

Regional renewable electricity in 2023

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Key headlines

Renewable generation in the UK increased by **0.3 per cent** from 135.2 TWh in 2022 to 135.7 TWh in 2023. This was a result of increased solar, wind and energy from waste generation. Within this:

- Generation in England was **up 2.4 per cent**
- Generation in Northern Ireland was **down 12 per cent**
- Generation in Scotland was **down 3.6 per cent**
- Generation in Wales was **up 2.8 per cent**

Overall capacity increased by **5.2 per cent** from 53.5 GW at the end of 2022 to 56.5 GW at the end of 2023. Within this:

- Capacity in England was **up 4.1 per cent**
- Capacity in Northern Ireland was **up 0.9 per cent**
- Capacity in Scotland was **up 11 per cent**
- Capacity in Wales was **up 3.5 per cent**

Background

This article provides information and analysis on the amount of electricity from renewable sources, disaggregated below the UK level. It includes information on capacity, generation, and number of operational sites, as well as derived load factors, for the four UK countries, the nine English regions and, from 2020, UK Local Authorities. It updates the previously published figures in the September 2023 edition of Energy Trends.

These data are consistent with those published in the Digest of United Kingdom Energy Statistics 2024 (DUKES)¹, and use similar categories². The UK totals for 2023 published here are consistent with the figures published in Energy Trends; however, data for 2022 and earlier have not been revised in this publication **so 2023 figures are not directly comparable with earlier years**. This is due to delays receiving information from suppliers. We plan to revise data back to 2020 in next year's publication. This leads to some differences for generation between DUKES and these tables for 2020, 2021 and 2022. This particularly affects wind generation. Revisions were made in DUKES to include generator's own use of wind and solar for the first time. See: <https://www.gov.uk/government/publications/energy-trends-june-2024-special-feature-article> for more information.

Furthermore, generation from **liquid biofuels** (biodiesel) is not included here. This is because there are a relatively small number of sites that generate from biodiesel and publishing their totals would be disclosive. In total there are:

- 55 sites that generate from biodiesel, with 53 in England
- Their total capacity is 36 MW
- In 2023, they generated 147 GWh in total (0.1 per cent of total renewable generation).

In addition, there are small differences between the totals published for England, Northern Ireland,

¹ <https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes>

² On occasion, it has been necessary to combine some renewable sources into categories so that information about individual sites provided in confidence to DESNZ is not disclosed.

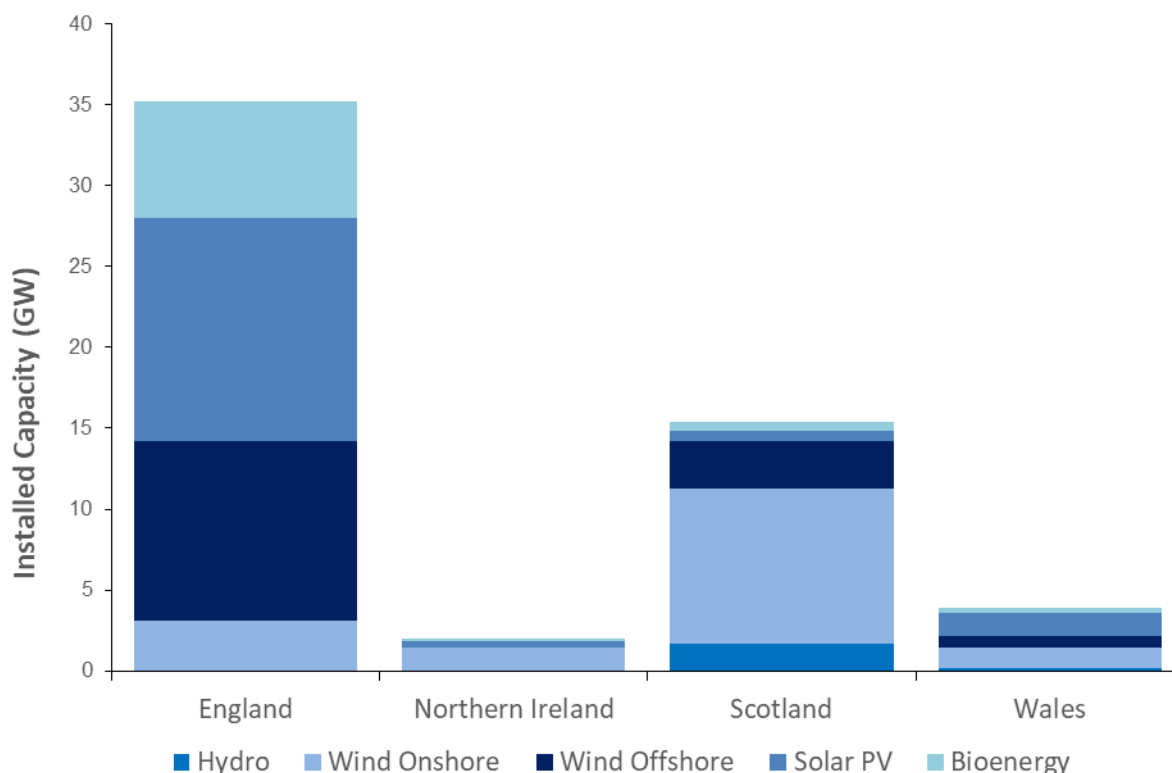
Scotland and Wales published here and those published in ET 6.1. This is because some sites cannot be allocated to local authorities where it would disclose the electricity generated by individual schemes.

