

Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2010

Background

This article updates that presented in the September 2010 edition of *Energy Trends* on the amount of electricity from renewable sources disaggregated below the national level. As before, it has been necessary to combine renewable sources into categories so that information about individual sites provided to AEA and the Department of Energy and Climate Change (DECC) in confidence is not disclosed. For the first time this year, however, solar photovoltaics (pv) have been broken down into regional components.

As in previous years, micro-wind (defined as turbines with an installed capacity <1.5kW) has not been included in the tables because, at present, they are estimated on a UK-wide basis that cannot readily be further sub-divided. Micro-wind in 2010 amounts to 20.4 MWe of capacity and 22.7 GWh of generation (less than half of one percent of total wind capacity and generation). Otherwise, figures in tables 2 and 3 correspond to the totals shown in table 7.4 of the Digest of United Kingdom Energy Statistics 2011 (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.

What the figures show

Excluding the large numbers of small solar PV schemes, as their inclusion would misrepresent its overall contribution to UK renewables, table 1 and chart 1 show that there were 1,136 sites in England generating electricity from renewable sources, with 633 in Scotland, 171 in Wales and 144 in Northern Ireland. There were 21,032 PV sites reported for England with 915 for Wales and 601 for Scotland; as these rely on FITs data, it is not yet possible to report uptake for Northern Ireland.

In capacity terms, including PV, Scotland had 18 per cent more renewable electricity capacity than England (table 2 and chart 3). This is because of Scotland's considerable hydro resources (89 per cent of the UK's total hydro capacity). Hydro accounted for 34 per cent of generation from renewables in Scotland (table 3 and chart 7). However, because biomass 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 2010 was 45 per cent higher than generation in Scotland. These differences in generation are much higher than in previous years, owing to the unusually low levels of rain in 2010 which reduced hydro generation.

Table 1: Number of sites generating electricity from renewable sources, 2010¹

	Hydro	Wind and wave ²	Landfill gas	Sewage gas	Other biomass ³	Total excluding Solar PV	Solar PV	Total
England	91	425	361	157	102	1,136	21,032	22,168
East Midlands	18	46	43	15	15	137	1,838	1,975
East	-	48	68	13	10	139	3,088	3,227
North East	3	52	18	8	4	85	415	500
North West	18	58	63	25	9	173	1,178	1,351
London	-	10	-	...	6	16	1,044	1,060
South East	4	26	68	31	20	149	4,949	5,098
South West	33	72	36	19	11	171	4,308	4,479
West Midlands	6	18	28	21	12	85	1,499	1,584
Yorkshire and the Humber	9	95	37	25	15	181	2,713	2,894
Wales	54	74	23	13	7	171	915	1,086
Scotland	225	339	41	8	20	633	601	1,234
Northern Ireland	45	83	5	3	8	144	-	144
<i>Other Sites</i>	-	3	-	-	-	3	212	215
UK Total	415	924	430	181	137	2,087	22,760	24,847

For notes to Table 1 see below Table 3.

Table 2: Installed capacity of sites generating electricity from renewable sources, 2010¹

	MWe						
	Hydro	Wind and wave ²	Landfill gas	Sewage gas	Other biomass ⁴	Solar PV	Total
England	28.1	1,849.3	859.7	155.6	737.3	55.5	3,685.5
East Midlands	5.7	309.1	69.9	17.6	45.3	5.1	452.8
East	-	358.6	201.5	22.1	105.2	7.4	694.8
North East	6.3	151.8	39.4	15.6	76.3	1.1	290.5
North West	5.9	378.8	172.1	23.4	30.2	3.2	613.7
London	-	3.7	-	...	110.6	2.8	117.1
South East	0.1	467.3	162.3	30.8	176.2	12.3	849.0
South West	8.3	72.0	89.9	13.5	10.9	11.9	206.5
West Midlands	0.6	0.2	57.6	23.4	115.8	3.9	201.6
Yorkshire and the Humber	1.2	107.9	67.0	9.2	66.7	7.6	259.6
Wales	149.3	541.8	45.8	4.6	20.2	2.6	764.5
Scotland	1,459.3	2,646.7	108.9	8.2	140.1	1.9	4,365.1
Northern Ireland	11.5	322.2	10.1	0.2	5.8	-	349.8
<i>Other Sites</i>						16.9	16.9
Total	1,648.3	5,360.0	1,024.6	168.6	903.4	76.9	9,181.8
Micro wind turbines		20.4					20.4
UK Total	1,648.3	5,380.4	1,024.6	168.6	903.4	76.9	9,202.2

