

Regional renewable electricity in 2022

William Spry

07825 194608

william.spry@energysecurity.gov.uk

Key headlines

Renewable generation in the UK increased by **10.5 per cent** from 122.0 TWh in 2021 to 134.9 TWh in 2022. This was a result of increased rainfall, wind and sunshine hours. Within this:

- Generation in England was **up 4.4 per cent**
- Generation in Northern Ireland was **up 16.4 per cent**
- Generation in Scotland was **up 29.4 per cent**
- Generation in Wales was **up 5.1 per cent**

Overall capacity increased by **7.7 per cent** from 49.7 GW at the end of 2021 to 53.5 GW at the end of 2022. Within this:

- Capacity in England was **up 6.9 per cent**
- Capacity in Northern Ireland was **up 0.7 per cent**
- Capacity in Scotland was **up 13.0 per cent**
- Capacity in Wales was **up 1.2 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 2014, UK Local Authorities. It updates the previously published figures in the September 2022 edition of Energy Trends.

These data are consistent with those published in the Digest of United Kingdom Energy Statistics 2023 (DUKES)¹, and use similar categories². The UK totals published here are consistent with the figures published in Energy Trends.

The main difference between the data published here and the data published in DUKES / Energy Trends is that 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 of them in England
- Their total capacity is 36 MW
- In 2022, 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, 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 – 2022 and the Local Authority tables include data for 2014 – 2022. The spreadsheets include detailed data and additional charts for generation, capacity, number of sites, generation per GVA, and load factors.

¹ 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 (rather than from publicly available sources) to Ricardo and (DESNZ) is not disclosed.

