Electricity generation and supply in Scotland, Wales, Northern Ireland, and England, 2019 to 2023

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Introduction

This article examines the variation of electricity generation and consumption in the four nations of the United Kingdom. It updates and extends the previous version, published in December 2023. The UK data in this article is taken from chapters 5 and 6 of the Digest of United Kingdom Energy Statistics (DUKES) 2024 and the definitions match those in DUKES. The main text covers the latest five years of data and the corresponding timeseries (including the latest revisions) for 2004 to 2023 can be found in the accompanying Excel spreadsheet.

Key headlines

- UK total electricity generation in 2023 was 293 TWh, a decrease of 9.9 per cent compared to 2022. This is the lowest electricity generation on the published data series.
- Generation from fossil fuel fell in all four nations of the UK compared to 2022. Scotland -36 per cent, Wales -27 per cent, Northern Ireland -19 per cent, England -18 per cent.
- Renewable generation trends were mixed across the nations with decreased renewable generation in Scotland and Northern Ireland but increases for England and Wales. Overall, there were record levels of total UK renewable generation.
- UK nuclear generation decreased by 14 per cent compared to 2022, to the lowest value on the published data series. Nuclear generation increased by 14 per cent in Scotland and decreased by 20 per cent in England where maintenance and refuelling outages took place.
- The low carbon shares (renewables + nuclear) of electricity generation were 89.6 per cent in Scotland, 57.2 per cent in England, 50.9 per cent in Northern Ireland and 34 per cent in Wales. Total UK low carbon generation share stood at its second highest value on the time series at 60.3 per cent.
- Generation patterns were influenced by record imports from Europe. Net imports totalled 23.8 TWh, this was due to favourable price differentials from interconnectors.