Table 3: Generation of electricity from renewable sources, 2010

	GWh						
	Hydro	Wind and wave ²	Landfill gas	Sewage gas	Other biomass ⁵	Solar PV	Total
England	67.7	3,657.6	4,219.5	603.8	5,210.1	18.1	13,776.7
East Midlands	16.3	756.1	337.4	74.1	362.6	1.5	1,548.0
East	0.1	838.7	1,055.6	60.6	555.3	2.1	2,512.5
North East	15.9	235.1	168.7	65.2	367.4	0.4	852.8
North West	12.1	787.8	765.0	83.1	269.9	1.0	1,918.9
London	-	4.9	-	...	379.3	1.4	385.7
South East	0.2	750.4	869.1	107.4	704.8	4.2	2,436.1
South West	18.4	92.9	430.1	52.6	64.6	4.4	663.0
West Midlands	1.0	0.7	286.7	121.7	526.9	1.2	938.2
Yorkshire and the Humber	3.7	191.0	307.0	38.9	1,979.2	1.9	2,521.6
Wales	212.8	999.4	223.2	11.0	173.9	0.8	1,621.1
Scotland	3,266.8	4,861.1	536.6	31.9	818.1	0.7	9,515.3
Northern Ireland	55.9	641.5	57.6	1.0	28.0	-	784.0
<i>Other Sites</i>						13.6	13.6
Total	3,603.2	10,159.7	5,036.9	647.7	6,230.0	33.2	25,710.7
Micro wind turbines		22.8					22.8
UK Total	3,603.2	10,182.5	5,036.9	647.7	6,230.0	33.2	25,733.5

Notes to Tables 1 to 3

Components may not add exactly to totals because of rounding.

- Nil or less than half the final digit shown.

... Data cannot be shown because of the small number of sites providing information for these cells. Instead these data are combined with the Other Biomass category.

¹ At the 31 December 2010.

² Wind Offshore is allocated to regions/countries according to where the cabling comes ashore.

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

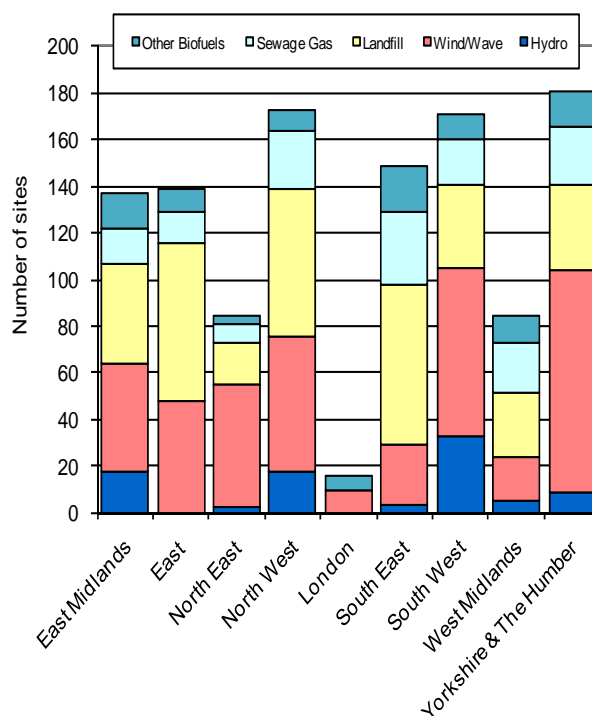
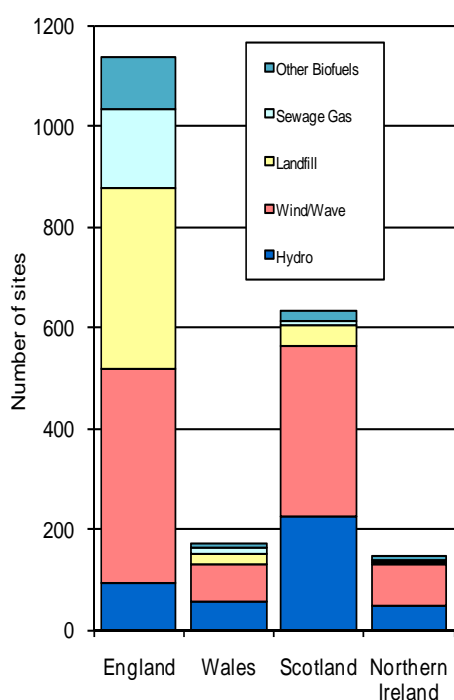
⁴ This is the proportion of non-fossil fuelled capacity used for co-firing of renewables based on the proportion of generation accounted for by the renewable source. This estimate has not been disaggregated into region values because to do so could disclose data that relate to individual companies.

