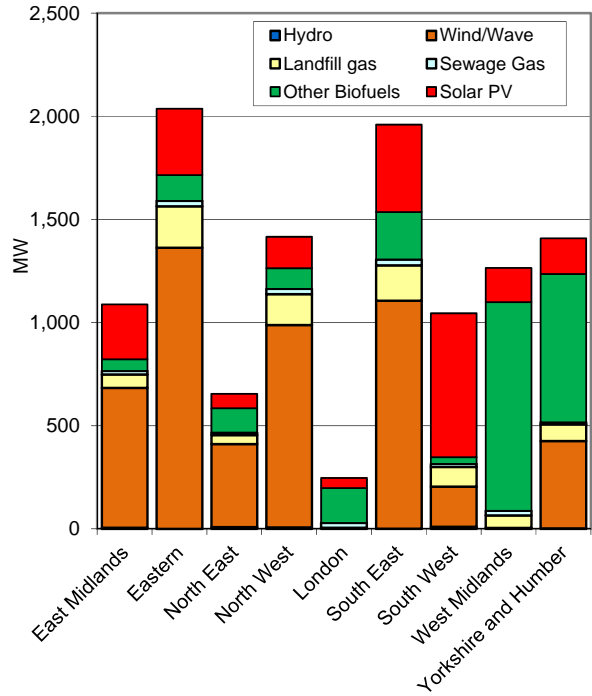
In 2013, Scotland had 42 per cent of the UK’s wind capacity and produced 39 per cent of the output (Tables 2 and 3; Charts 5 and 9). The East has the next largest wind share (12 per cent of capacity and 15 per cent of generation) followed by the South East (10 per cent of the capacity and 12 per cent of the output), the North West (9 per cent of capacity and 11 per cent of generation) and Wales (7 per cent of capacity and 6 per cent of generation (Tables 2 and 3; Charts 3 to 10)<sup>2</sup>. England as a whole accounts for 46 per cent of wind capacity and 50 per cent of generation.

<sup>2</sup> A map of wind farm installed capacities in the UK at the end of 2013 was published in the renewables chapter of the 2014 edition of the Digest of UK Energy Statistics, available at: [www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes](http://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes)

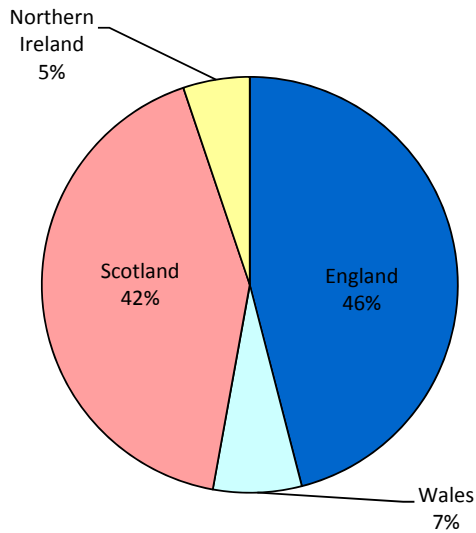
**Chart 3: Renewable capacity by country**



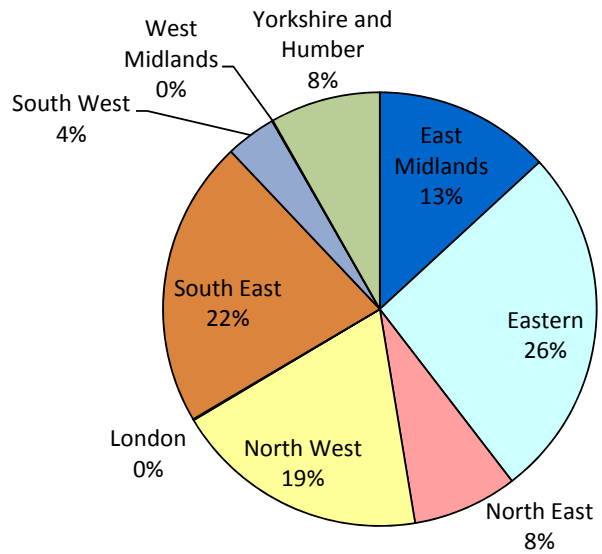
**Chart 4: Renewable capacity by English region**