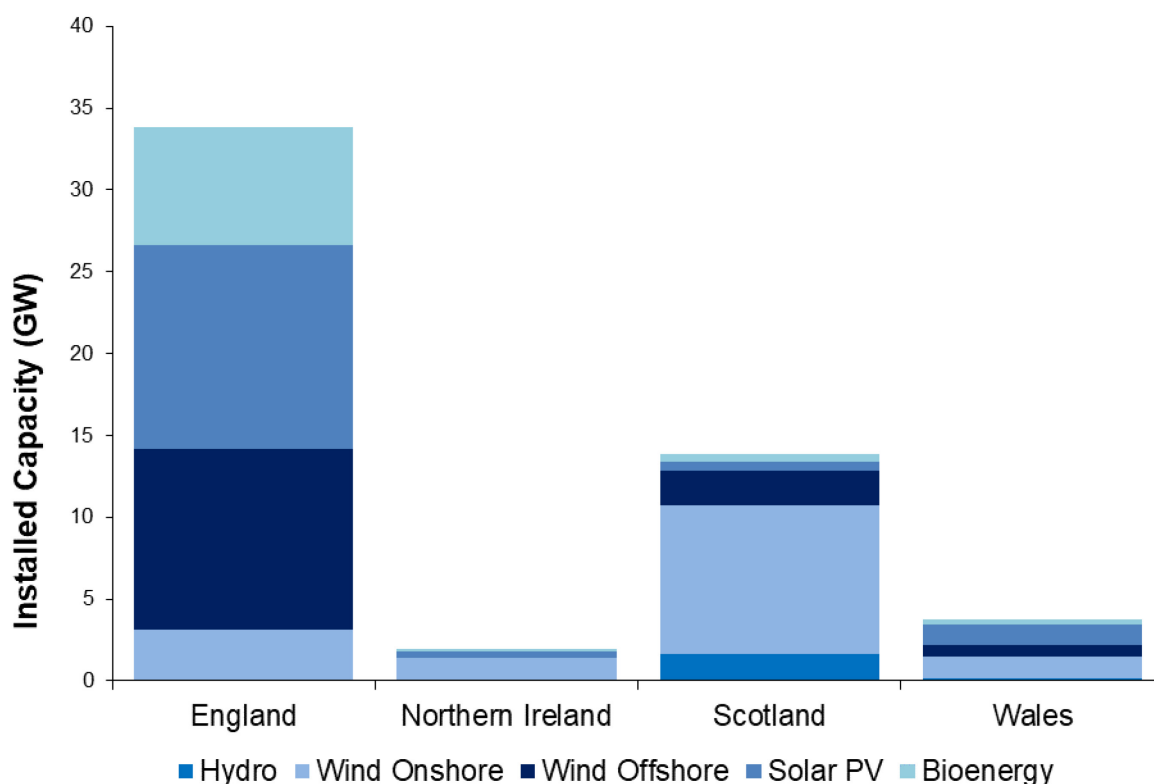
Changes from last year

This year, a District Level breakdown of the MCS (Microgeneration Certification Scheme) data was extended to include onshore wind data for Great Britain and solar PV data for Northern Ireland; this breakdown is from 2020 onwards. Further revisions are shown in the 'Revisions' section in Annex B.

Capacity

- England had the most renewable capacity and generation, nearly two and a half times that for Scotland. This is largely because England has 88 per cent of the UK's bioenergy capacity (mostly from 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 79 per cent of the offshore wind capacity. Chart 1 shows a breakdown of capacity at the end of 2022 by technology and country.

Chart 1: Renewable capacity at the end of 2022 by technology and country



- The technology with the highest growth in capacity was **offshore wind**³ (24 per cent) which accounted for 69 per cent of the total UK growth. The new offshore wind capacity was located mainly in the Yorkshire and the Humber (52 per cent), and Scotland (46 per cent). This was largely driven by Hornsea 2 and Moray East, with the addition of 1,386 and 950 MW capacity, respectively.
- **Solar PV** capacity grew by 5.3 per cent, 19 per cent of the total UK growth. The South West had the largest share (20 per cent) of the new capacity, primarily from South Farm Solar Park (40 MW).
- **Onshore wind** capacity grew by 2.4 per cent in the UK, accounting for 8.9 per cent of the total UK growth. 97 per cent of the new capacity was in Scotland - the largest schemes were Sandy Knowe (86 MW) and Kennoxhead Phase 1 (62 MW). The remaining 3 per cent of new capacity was in Wales.
- **Bioenergy** capacity grew by 1.2 per cent overall, 2.5 per cent of the total UK growth. England accounted for most of this, primarily from Rookery South ERF in East of England. Within this **AD**

³ Offshore wind is allocated to the region to which its output is connected. The exceptions are Robin Rigg, which comes ashore at Seaton, Cumbria but whose generation is associated with Scotland, Burbo Bank, which comes ashore in Wales but whose generation is associated with the North West and Hornsea Project One which lands in the East Midlands but with grid connection in Yorkshire and the Humber.

(anaerobic digestion) capacity grew by 2.6 per cent, with 91 per cent of the new AD capacity being in England.

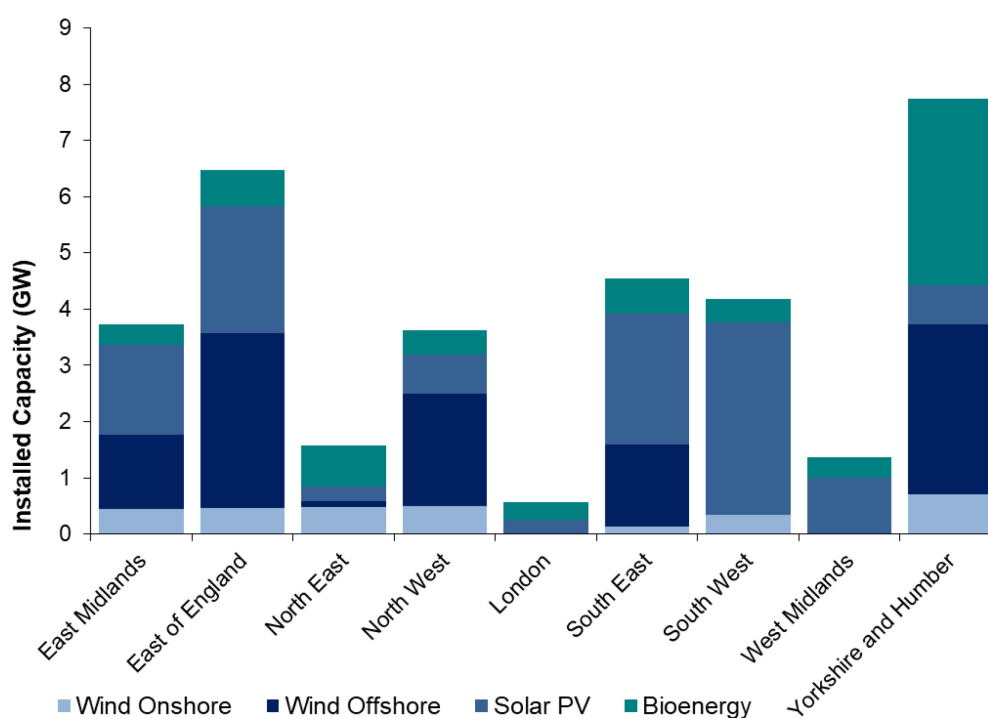
Table 1 - Largest new schemes (including capacity increases) in 2022:

Onshore wind	Blary Hill	Scotland	35 MW
	Glen Kyllachy	Scotland	49 MW
	Twentyshilling	Scotland	38 MW
	Kennoxhead Phase 1	Scotland	62 MW
	Sandy Knowe	Scotland	86 MW
Offshore wind	Hornsea 2	Yorkshire and the Humber	1,386 MW
	Moray East	Scotland	950 MW
	Seagreen (first phase)	Scotland	270 MW
	Triton Knoll (growth)	East Midlands	32 MW
Solar PV	Carland Cross	East of England	10 MW
	Thornham	East Midlands	21 MW
	Glebe Farm Solar Farm	West Midlands	32 MW
	Cirencester Solar Farm	South West	23 MW
	South Farm Solar Park	South West	40 MW
Biomass and waste	Rookery South ERF	East of England	60 MW
	Minworth STW Dual Fuel Generating station	West Midlands	10 MW
	Langleys Lane - Electricity Generation Plant	South West	6 MW
	Thornfield Energy (Waste AD)	West Midlands	5 MW

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 – 7,751 GW (48 per cent from wind – the largest plants being Hornsea phase 1 and 2 and 41 per cent from biomass and waste - mostly from Drax and Ferrybridge).
- East of England - 6,470 GW (55 per cent from wind and 35 per cent from solar PV).
- South East - 4,558 GW (51 per cent from solar PV and 35 per cent from Wind).

Chart 2 – Renewable capacity at the end of 2022 by English region and technology



The table in Annex A summarises capacity growth, the key technologies in each region as well as the major sites.

The Feed in Tariff scheme (FiTs) closed to new entrants at the end of March 2019, small-scale solar PV installations that have come online since April 2019 are now recorded through the MCS (Microgeneration Certification Scheme).

Generation

- For similar reasons to capacity, generation from renewable sources in England was almost two and a half times that for Scotland but a decrease from three times higher in 2021. England has a lot of bioenergy and 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 sites (6,024) followed by Scotland (4,692), Northern Ireland (1,217), and Wales (1,195). 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)⁴. Scotland continues to show the largest capacity and generation from renewables per £ of GVA followed by Yorkshire and the Humber, Wales, 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 configuration⁵.

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 3:

⁴ GVA as published in Regional Gross Value Added (Income Approach), December 2015 at: www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/regionaleconomicactivitybygrossdomesticproductuk/1998to2021
www.ons.gov.uk/economy/grossvalueaddedgva/datasets/nominalandrealregionalgrossvalueaddedbalancedbyindustry

⁵ The formula for calculating this is:

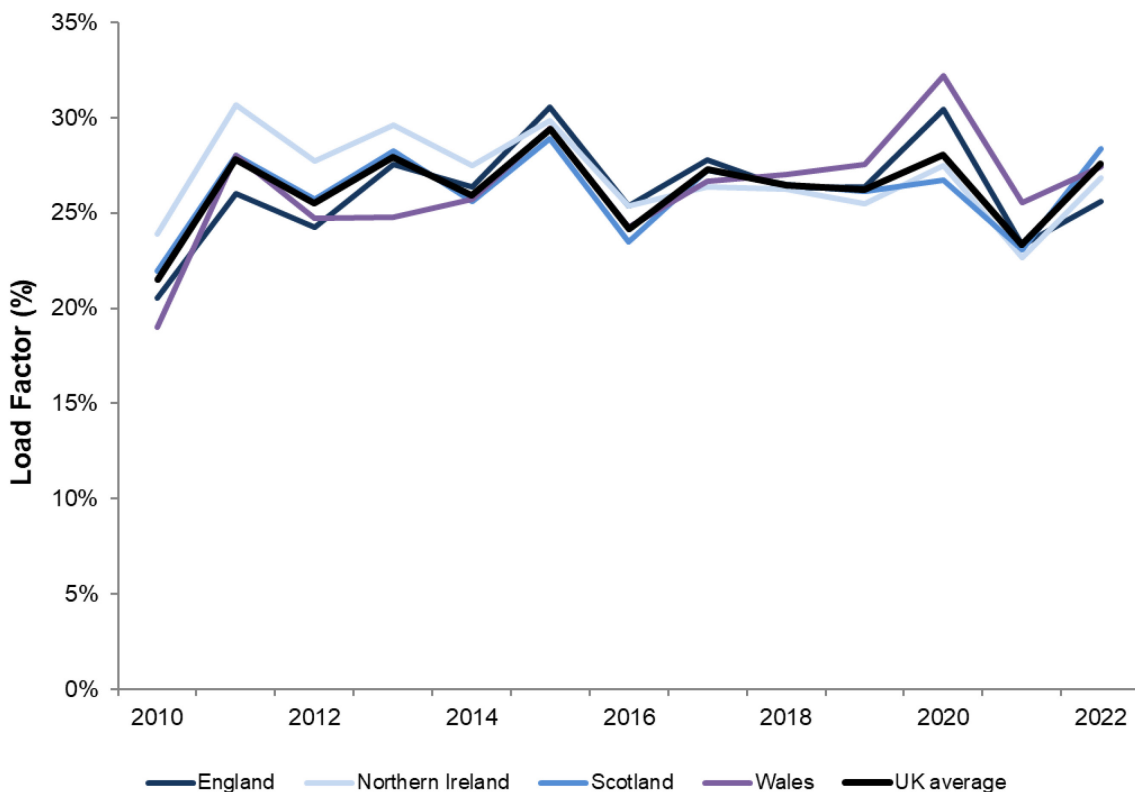
$$\frac{\text{Electricity generated during the year (MWh)}}{\text{Installed capacity of schemes operating throughout the year with unchanged capacity configuration (MW)} * \text{hours in year}}$$

Table 2 - Load factors on an unchanged configuration basis by UK country and technology:

	Onshore Wind	Offshore Wind	Solar PV	Hydro	Biomass and Waste
England	25.6%	40.1%	11.5%	30.1%	60.3%
Northern Ireland	26.8%	n/a	9.3%	33.1%	66.1%
Scotland	28.4%	32.9%	10.6%	34.9%	70.2%
Wales	27.4%	33.6%	10.9%	17.8%	73.9%
UK average	27.6%	38.6%	11.3%	33.2%	61.2%

- Scotland has the highest **onshore wind** load factor, then Wales, followed closely by Northern Ireland (26.8 per cent) and England (25.6 per cent).
- England continues to have the highest load factor for **offshore wind** (40.1 per cent), followed by Wales (33.6 per cent) and Scotland (32.9 per cent). Regional differences exist for average wind speeds.
- England also continues to have the highest average load factor for **solar PV** (11.5 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 and additional graphs are included in the related spreadsheets.

Chart 3 – Onshore wind Unchanged Configuration LFs since 2010 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). There continues to be growth from unsubsidised installations. The solar PV figures published here in Energy Trends include plants on our own survey of major power producers, all installations accredited on FiTs, RO and CfD, all those registered on MCS and any others that are recorded in the Renewable Energy Planning Database. However, there are likely to be some unsubsidised installations that are not covered by these sources. We have reviewed this issue with solar analysts at the University of Sheffield, our figures are consistent with theirs and we believe the capacity that we are missing is likely to be small. We will continue to explore new data sources going forward such as embedded capacity registers that are published by DNOs (Distribution Network Operators) with the aim of improving coverage.