Time-series data are available as Excel spreadsheets at: www.gov.uk/government/statistics/regional-renewable-statistics. The regional tables include data for 2003 – 2023 and the Local Authority tables include data for 2014 – 2023. The spreadsheets include detailed data and additional charts for generation, capacity, number of sites, generation per GVA, and load factors.

Capacity

- England had the most renewable capacity and generation, roughly two and a half times that of Scotland. This is largely because England has 88 per cent of the UK’s bioenergy capacity (including four biomass units at Drax and the Ferrybridge Multifuel Power Station in Yorkshire and the Humber), 85 per cent of the solar PV capacity, and 75 per cent of the offshore wind capacity. Chart 1 shows a breakdown of capacity at the end of 2023 by technology and country.

Chart 1: Renewable capacity at the end of 2023 by technology and country



- The technology with the highest growth in capacity was **Solar PV** (10.8 per cent) which accounted for around half of the total UK growth. The new solar PV capacity was located mainly in the South West (16 per cent) and South East (15 per cent). New capacity in the South West was primarily from Larks Green (49.9 MW) and Litchardon Cross (49.9 MW).
- **Offshore wind** capacity grew by 5.9 per cent in the UK, accounting for 27 per cent of the total UK growth. All of the new capacity is in Scotland – this includes Seagreen (805 MW).
- **Onshore wind** capacity grew by 3.9 per cent, 19 per cent of the total UK growth. Scotland accounted for most of this, primarily from South Kyle (240 MW) and Creag Riabhach Wind Farm (90 MW), and Harting Rig (67.2).