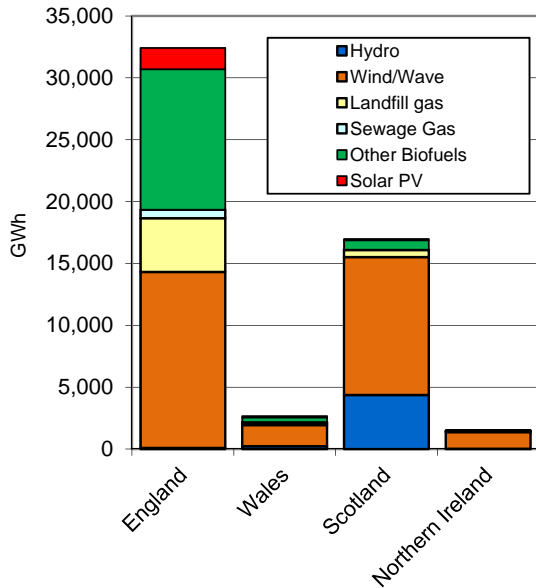
**Chart 5: Wind capacity by country**



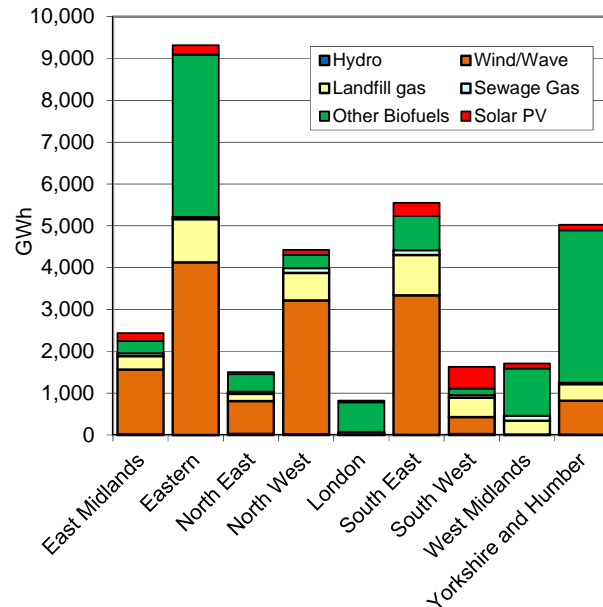
**Chart 6: Wind capacity by English region**



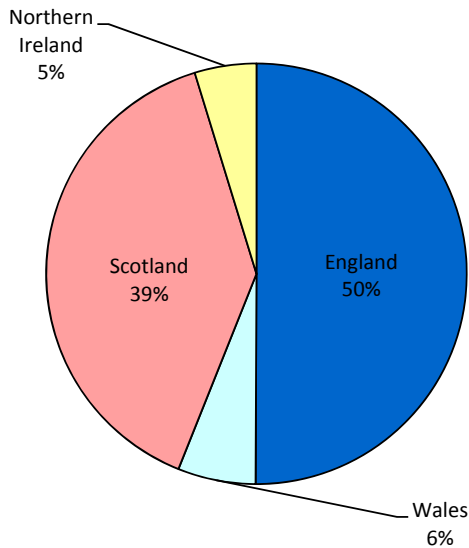
**Chart 7: Renewable generation by country**



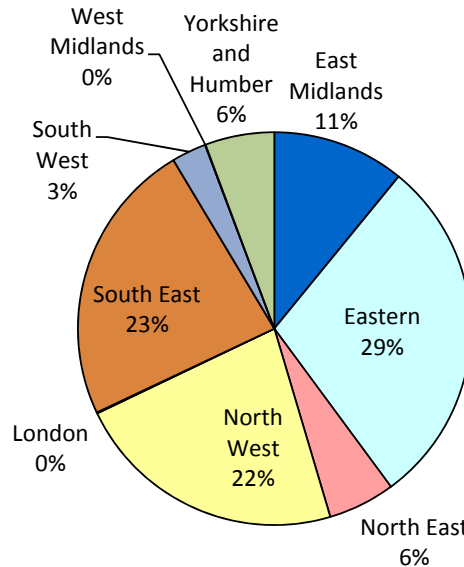
**Chart 8: Renewable generation by English region**



**Chart 9: Wind generation by country**



**Chart 10: Wind generation by English region**



Ninety 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 West Midlands (16 per cent), South East (15 per cent) and North West (15 per cent each) and East Midlands (9 per cent) were the major sewage gas areas. In the other bioenergy category, East of England (31 per cent) had the largest share, closely followed by Yorkshire and the Humber (29 per cent) (mostly from the biomass converted unit, as well as some co-firing at other units, at Drax power station), the West Midlands (9 per cent), then followed jointly by Scotland, London and the South East (6 per cent each).