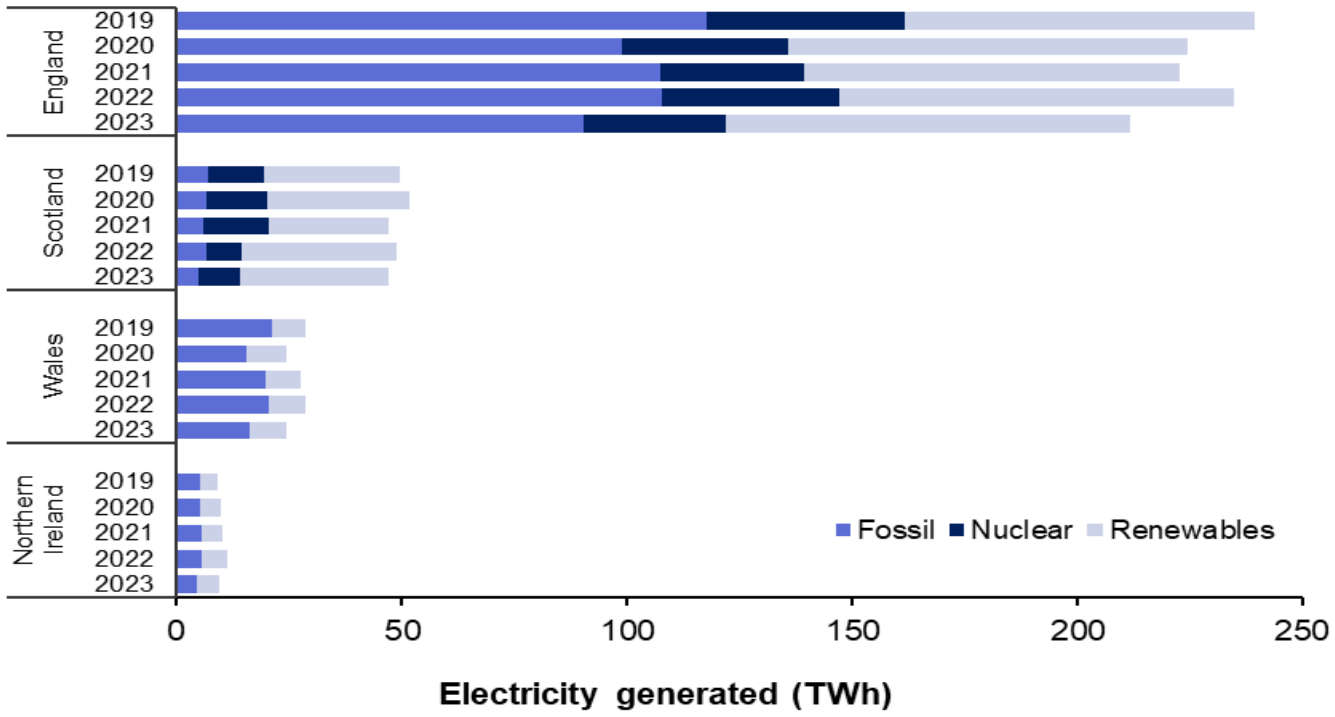
Generation, consumption, and trade

During 2023, the UK generated 293 TWh of electricity. This was a decrease of 9.9 per cent compared to 2022 and was the lowest UK generation figure on the published data series. This was due to lower UK demand, increased electricity imports and lower demand for exports to Europe. Generation has been on a downward trend since 2016, though there was a year-on-year increase in 2022 when nuclear outages in France led to increased UK generation for exports.

From 2022 to 2023, all four UK regions saw a decrease in generation. Scotland decreased by 3.9 per cent while Wales decreased by 19 per cent. Northern Ireland decreased by 15 per cent and England decreased by 10 per cent from 2022's figure. Chart 1 shows total electricity generation by country, between 2019 and 2023, with generation divided by fossil fuel, nuclear and renewable technologies.

The reduction in generation was in line with reduced demand for electricity, shown in the regional tables by reduced consumption of electricity. This fell 1.2 per cent to 269 TWh, another record low figure in the published data series. This was a smaller decrease than the decrease in generation, with increased electricity imports making up the difference.

Chart 1: Total electricity generation by country (all generating companies), 2019 to 2023.



Shares of electricity generated by nation remained similar to the previous year, with England having the largest share of electricity generation at 72.3 per cent, increasing by 0.1 percentage points relative to 2022. Scotland accounted for the second largest share, at 16.1 per cent, increasing by 1.0 percentage points. Wales's share decreased to 8.3 per cent, by 0.9 percentage points. Northern Ireland's share decreased by 0.2 percentage points to 3.3 per cent.

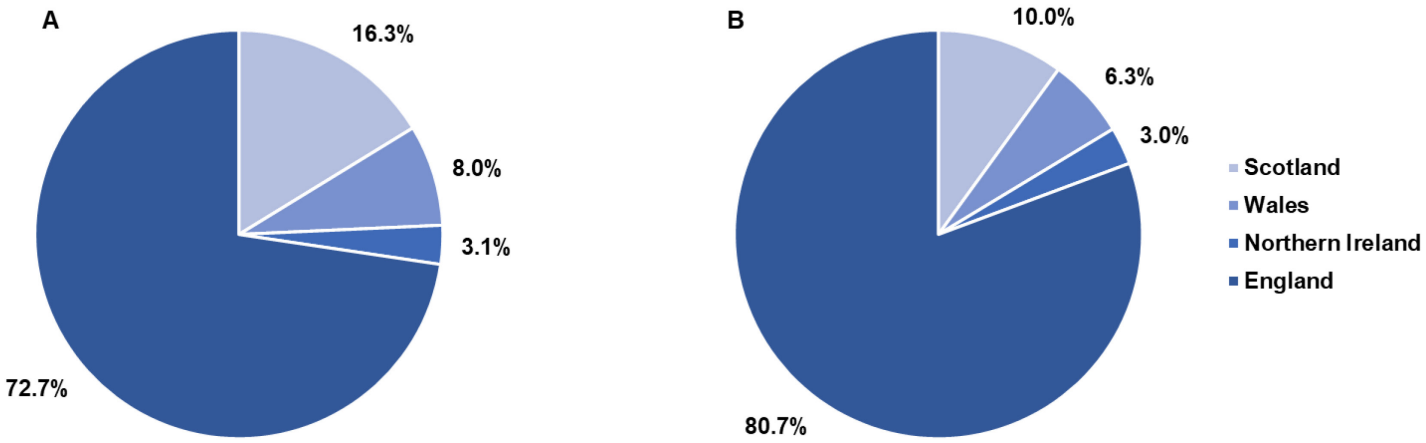
UK fossil fuel generation decreased by 20 per cent from 2022 to 2023, to 107 TWh. This was the lowest figure on the published data series. In line with the low generation, the share of generation from fossil fuel fell to 36.7 per cent, a decrease of 4.5 percentage points. This year-on-year decrease in fossil fuel use reflects lower overall generation numbers due to high net imports. Scotland had the largest year-on-year decrease in fossil fuel generation, down by 36 per cent. Wales saw a decrease of 27 per cent from 2022, down to 14.4 TWh. Coal generation continued in England and Northern Ireland in 2023, but their fossil fuel generation still decreased by similar rates. Fossil fuel generation in England was down 18 per cent and Northern Ireland down 19 per cent, with larger decreases in coal generation in both nations. This resulted in coal's overall share of UK generation being 1.3 per cent, down by 0.5 percentage points from 2022, with the last coal plants closing during 2024.