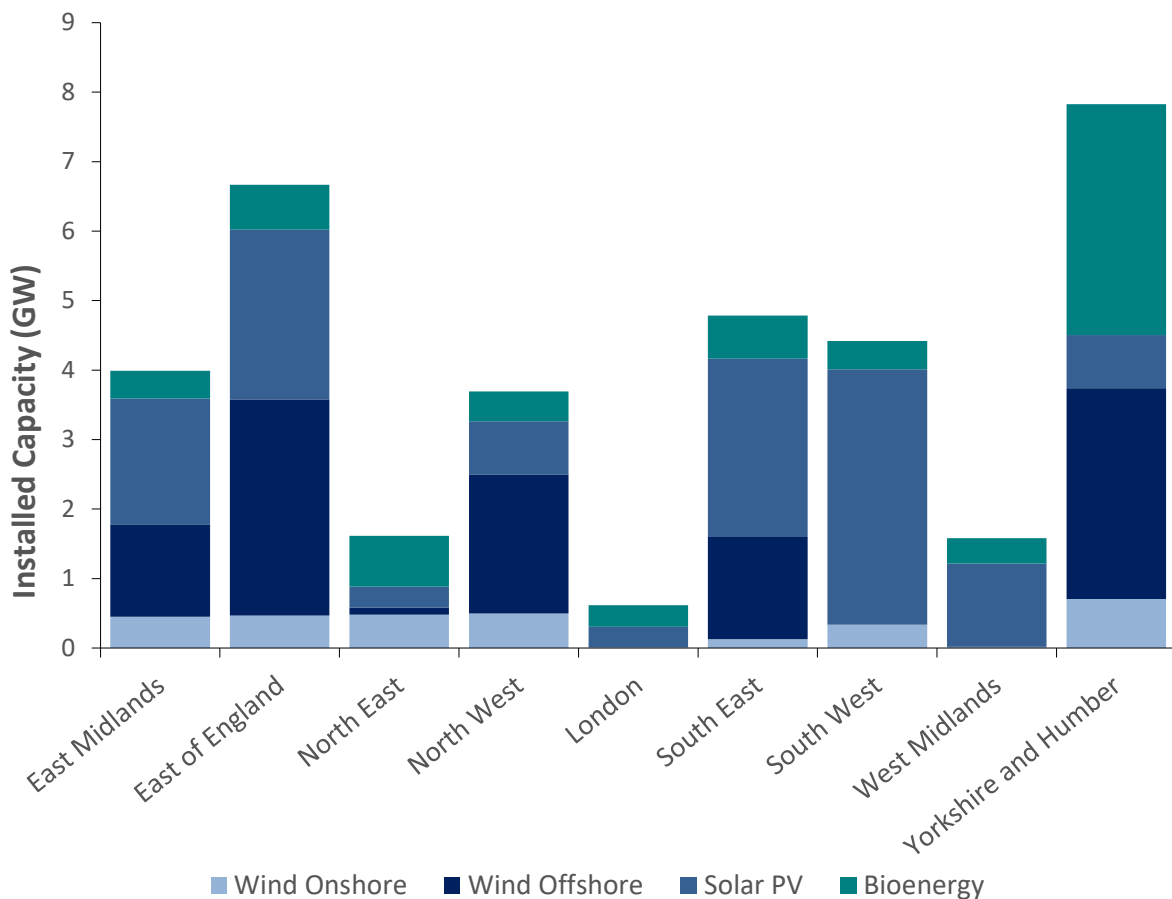
Within England, the breakdown of renewable capacity varies by region as shown in Chart 2. The regions with the highest capacity in England are:

- Yorkshire and the Humber – 7,831 MW (42 per cent from bioenergy - mostly from Drax and Ferrybridge and 39 per cent from offshore wind – the largest plants being Hornsea phase 1 and 2).
- East of England - 6,667 GW (53 per cent from wind and 46 per cent from solar PV).
- South East – 4,785 GW (54 per cent from solar PV and 33 per cent from wind).

Table 1 - Largest new schemes (including capacity increases) in 2023:

Offshore wind	Seagreen Offshore Wind Farm	Scotland	805.0 MW
Onshore wind	South Kyle	Scotland	240.0 MW
	Creag Riabhach Wind Farm	Scotland	90.0 MW
	Harting Rig	Scotland	67.2 MW
	Cumberhead	Scotland	50.0 MW
Solar PV	Larks Green Solar Farm	South West	49.9 MW
	Litchardon Cross Solar Farm	South West	49.9 MW

Chart 2 – Renewable capacity at the end of 2023 by English region and technology



Generation

- For similar reasons to capacity, generation from renewable sources in England was around two and a half times that for Scotland. However, this gap has narrowed from three times higher in 2021 as Scotland's wind generation increased more rapidly than England's over this period. The breakdown of renewable capacity and generation is different in each nation, England has a lot of bioenergy while Scotland has a lot of onshore wind capacity. Bioenergy tends to have higher load factors (see below) than wind, but this is offset by England having more solar PV capacity which has a lower load factor.