Excluding bioenergy sources used for co-firing (which cannot be allocated to regions – see note 4

to Table 2), the West Midlands has the largest capacity to generate from bioenergy (37 per cent of the UK total, and mostly from the 900 MW Ironbridge biomass conversion, followed by Yorkshire and the Humber (26 per cent, mostly from the 645 MW converted unit at Drax), and the South East (8 per cent).

In terms of change to total renewables generating capacity, West Midlands (+954 MW), Yorkshire and the Humber (+909 MW), the Scotland (+808 MW), the South East (+482 MW), East Midlands (+429 MW), the North East (+355 MW) have all shown considerable growth this year. However, the East of England shows a net decrease of 529 MW, as a result of the closure of Tilbury Power Station in August 2013.

The growth in overall renewables capacity has primarily come from: biomass in the West Midlands (+905 MW, mostly from the Ironbridge conversion); biomass and wind in Yorkshire and the Humber (+648 and +217 MW, respectively, including the Drax unit conversion); wind in Scotland (+773 MW); wind and solar in the South East (+322 MW and +157 MW, respectively, with over 300 MW from the completion of London Array Phase 1 offshore wind farm); wind and solar in the East Midlands (+322 MW and +102 MW, respectively, mostly from the completion of the Lincs offshore wind farm); and solar in the South West (+308 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. Among the English regions, the East of England is highest in generating capacity per unit of GVA terms followed by the North East then very closely by the Yorkshire and the Humber. In terms of Generation/GVA, East of England is the highest followed by 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) <sup>1,2</sup>	Electricity generated from renewable sources kWh/GVA (£million) <sup>1</sup>
<b>England</b>	<b>9.49</b>	<b>27,624</b>
East Midlands	13.66	30,553
East	17.69	80,249
North East	15.62	35,881
North West	10.84	33,886
London	0.80	2,651
South East	9.67	27,393
South West	10.29	16,038
West Midlands	12.86	17,383
Yorkshire and the Humber	15.09	53,851
<b>Wales</b>	<b>24.56</b>	<b>56,265</b>
<b>Scotland</b>	<b>61.97</b>	<b>159,555</b>
<b>Northern Ireland</b>	<b>21.91</b>	<b>52,046</b>
<b>UK average</b>	<b>14.12</b>	<b>38,739</b>

1. GVA is Gross Value Added as published as Total GVA in Regional Gross Value Added (Income Approach), December 2013 at: [www.ons.gov.uk/ons/dcp171778\\_345191.pdf](http://www.ons.gov.uk/ons/dcp171778_345191.pdf)

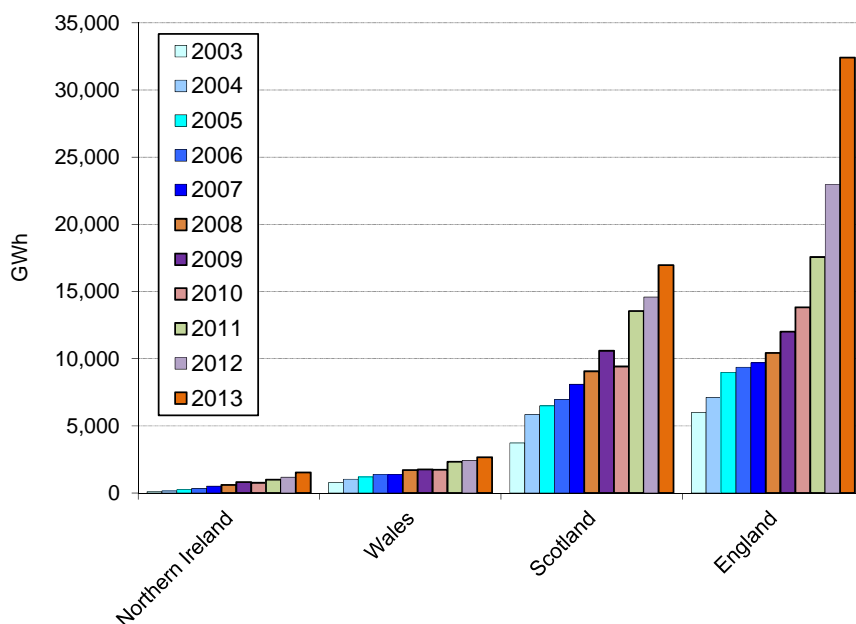
2. Excludes capacity attributable to co-firing of bioenergy which has not been allocated to regions (see footnote 4 to Table 2).