⁵ Includes biomass co-fired with fossil fuels.

In England the number of sites varies from 16 in London to 181 in Yorkshire and the Humber (table 1 and chart 2). In capacity terms (including PV) the South East has the greatest ability to generate, followed closely by the East of England, the North West and the East Midlands (table 2 and chart 4). In the South East, 55 per cent of this capacity is from wind; in the East of England, 52 per cent of capacity is from wind with almost two thirds of this from three large offshore wind farms. In the North West, 62 per cent of capacity is from wind (more than half from two offshore wind farms) whilst in the East Midlands it is 68 per cent. The South East has 16 per cent of the UK's landfill gas capacity, 18 per cent of the UK's sewage gas capacity and 20 per cent of the UK's other biomass and wastes capacity. The East of England region has 20 per cent of the UK's landfill gas capacity and 13 per cent of the UK's capacity to generate from sewage and 12 per cent from other biomass and wastes. The North West (with 17 per cent of the UK's landfill gas capacity), and the South West (with 11 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 53 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 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 2010, Scotland had 49 per cent of the capacity to generate from wind and produced 48 per cent of the output (tables 2 and 3; charts 5 and 9). Wales has the next largest (10 per cent of capacity and 10 per cent of generation) followed by the South East of England (9 per cent of the capacity and 7 per cent of the output) and jointly, the North West of England and the East of England (7 per cent of capacity and 8 per cent of generation) (tables 2 and 3; charts 3 to 10)¹.

¹ A map of wind farm installed capacities in the UK at the end of 2010 was published in the renewables chapter of the 2011 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