Number

- Excluding solar PV, England continues to have the largest number of renewable generating sites (6,047) followed by Scotland (4,699), Northern Ireland (1,222), and Wales (1,200). Wales has more sites than Northern Ireland when solar PV is included.
- Excluding solar PV, regions with the most sites in England are the South West, East of England, and Yorkshire and the Humber which each have over 1,000 installations. When solar PV is taken into consideration, the South East has the highest number of sites followed closely by the South West and the East of England.

Capacity and Generation per GVA

- Economic activity in each country or region is measured in terms of Gross Value Added (GVA)³. Scotland continues to show the largest generation from renewables per £ of GVA followed by Yorkshire and the Humber, Wales, East of England, and Northern Ireland.

Load Factors

Load factors are the ratio of how much electricity was generated as a proportion of the total generating capacity. UCLFs or "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 configuration⁴.

The UCLFs and load factors on a standard basis can be found in the load factor time-series spreadsheets. A summary by country is given in Table 2:

³ GVA as published in Regional Gross Value Added (Income Approach), December 2015 at:
<https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/regionaleconomicactivitybygrossdomesticproductuk/1998to2022>
<https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/nominalandrealregion>

⁴ The formula for calculating this is:

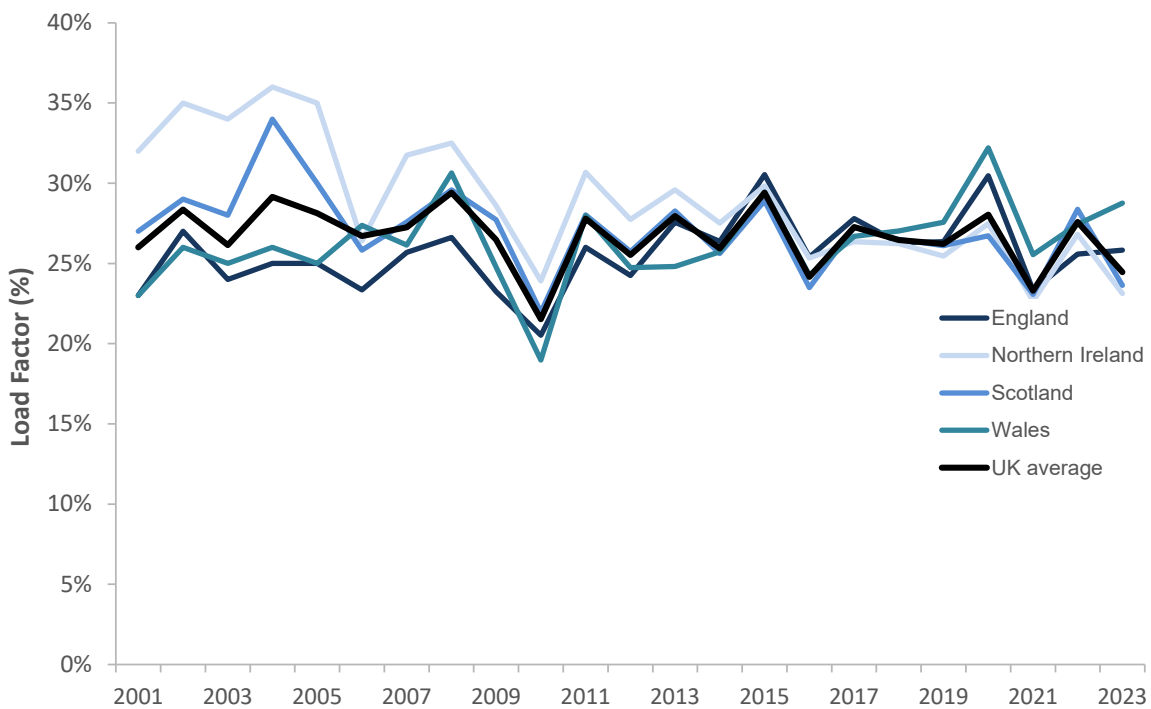
$$\frac{\text{Electricity generated during the year (MWh)}}{\text{Installed capacity of schemes operating throughout the year with unchanged capacity configuration (MW) * hours in year}}$$