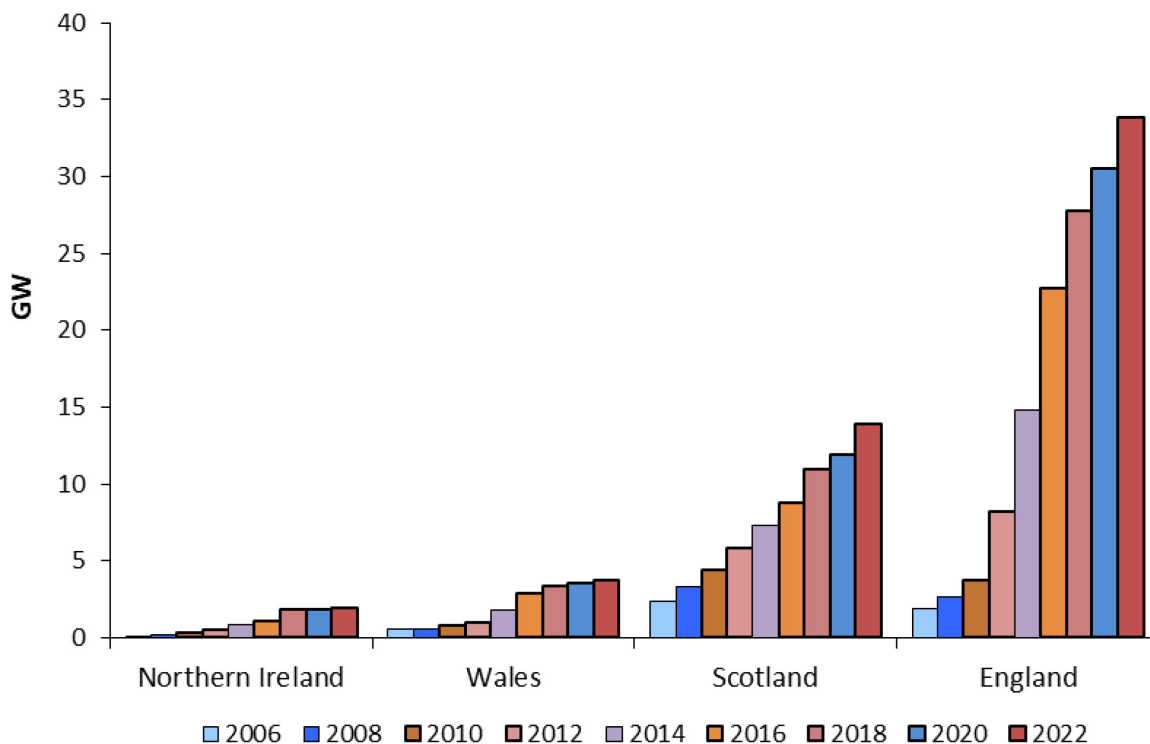
Offshore wind continues to grow. In total, offshore wind capacity grew by 24 per cent, accounting for more than two thirds of the new capacity in 2022. All of the offshore wind plants that came online in 2022 are accredited on the Contracts for Difference (CfD) support scheme. More than half of this new capacity came from one site alone – Hornsea 2 in Yorkshire and the Humber. Offshore wind capacity has grown more than fourfold in England and nearly fivefold in Wales over the last ten years. Offshore wind capacity in Scotland more than doubled in 2022 and is now more than eleven times higher than it was ten years ago.

Bioenergy: most of the new growth this year (1.2 per cent) again came from biomass and waste, the majority of this within England.

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 2006 – 2022



Local authority analysis

- Tables 4 to 6 rank the top five Local Authorities⁶ (LAs), per: number of installations, installed capacity, and generation for key technologies.
- **Number of sites:** are summarised in Table 4. Cornwall remains the top-ranked (23,069), 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. Mendip has the most bioenergy sites including the most plant biomass sites.
- **Capacity:** data are summarised in Table 5. North East Lincolnshire is the top ranked local authority, primarily from offshore wind. This is followed closely by Highland, which has more hydro and onshore wind capacity and generation than any other LA.
- **Generation:** data are summarised in Table 6. Selby is the top ranked local authority, primarily from plant biomass, including Drax, the largest biomass plant in the UK.
- For other technologies, the top ranking LAs for both capacity and generation are Cornwall (solar PV), Shropshire (anaerobic digestion) and Selby (plant biomass). Thurrock has the most landfill gas capacity while Buckinghamshire has the most generation.
- Cornwall and Wiltshire continue to have large numbers of solar PV sites with correspondingly high capacity and generation which represents the installation of large solar farms. These are followed closely by Aberdeenshire, Dorset, and Leeds which, between them, have an unusually large number of solar PV sites. However, they have