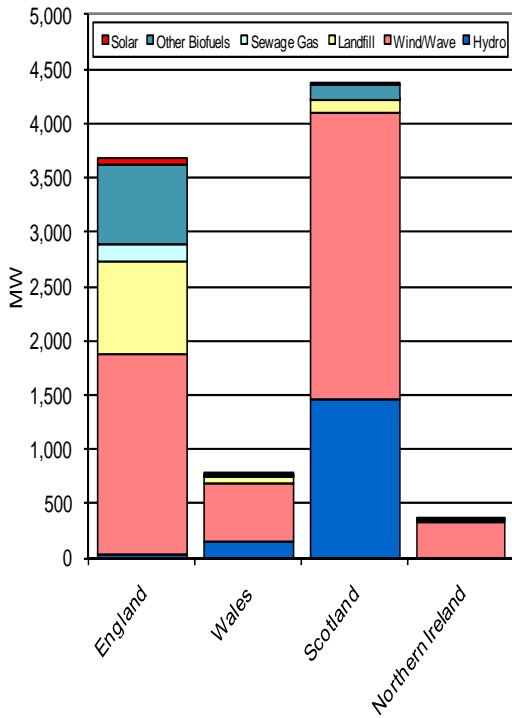


Chart 4: Renewable capacity by English region

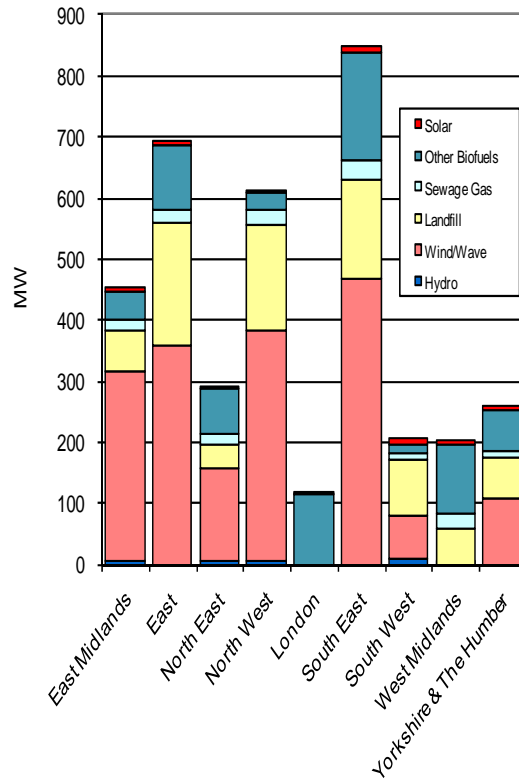


Chart 5: Wind capacity by country

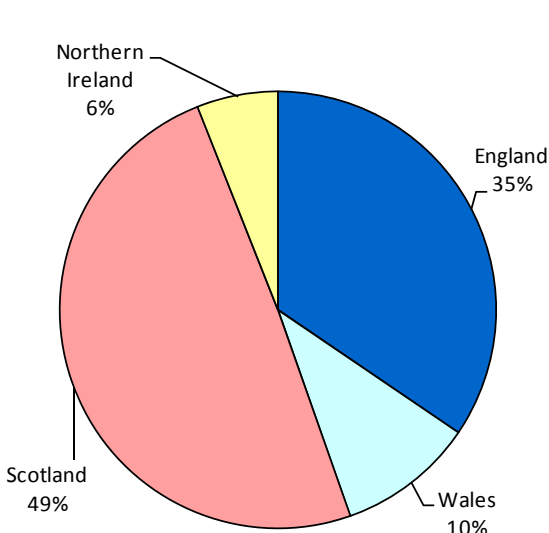


Chart 6: Wind capacity by English region

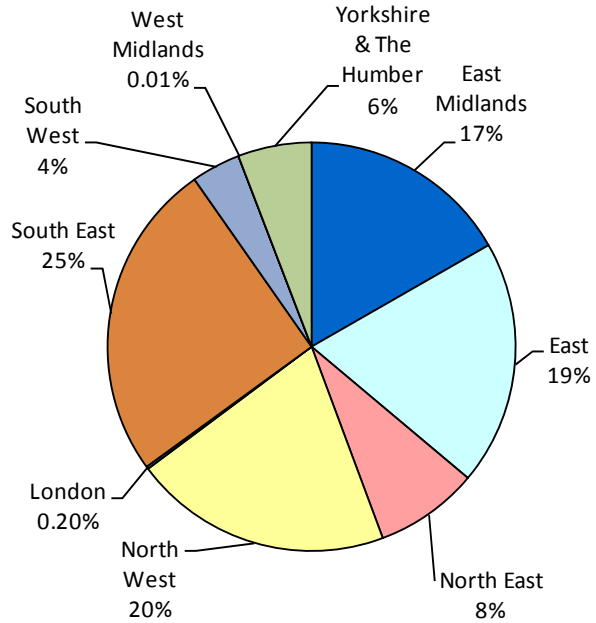


Chart 7: Renewable generation by country

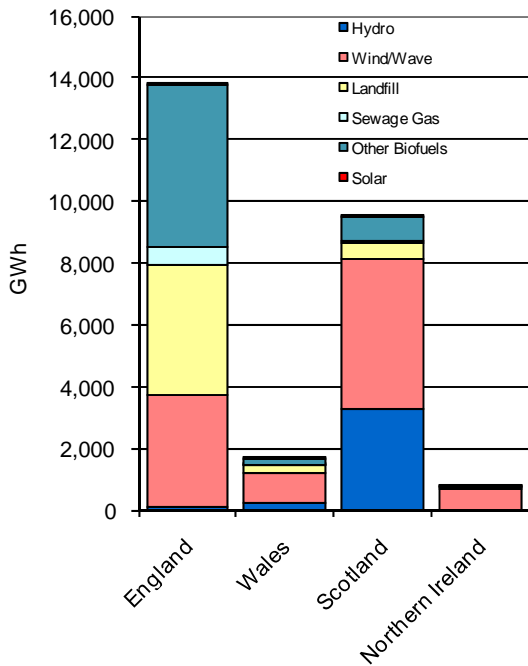


Chart 8: Renewable generation by English region

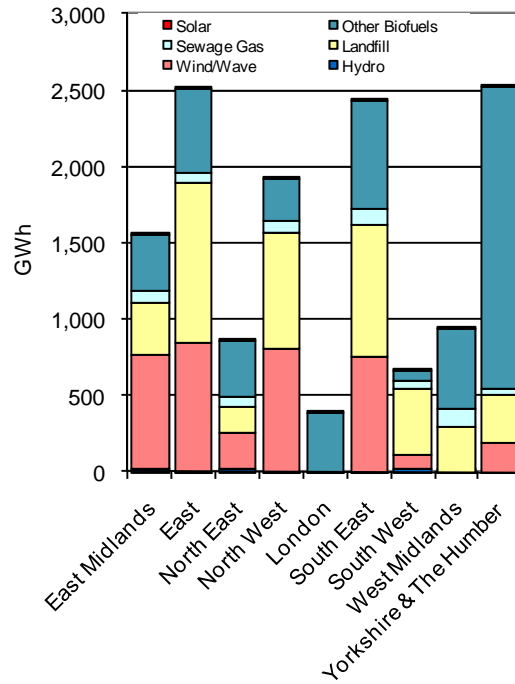


Chart 9: Wind generation by country

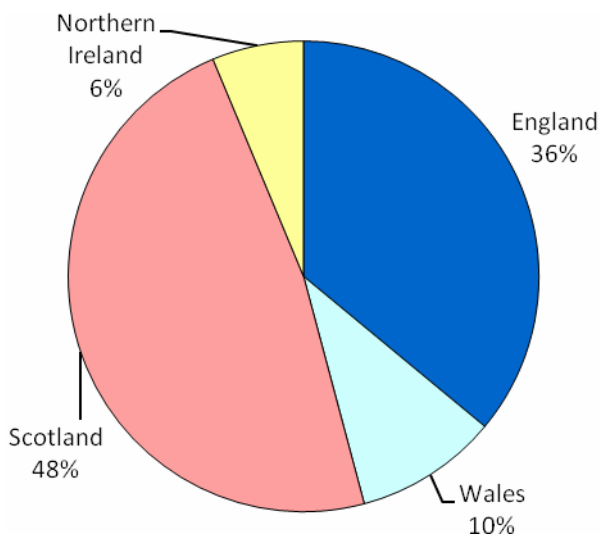
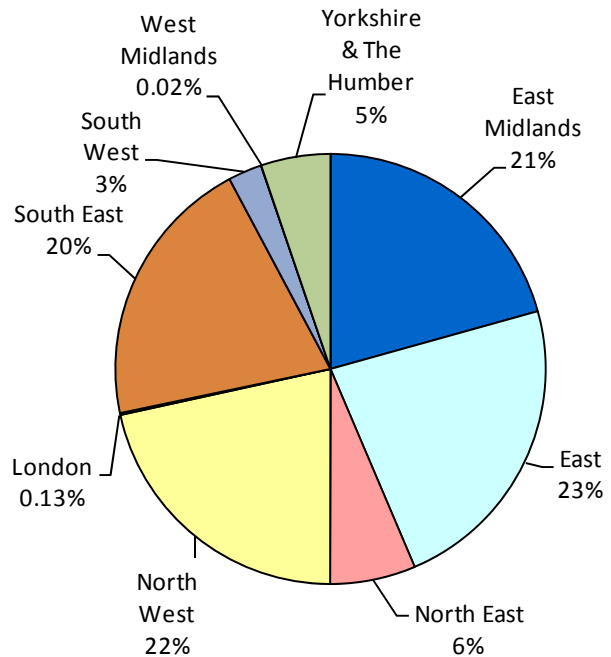


Chart 10: Wind generation by English region



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Ninety-three per cent of the generation from sewage and 84 per cent of the generation from other biomass (including biomass used for co-firing) took place in England. The West Midlands (19 per cent), South East (7 per cent) and North West (12 per cent) were the major sewage gas areas, whilst in the other biomass category, Yorkshire and the Humber (32 per cent) was the largest, followed by the South East (12 per cent) and the East of England (11 per cent) followed closely by the West Midlands (8 per cent). Excluding biomass used for co-firing (which cannot be allocated to regions – see note 4 to table 2), the South East has the largest capacity to generate from biomass (20 per cent of the UK total) followed by Scotland (16 per cent), West Midlands (13 per cent) and jointly London and the East of England (12 per cent).

In terms of total renewables generating capacity, Scotland (+550 MWe) and the South East (+456 MWe) have shown considerable growth this year. This growth has primarily come from Wind (+531 MWe) in Scotland, and Wind (+314 MWe) and Other Biomass (+57 MWe) in the South East.

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 not only has the largest generating capacity from renewables, it is the largest 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 North East is highest in generating capacity per unit of GVA terms followed by the East of England then the East Midlands. In terms of Generation/GVA, Yorkshire and the Humber is the highest followed by the East of England, North East and East Midlands.