Table 2 - Load factors (UCLFs) by country and technology - 2023:

	Onshore Wind	Offshore Wind	Solar PV	Hydro	Biomass and Waste
England	25.8%	42.5%	10.9%	41.3%	53.5%
Northern Ireland	23.1%	n/a	8.7%	41.2%	57.8%
Scotland	23.6%	29.5%	9.5%	33.4%	72.4%
Wales	28.8%	34.7%	10.8%	25.9%	66.4%
UK average	24.5%	40.3%	10.8%	32.9%	54.8%

- Wales has the highest **onshore wind** load factor (28.8 per cent), followed by England, Scotland and Northern Ireland. Scotland has the highest onshore wind capacity, but a lower load factor than the UK average. Load factors can be affected by differences in regional average wind speeds as well as curtailments and planned maintenance.
- England continues to have the highest load factor for **offshore wind** (42.5 per cent), followed by Wales (34.7 per cent) and Scotland (34.7 per cent).
- England also continues to have the highest average load factor for **solar PV** (10.9 per cent), followed by Wales, Scotland and Northern Ireland, which is in keeping with the relative solar irradiance in these countries.
- Load factors for other technologies are included in the related spreadsheets.

Chart 3 – Onshore wind Unchanged Configuration LFs since 2001 by UK country



Time series

Capacity and generation have grown at different rates in different regions for each technology, which is partly dependent on the available resource and the support mechanism.

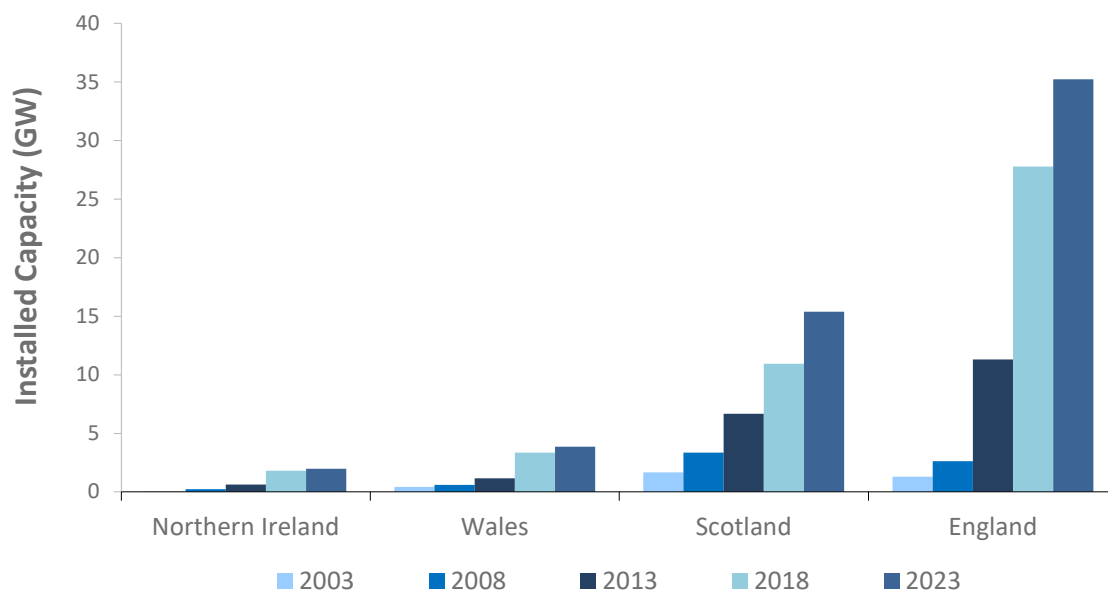
Solar PV: following a period of rapid growth encouraged by the Renewables Obligation (RO) and FiT support mechanisms, the initial fast rate of growth has slowed down, which is also reflected in the corresponding generation figures; this is probably due to a combination of effects including the closure of the RO and FiT and the rapid exploitation of prime development sites. Similar patterns are seen for other technologies (onshore wind, landfill gas, sewage gas, and hydro). However, 2023 saw strong growth from domestic solar in each region of the UK.