UK nuclear generation was down by 14 per cent to 40.6 TWh from 2022. This resulted in a 13.9 per cent share of overall UK generation, a decrease of 0.7 percentage points. Scotland and England are the only nations with nuclear generation, as has been no nuclear generation within Wales or Northern Ireland since the closure of Wylfa in Wales in 2015. Although overall nuclear generation fell, Scotland's increased by 14 per cent to 9.1 TWh but England's share fell as a result of outages. There was a 20 per cent decrease in England's nuclear generation from 2022, down to 32 TWh.

UK renewable generation was similar in 2022 and 2023, but with a small increase to a new record figure of 136 TWh in 2023. The renewable share of UK generation also increased to 46.4 per cent, an increase of 4.7 percentage points, with lower generation overall and lower fossil fuel generation. Increased capacity saw higher wind and solar generation despite slightly lower average wind speeds and lower average daily sun hours, while hydro and bioenergy generation both fell.

Shares of annual electricity consumption of the respective UK nations did not vary much from 2022 and have been relatively consistent across the reported data series. The majority of consumption came from England (80.7 per cent), 10.0 per cent from Scotland, 6.3 per cent from Wales and 3.0 per cent from Northern Ireland. This shows that Scotland and Wales supply more than they consume, whereas the reverse is true for England and the shares for Northern Ireland are similar for supply and consumption. Chart 2 shows shares of electricity supply and consumption in the UK by country in 2023.

Chart 2: Shares of electricity supply (A) and consumption (B) in the UK by country in 2023



International exports and transfers

The UK returned to being a net importer of electricity in 2023 after the atypical net exports in 2022. This was primarily due to electricity price differentials between interconnected countries making interconnectors a cheaper source of electricity compared to the more expensive types of UK based generation. The UK transfers electricity to Europe via interconnectors with France, Netherlands, Belgium, the Republic of Ireland, and Norway and a new interconnector with Denmark called Viking Link (commissioned in December 2023). England was the largest importer of electricity from Europe, with 27 TWh of net imports compared to last year where net exports totalled 5.1 TWh. Although the UK as a whole was a net importer from Europe, Wales and Northern Ireland were still net exporters as they host interconnectors with the Republic of Ireland. Wales transferred 1.7 TWh and Northern Ireland transferred 1.6 TWh of electricity to Europe. Scotland transferred 14 TWh of electricity to England as well as 2.0 TWh to Northern Ireland.

Transfers and trade between countries is complex as it will depend on the generation mix at any given time and the price differentials in operation. Transfers and trading patterns are ascribed to the country or nation where the interconnector is located, but this cannot reflect the full complexity of how electricity flows between countries. A flow chart illustrating electricity generation, consumption and trade in the UK nations is provided in Appendix A.

Electricity generation by fuel

In recent years the closure of coal and gas fired power stations and an increase in the capacity of renewable generators has shifted the UK's mix of generation from fossil fuels to renewables. This is the second year in a row that renewable generation had a greater share than fossil fuels across electricity generation for the UK as a whole. The difference between the shares was much larger in 2023 with a difference of 9.7 percentage points this year, compared to only 0.5 percentage points in 2022. Fossil fuel share fell from 43.4 per cent in 2019 to 36.7 per cent in 2023. This contrasts in relation to the renewable share increasing from 36.6 per cent in 2019 to 46.4 per cent in 2023. These decreases can mostly be attributed to the majority of fossil fuel generation coming from gas-fired stations and their overall decrease in generation. UK gas generation fell by 24 per cent from 2019 to 2023, compared to the biggest renewable fuel, wind, which increased by 29 per cent

through the same period. No nations sustained an increase of fossil fuel generation from 2019, indicating a shift to renewable energy sources.