Table 4: Density of renewables generation in different areas

	Electrical generating capacity from renewable sources kWe/GVA (£million) ^{1,2}	Electricity generated from renewable sources kWh/GVA (£million) ¹
England	3.48	13,008
East Midlands	5.86	20,046
East	6.48	23,435
London	0.44	1,455
North East	7.20	21,125
North West	5.15	16,114
South East	4.81	13,803
South West	2.17	6,960
West Midlands	2.21	10,289
Yorkshire and the Humber	2.98	28,944
Wales	17.17	36,416
Scotland	42.56	92,785
Northern Ireland	12.38	27,746
UK total	7.45	20,817

1. GVA is provisional gross value added in 2009 (workplace based) as published in table NUTS1.1 at

www.ons.gov.uk/ons/rel/regional-accounts/regional-economic-activity--gva-/december-2010/regional--sub-regional-and-local-gross-value-added.pdf

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

Comparison with earlier years

As in the September 2010 article, DECC and AEA have compiled for each year from 2003 to 2009, the number, installed capacity and generation data comparable to that shown in Tables 1 to 3. These data are now 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. In addition, non-biodegradable wastes were included in the figures for prior to 2002, but the international definition of renewables being used both here and in the Digest of UK Energy Statistics excludes non-biodegradable wastes.

Between 2003 and 2010 there was a 143 per cent increase in generation from renewables in the UK, but faster rates of growth were recorded in Northern Ireland (652 per cent), Yorkshire and The Humber (287 per cent), East Midlands (258 per cent), North East (231 per cent) and South East (207 per cent) (see charts 11 and 12). For the individual technology groups some very large increases are recorded in percentage terms because in 2003 there was very little use of some of the technologies in various regions.

The low wind speeds and rainfall during 2010 saw reductions in generation for both Scotland (despite a large increase in wind capacity) and Northern Ireland for which wind and hydro form a major component.

Chart 11: Trends in generation from renewables by country

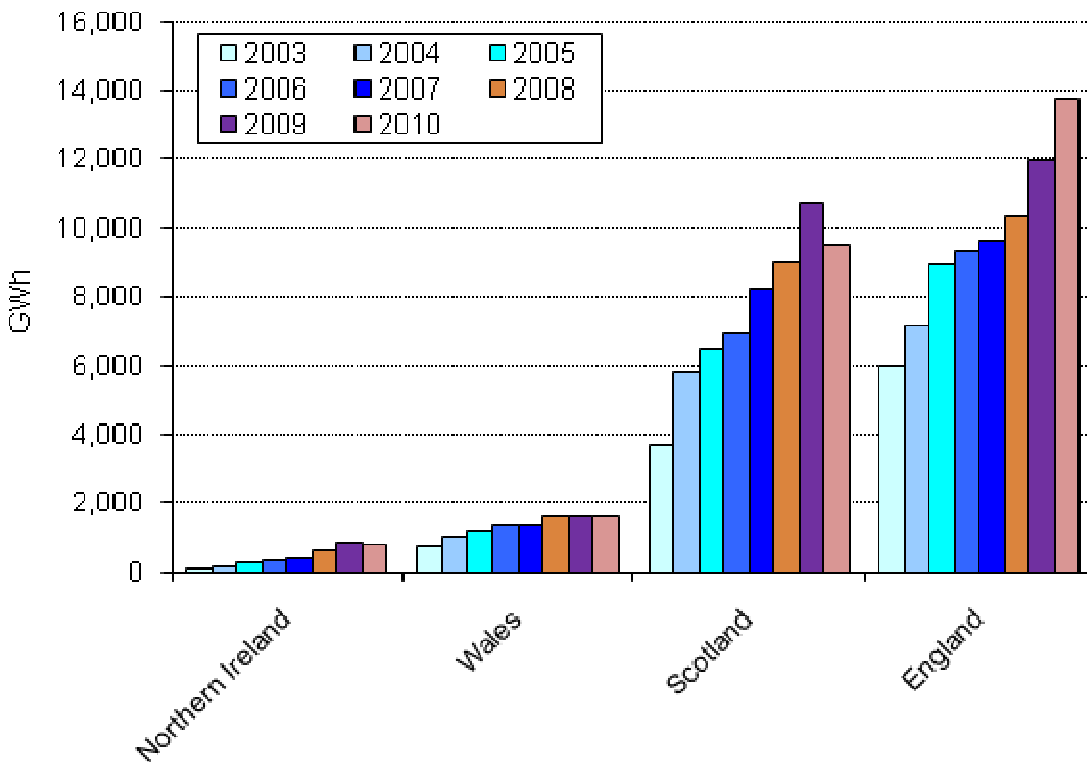
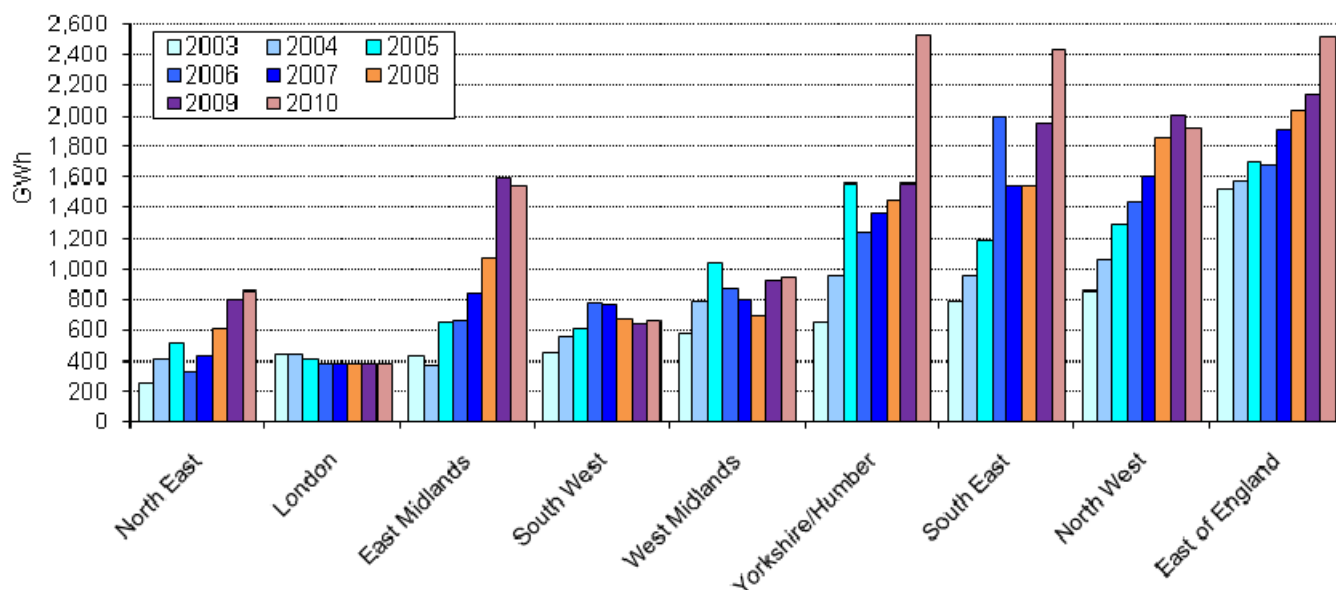