Offshore wind continues to grow. In total, offshore wind capacity grew by 5.8 per cent, most of this growth came from Seagreen.

Landfill gas: the rate of exploitation of prime sites reached saturation more than a decade ago but there is no similar plateauing of generation data which instead decreases with time. This is because biogas production rates reduce with time as the biodegradable resource gets exploited.

Chart 4 shows how capacity has grown over time in each country:

Chart 4 – Total renewable capacity by country 2003 – 2023



Tables 3 to 5 rank the top five Local Authorities⁵ (LAs), by number of installations, installed capacity, and generation for key technologies.

- **Number of sites:** data are summarised in Table 3. Cornwall remains the top-ranked (27,994), reflecting the large number of solar PV schemes installed in the South West. The Orkney Islands has the most onshore wind sites. Highland has the most hydro sites. Somerset has the most plant biomass sites.
- **Capacity:** data are summarised in Table 4. North Yorkshire is the top ranked local authority, primarily from Bioenergy. This is followed closely by Highland, which has more hydro and onshore wind capacity than any other LA.
- **Generation:** data are summarised in Table 5. North Yorkshire is the top ranked local authority, primarily from plant biomass, including Drax, the largest biomass plant in the UK. Despite Buckinghamshire having the most landfill gas capacity, Thurrock has the most generation.
- Cornwall continues to have the most **solar PV** in terms of number, capacity and generation. Wiltshire is second and Somerset third in terms of capacity and generation. North Yorkshire has the third highest number of sites and Aberdeenshire the fifth. However, they have significantly lower capacities and generation due to the high proportion of small-scale domestic solar in these local authorities.
- Highland's overall capacity and generation is driven by the construction of large-scale, **onshore wind** farms. Whilst the Orkneys has the highest number of wind sites (almost three times that of Highland) it has much smaller capacity and generation, suggesting these tend to be smaller projects meeting local needs.

⁵ Where disclosure of confidential generation data was likely at the site level, the data have been removed, and added to the unallocated row at the bottom of the Local Authority listings.

- Shropshire continues to show the highest number, capacity and generation of anaerobic digestion facilities. In terms of number, Shropshire is followed closely by East Cambridgeshire, East Riding of Yorkshire, Midi Ulster and Armagh City, Banbridge and Craigavon, while Derry City and Strabane is the next largest in terms of capacity and generation. This probably reflects the availability of AD feedstock due to the high levels of farming undertaken here.

Table 3: Local Authority: Number of sites generating electricity from renewable sources, 2023

Onshore Wind	Solar PV		Hydro		Bioenergy		Total		
Orkney Island	803	Cornwall	27,526	Highland	307	Somerset	59	Cornwall	27,994
Aberdeenshire	589	Somerset	21,810	Argyll and Bute	127	Shropshire	52	Somerset	21,960
Cornwall	432	North Yorkshire	20,194	Gwynedd	120	North Yorkshire	49	North Yorkshire	20,507
Dumfries and Galloway	316	Wiltshire	17,380	Perth and Kinross	90	Armagh City, Banbridge and Craigavon	43	Wiltshire	17,412
Highland	276	Aberdeenshire	15,521	Dumfries and Galloway	84	Dumfries and Galloway	39	Aberdeenshire	16,143
UK Total	9,747		1,505,876		1,576		1,969		1,519,236

Table 4: Local Authority: Installed capacity of sites generating electricity from renewable sources, 2023