⁶ Where disclosure of confidential generation data was likely at the site level, this has been addressed, where possible, by replacing this with data from publicly available sources. Where this is not possible, the data have been removed, and added to the unallocated row at the bottom of the Local Authority listings.

significantly lower capacities and generation (with the exception of Dorset) and probably represents the uptake of domestic installations.

- 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.

Shropshire continues to show the highest number, capacity and generation of anaerobic digestion facilities. In terms of number, Shropshire is followed closely by Armagh City, Banbridge and Craigavon, while East Cambridgeshire and Mid Ulster are 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, 2022 ^a									Number
Onshore Wind	Solar PV		Hydro		Bioenergy		Total ^b		
Orkney Islands	802	Cornwall	23,069	Highland	307	Shropshire	52	Cornwall	23,536
Aberdeenshire	586	Wiltshire	13,390	Argyll & Bute	127	Armagh City, Banbridge and Craigavon	44	Wiltshire	13,422
Cornwall	432	Aberdeenshire	12,589	Gwynedd	120	Dumfries and Galloway	40	Aberdeenshire	13,209
Dumfries & Galloway	316	Dorset	11,746	Perth & Kinross	90	Herefordshire, county of	38	Dorset	11,800
Highland	275	Leeds	10,698	Dumfries & Galloway	84	Mendip	37	County Durham	10,784
UK Total	9,601		1,249,511		1,576		1,954		1,262,707

Table 4: Local Authority: Installed capacity of sites generating electricity from renewable sources, 2022 ^a									MW
Onshore Wind	Solar PV		Hydro		Bioenergy		Total ^b		
Highland	1,954	Cornwall	612	Highland	813	Selby	2,668	North East Lincolnshire	2,869
South Lanarkshire	1,305	Wiltshire	554	Argyll & Bute	300	Northumberland	456	Highland	2,838
Dumfries & Galloway	928	Dorset	334	Perth & Kinross	278	Wakefield	192	Selby	2,723
South Ayrshire	672	South Cambridgeshire	283	Dumfries & Galloway	151	Bedford	131	Moray	2,080
Scottish Borders	641	Shropshire	225	Stirling	86	Halton	127	East Suffolk	1,745
UK Total	14,835		14,651		1,890		8,177		53,503

Table 5: Local Authority: Generation of electricity from renewable sources, 2022 ^a									GWh
Onshore Wind	Solar PV		Hydro		Bioenergy		Total ^b		
Highland	5,140	Cornwall	578	Highland	2,948	Selby	10,757	Selby	10,843
South Lanarkshire	3,179	Wiltshire	527	Perth & Kinross	820	Fife	536	Highland	8,313
Dumfries & Galloway	2,127	Dorset	287	Argyll & Bute	612	Breckland	524	Lancaster	3,626
Scottish Borders	1,657	South Cambridgeshire	285	Dumfries & Galloway	326	North Lincolnshire	480	South Lanarkshire	3,310
South Ayrshire	1,589	Shropshire	204	Stirling	323	Thurrock	406	East Suffolk	3,199
UK Total	35,237		13,283		5,640		35,673		134,864

Totals include offshore wind sites allocated to nearest Local Authority

Annex A – Regional capacity growth

Table 6 shows the main capacity changes for each region in 2022:

Region	Key Technology	Growth (MW)	Key Schemes
East Midlands	AD	4	Pebble Hall Farm
	Solar PV	83.8	High Leas, Thornham,
	Offshore Wind	32	Triton Knoll (expansion)
East of England	AD	0.1	
	Biomass and Waste	72.0	Rookery South ERF, Goosey Lodge CHP Plant
	Landfill gas	-1.2	Arlesey (Closed)
	Solar PV	177.8	Fambridge Road/Canewdon Road, Carland Cross, Canewdon CIC
North East	Solar PV	34.1	Land at Woodhouse Farm, Lumley Water Treatment Works - Solar Panels
	Onshore Wind	-3.4	Red Gap Moor Wind Farm (capacity revision)
North West	Landfill gas	-1.0	Bidston Moss Landfill (Closed)
	Hydro	0.2	
	Solar PV	94.5	Amazon Omega Business Park
	Onshore Wind	1.0	Wythegill Wind Turbine
London	Sewage gas	1.0	Kenley
	Solar PV	116.1	Twin Tumps Way - Solar Panels
	Onshore Wind	0.1	
South East	AD	1.2	Ramsgate Road AD
	Biomass and Waste	-2	
	Solar PV	228.0	West End Farm, Worstead Farm, West End Farm
South West	AD	3.5	Evercreech Junction, Willow Farm (Avonmouth)
	Biomass and Waste	-0.7	Capacity revisions
	Hydro	-0.9	
	Landfill gas	6.0	Langleys Lane - Electricity Generation Plant
	Solar PV	220.1	MCS, FIT revisions, Nether Mill Farm (resubmission), Trefullock Solar Farm, Cirencester Solar Farm, South Farm Solar Park, Bulkworthy Solar Park
West Midlands	AD	5.5	Lower Drayton Farm, Thornfield Energy
	Biomass and Waste	0.1	Ridby Court
	Sewage gas	9.7	Minworth STW Dual Fuel Generating station

	Solar PV	141.5	Willows Farm Solar Limited, Keele University, Glebe Farm Solar Farm, Ling Hall
	Onshore Wind	0.1	
Yorkshire and the Humber	AD	4.4	Railway Farm AD, Key Growers, Lanes Farm AD
	Biomass and Waste	-1.0	capacity revisions
	Solar PV	83.1	Cottingham - Solar Farm
	Onshore Wind	2.6	Blackstone Edge, Tedder Hill
	Offshore Wind	1386.0	Hornsea 2
Northern Ireland	AD	1.3	Bowtown Road, Granville
	Solar PV	13.3	MCS, Laurelhill
	Onshore Wind	0.9	Torrard Turbine (Replacement), Kingsmill Road (Replacement)
Scotland	AD	0.1	Wester Clockeasy Farm
	Biomass and Waste	-2.1	capacity revisions
	Hydro	6.1	
	Solar PV	142.9	Cupar Wastewater Treatment Works Solar Farm
	Onshore Wind	334.1	Blary Hill, Glen Kyllachy, Twentysilling, Kennoxhead, Sandy Knowe, Hadyard Hill, Gordonbush (extension)
	Offshore Wind	1220.0	Moray East, Seagreen
Wales	AD	82.6	Derwyn Farm, Maesgwyn, Fferm Penglais, Crumps Yard
	Onshore Wind	13.2	y Wal, Graig Fatha Farm, Parc Stormy

Annex B - Revisions

Historic revisions this year were carried out to the 2020 and 2021 datasets which have resulted in changes to both capacity and generation in all regions. These are due to several reasons including the reassignment of unknown FiT and MCS data from the 'Other' category to identified regions. There have also been capacity revisions in several data sources: the MPP (Major Power Producers) survey, ROCs (Renewable Obligation Certificates), and the MSIW (Municipal Solid & Industrial Waste) survey. Other changes include the identification and removal of duplicates. These revisions are summarised in Table 7:

Year	2020		2021	
	Capacity	Generation	Capacity	Generation
	(MW)	(GWh)	(MW)	(GWh)
England	381	-46	548	402
East Midlands	3	-59	16	9
East of England	62	18	88	72
North East	13	-1	17	22
North West	38	-17	51	37
London	75	45	89	51
South East	81	53	119	85
South West	37	-53	69	66
West Midlands	41	7	58	41
Yorkshire and the Humber	31	-38	42	20
Northern Ireland	1	2	2	9
Scotland	68	-72	100	-8
Wales	35	-36	50	11
Other	-510	-457	-746	-551
TOTAL	-24	-608	-47	-138



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