Chart 12: Trends in generation from renewables by English region



Load factors

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

Table 5: Load factors, 2010

	Hydro	Wind and wave	Landfill gas	Sewage Gas	Other biofuels (ex cofiring & sewage)
England	27.5%	25.3%	57.2%	50.4%	45.2%
East Midlands	33.3%	28.3%	57.5%	65.7%	47.1%
East of England	6.7%	26.8%	60.3%	32.3%	60.5%
North East	29.0%	20.6%	49.6%	44.6%	49.3%
North West	23.4%	24.4%	52.1%	46.5%	40.1%
London		15.3%			33.1%
South East	26.8%	27.6%	62.6%	47.6%	46.8%
South West	25.0%	15.9%	55.8%	51.7%	45.5%
West Midlands	17.9%	21.5%	58.1%	66.4%	39.5%
Yorkshire and the Humber	38.4%	20.3%	53.5%	62.0%	43.6%
Wales	16.3%	21.2%	55.8%	19.1%	65.4%
Scotland	25.6%	23.3%	56.6%	47.4%	60.8%
Northern Ireland	55.4%	23.1%	71.3%	51.9%	73.9%
MEAN	25.0%	23.8%	57.2%	48.9%	48.2%
MEDIAN	25.6%	22.3%	56.6%	47.6%	47.0%

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The load factors for hydro range from 6.7 per cent in the East of England to 55.4 per cent in Northern Ireland, with mean and median values of 25.0 and 25.6 per cent, respectively. For landfill, the load factors vary from 49.6 per cent for North East to 71.3 per cent for Northern Ireland, with mean and median values of 57.2 and 56.6 per cent, respectively.

For wind, based on combined offshore and onshore capacities and generation, load factors varied from 15.3 per cent in London to 28.3 per cent in the East Midlands. This load factor measure does not take into account the effect of different scheme sizes that are especially significant in hydro and wind, nor the impact of new schemes being constructed but not operating fully in the year. A better measurement of load factors for wind is discussed below.