### Comparison with earlier years

DECC and Ricardo-AEA have compiled, for each year since 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 at: [www.gov.uk/government/collections/renewables-statistics](http://www.gov.uk/government/collections/renewables-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.

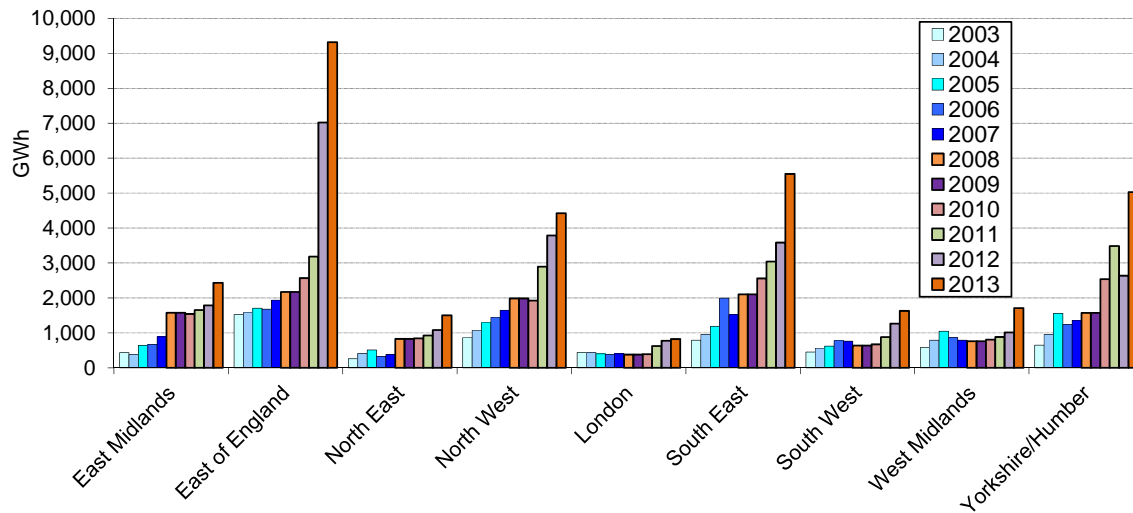
Between 2003 and 2013 there was a 407 per cent increase in generation from renewables in the UK, but faster rates of growth were recorded in Northern Ireland (1,368 per cent), Yorkshire and The Humber (672 per cent), South East (600 per cent), Eastern (511 per cent), North East (483 per cent), East Midlands (463 per cent), North West (416 per cent) and Scotland (356 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 used 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](http://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, so the unchanged configuration basis is 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 24.7 per cent in Wales, to 31.3 per cent in London, with Scotland occupying the median position at 28.2 per cent<sup>3</sup>. For offshore wind, load factors varied from 11.7 per cent (largely due to problems at Blyth) in the North East to 41.1 per cent in the North West.

<sup>3</sup> 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 2014, when 2013 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.

**Table 5: Regional load factors on an unchanged configuration basis, 2013**

	Wind Offshore	Wind Onshore	Landfill gas	Sewage gas	Other bioenergy (ex cofiring, sewage, LFG)	Hydro (large scale)	Hydro (small scale)	Hydro
<b>England</b>	<b>37.8%</b>	<b>27.6%</b>	<b>57.6%</b>	<b>50.7%</b>	<b>64.0%</b>	<b>27.2%</b>	<b>38.5%</b>	<b>33.8%</b>
East Midlands	34.0%	26.9%	55.1%	52.6%	57.8%		39.9%	39.9%
East of England	38.1%	26.0%	60.0%	39.7%	72.6%			
North East	11.7%	27.2%	45.5%	51.8%	64.8%	27.2%	74.1%	34.0%
North West	41.1%	28.7%	50.1%	56.0%	31.7%		35.8%	35.8%
London		31.3%	81.0%	32.6%	71.2%			
South East	33.1%	28.4%	65.1%	51.9%	58.0%			
South West		27.1%	56.2%	42.3%	75.5%		27.4%	27.4%
West Midlands			64.2%	63.2%	65.0%			
Yorkshire and the Humber		28.3%	53.8%	42.0%	67.7%		48.1%	48.1%
<b>Wales</b>	<b>35.9%</b>	<b>24.7%</b>	<b>50.2%</b>	<b>39.1%</b>	<b>91.5%</b>	<b>15.1%</b>	<b>25.9%</b>	<b>16.2%</b>
<b>Scotland</b>	<b>34.8%</b>	<b>28.2%</b>	<b>59.1%</b>	<b>70.8%</b>	<b>68.2%</b>	<b>32.6%</b>	<b>36.0%</b>	<b>32.8%</b>
<b>Northern Ireland</b>		<b>29.6%</b>	<b>54.3%</b>		<b>66.3%</b>		<b>40.1%</b>	<b>40.1%</b>
<b>UK AVERAGE</b>	<b>37.5%</b>	<b>27.9%</b>	<b>57.3%</b>	<b>50.2%</b>	<b>65.1%</b>	<b>31.3%</b>	<b>35.2%</b>	<b>31.6%</b>
<b>MEDIAN</b>	<b>34.8%</b>	<b>28.2%</b>	<b>55.6%</b>	<b>51.8%</b>	<b>67.0%</b>	<b>27.2%</b>	<b>37.9%</b>	<b>34.9%</b>