Onshore Wind	Solar PV		Hydro		Bioenergy		Total ²		MW
Highland	2,044	Cornwall	635	Highland	813	North Yorkshire	2,722	North Yorkshire	2,968
South Lanarkshire	1,461	Wiltshire	580	Argyll and Bute	300	Northumberland	456	Highland	2,935
Dumfries and Galloway	928	Somerset	511	Perth and Kinross	278	Wakefield	187	North East Lincolnshire	2,890
South Ayrshire	672	Dorset	345	Dumfries and Galloway	151	Bedford	131	Moray	2,084
Scottish Borders	638	South Cambridgeshire	291	Stirling	86	Halton	127	East Suffolk	1,753
UK Total	15,438		16,517		1,890		8,231		56,844

Table 5: Local Authority: Generation of electricity from renewable sources, 2023

Onshore Wind	Solar PV		Hydro		Bioenergy		Total ^b		GWh
Highland	4,247	Cornwall	563	Highland	2,833	North Yorkshire	10,973	North Yorkshire	11,287
South Lanarkshire	3,051	Wiltshire	532	Perth and Kinross	813	Northumberland	904	Highland	7,303
Dumfries and Galloway	2,117	Somerset	448	Argyll and Bute	554	Breckland	601	Lancaster	3,537
Scottish Borders	1,399	Dorset	316	Stirling	313	Fife	542	East Suffolk	3,495
South Ayrshire	1,261	South Cambridgeshire	278	Dumfries and Galloway	289	North Lincolnshire	486	South Lanarkshire	3,193
UK Total	32,641		12,226		5,549		33,164		133,251

Totals include offshore wind sites allocated to nearest Local Authority

Annex A – Capacity Growth

Table 6 summarises capacity growth, the key technologies in each region as well as the major sites:

Region	Key Technology	Growth (MW)	Key Schemes
East Midlands	Solar PV	93.5	Northfield House Solar Farm, Dalby Solar, School farm, Bicker Fen, London Road, Irchester
	MSW	42	Newhurst Quarry
East of England	Solar PV	155	Ockendon Landfill Solar Farm, Elstree Film And TV Studios, Shenley Road, Outwood 2 Solar Park, Wilkin And Sons, Factory Hill, Sutton Bridge, Burwell
	Anaerobic Digestion	1	Attleborough Ad Plant Limited
North East	Solar PV	0.8	County Hall, Loansdean - Solar Array
North West	Solar PV	2.0	Denton Hall Farm Road, Bells Of Lazonby, Edenholme Bakery, Longlooms Road East
South East	Solar PV	81	Hurst Road - Walton Solar PV Farm, Blum UK, Arborfield PV, Fox Covert Solar Farm, Thaxted 48.00
South West	Solar PV	163	East Codford Solar Farm Extension Phase 3, Larks Green Solar Farm, Saputo Dairy UK, Two Post Lane, Hall Farm (Newnham), Litchardon Cross Solar Farm, Horsey Levels - Solar Farm
	Onshore Wind	4.2	Seabank
West Midlands	Solar PV	147	Streetfield Farm, New Cross Hospital Solar, Croome Defford Airfield Solar Farm, Bubney Farm
Yorkshire and the Humber	Solar PV	20.7	Low Farm Solar Array, LVF Packaging - Solar Panel, Tudworth Field Road, Hatfield, Regent Street, Sheepscar
Northern Ireland	Onshore wind	16.6	Ballykeel, Budore Road, 84, Ballyutoag Road, 40
	Anaerobic Digestion	0.5	Bowtown Road AD
Scotland	Offshore Wind	817.6	Seagreen, Sorbie Farm
	Onshore Wind	567.5	Deuchries Windfarm , South Kyle, Creag Riabhach Wind Farm, Cumberhead, Dalquhandy, Deuchries Windfarm, West Benhar wind farm, Greengairs East, Watsonhead Farm, Harting Rig
	Solar PV	11.1	Blair Castle Caravan Park, Blair Atholl, Claylands Road, Kirkcaldy W W T W, Nether Street, Balmore WTW, Dragon Hall FarmPV
Wales	Onshore wind	1.9	Pengarnddu Industrial Estate, Penyrheol Farm, Rhiwfelin Fach Farm Turbine 2



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