The term “load factor on an unchanged configuration basis” describes the amount of electricity generated from wind farms compared with the amount that such turbines would have generated had they been available for the whole of the calendar year and running continually and at maximum output throughout the calendar year. It is calculated as follows:

Electricity generated during the year (kWh)

(Installed capacity of wind farms operating throughout the year with an unchanged configuration (kW)) x 8760 hours

In view of the interest shown nationally in this measure for onshore wind, regional average load factors on an unchanged configuration basis are also calculated. These data are only reported where the region contains three or more operational wind farms. The England figure includes data from all English wind farms regardless of how many operational wind farms were in each region within England.

Table 6: Regional load factors for wind on an unchanged configuration basis, 2010

	Load Factor	Number of Schemes
Wind Offshore	29.6%	12
Wind Onshore (UK total)	21.5%	206
England	20.8%	89
East Midlands	21.2%	10
Eastern	20.9%	15
London		
North East	21.5%	17
North West	20.0%	22
South East (incl London)	22.1%	4
South West	17.7%	10
Yorkshire and the Humber	21.8%	11
Wales	19.0%	25
Scotland	21.7%	66
Northern Ireland	23.9%	26

These data show that for onshore wind, the unchanged configuration load factors range from 17.7 per cent in the South West to 23.9 per cent in Northern Ireland with East Midlands the median region at 21.3 per cent.

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 2011, when 2010 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

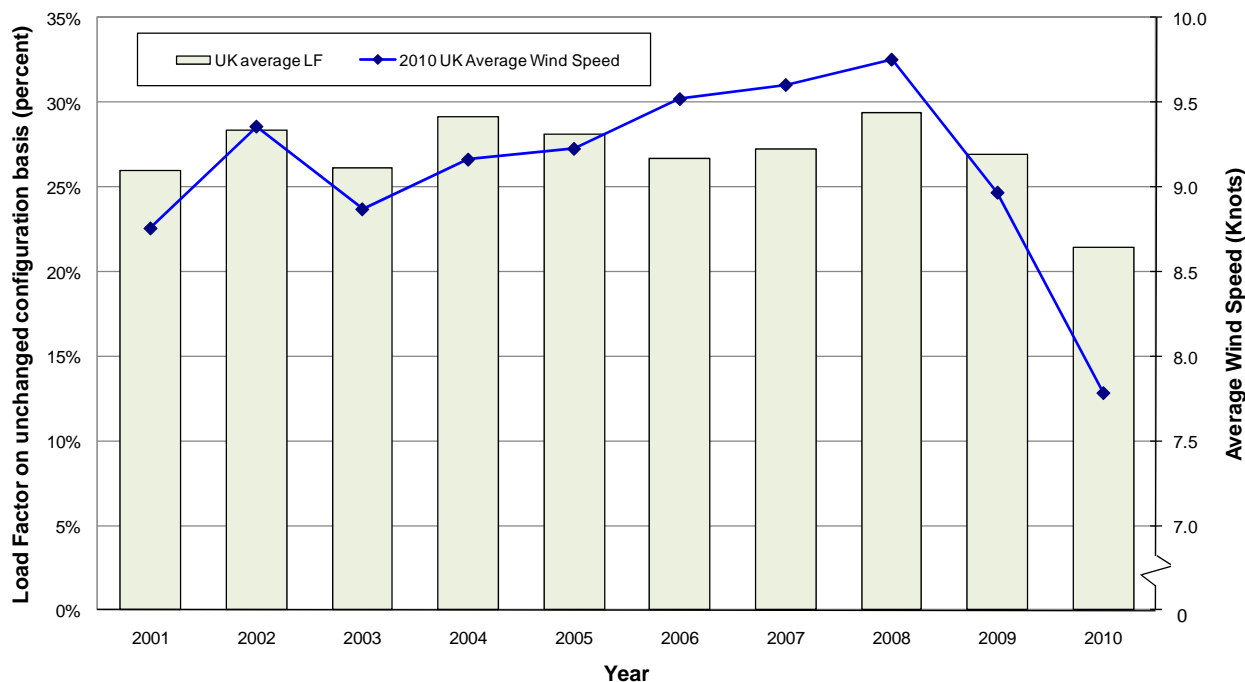
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reanalyse these results.

Chart 13 also shows the annual variation in load factor and wind speed. This uses a wind speed index² that provides an indication of the mean wind speed relative to that of the long-term average across the UK.

Over the 10-year period from 2001 to 2010, 2008 was the windiest year with 2001 and 2003 jointly sharing the position as being the least windy. 2010 has been the least windy year since 2003.

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



Further information

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² Based on data provided by the Meteorological Office. Information on the methodology used is given in Energy Trends, September 2008, page 44.