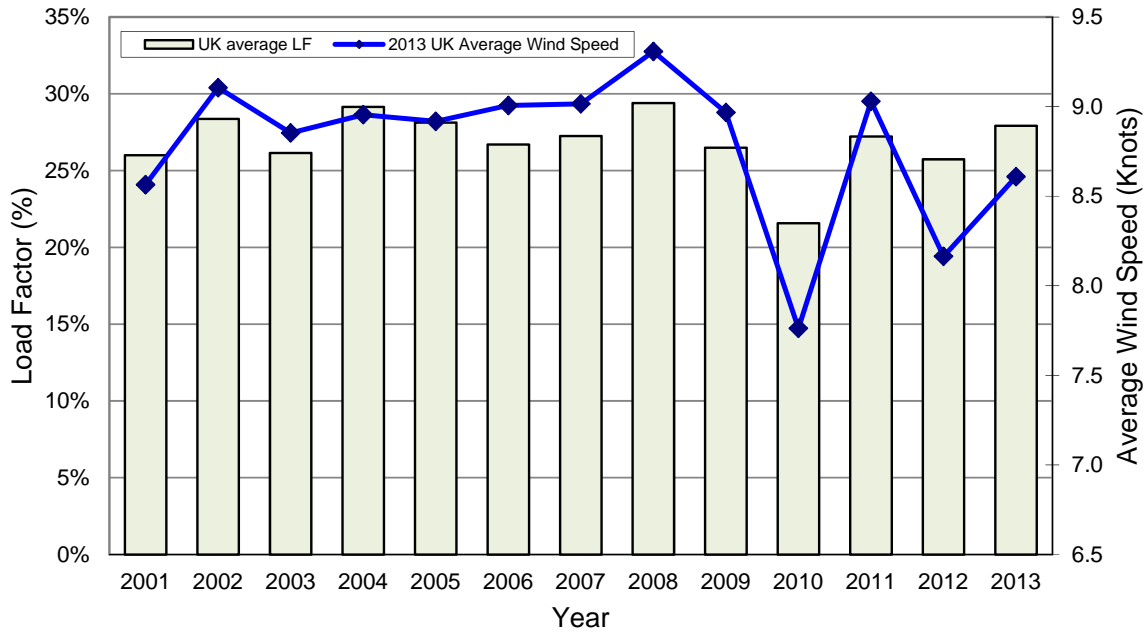
The load factors for hydro range from 16.2 per cent in Wales to 48.1 per cent in Yorkshire and the Humber, with UK average (mean) and median values of 31.6 and 34.9 per cent, respectively. For landfill gas, the load factors vary from 45.5 per cent in the North East to 81.0 per cent in London, with UK mean and median values of 57.3 and 55.6 per cent, respectively.

Chart 13 also shows the annual variation in load factor and wind speed. This uses a wind speed index<sup>4</sup> that provides an indication of the mean wind speed relative to that of the long-term average across the UK.

Over the 13-year period from 2001 to 2013, 2008 was the windiest year, with 2010 being the least windy year. Average wind speeds increased in 2013, making it the fourth windiest year in the period, and the windiest year since 2008.

<sup>4</sup> 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 Special feature article, March 2006, page 28: [www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/338330/et7\\_2.xls](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/338330/et7_2.xls)

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



**Further information**

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