Coal-fired generation's share of UK electricity was only 1.3 per cent in 2023, a record low. This was a steep decline from 2012 when coal accounted for 39.2 per cent of the UK mix and followed a range of policies including the introduction of the Carbon Price Floor (CPF) in April 2013. By the end of 2023, only one coal plant remained in the UK, Ratcliffe-on-Soar, which closed in late 2024. This came as West Burton and Kilroot closed during 2023 along with the closure of the two remaining coal units at Drax. Coal generation was down 33 per cent in England year-on-year as well as being down 54 per cent in Northern Ireland. Scotland and Wales no longer have any coal-fired stations.

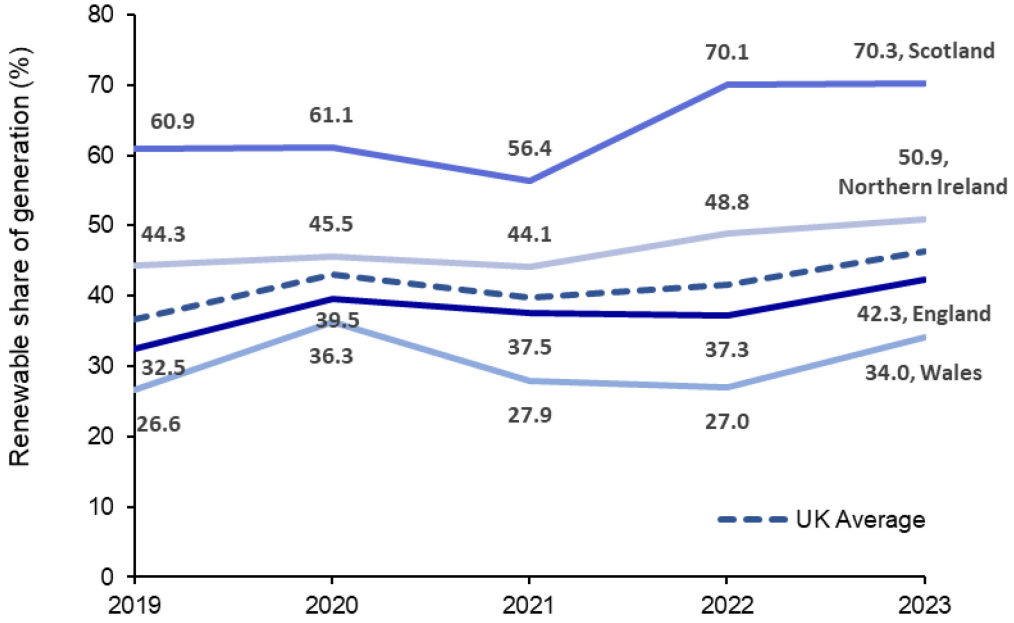
Gas had largely replaced coal in the generation mix since the introduction of the CPF. UK gas generation decreased to 102 TWh in 2023, though remained the fuel with the highest generation figure. This consistent decline can be seen as gas generation has decreased by 24 per cent compared to 2019. England had the highest level of gas generation with 80 TWh in 2023, a decrease of 16 per cent from 2022.

The UK's overall nuclear generation has been on a downward trend since 2019, although increased by a small amount in 2022. Nuclear generation decreased by 14 per cent to 41 TWh in 2023, with ongoing outages as a result of aging infrastructure. There were fewer outages for Scottish plants compared to 2022, which meant their nuclear generation increased by 14 per cent to 9.1 TWh year-on-year. However, England saw a decrease of 20 per cent compared to 2022's figure. Since the closure of Wylfa in 2015 there has been no nuclear generation in Wales.

UK low carbon generation decreased 3.5 per cent compared to 2022, from 183 TWh to 176 TWh. This is due to similar levels of renewable generation while nuclear generation decreased particularly in England. However, lower total UK-based generation meant that the low carbon's share of UK generation increased to 60.3 per cent, up by 4.0 percentage points, mostly due to fossil fuel decline. The share of low carbon generation varied across the 4 nations with Scotland having 89.6 per cent, England with 57.2 per cent, Northern Ireland with 50.9 per cent and Wales with 34.0 per cent. All 4 regions also increased their share of low carbon generation from 2022 but was particularly large for Wales with an increase of 7.1 percentage points.

Renewable generators saw their share of generation increase to 46.4 per cent, up by 4.7 percentage points compared to 2022. This occurred due to the emphasis on renewable fuels for generation compared to fossil fuel use as well as lower overall generation. The share of generation for most renewable technologies was similar in 2022 and 2023 due to minor differences in weather conditions and similar capacity levels. Chart 3 shows the renewable share of total electricity generation in each UK country from 2019 to 2023, in comparison to the UK average.

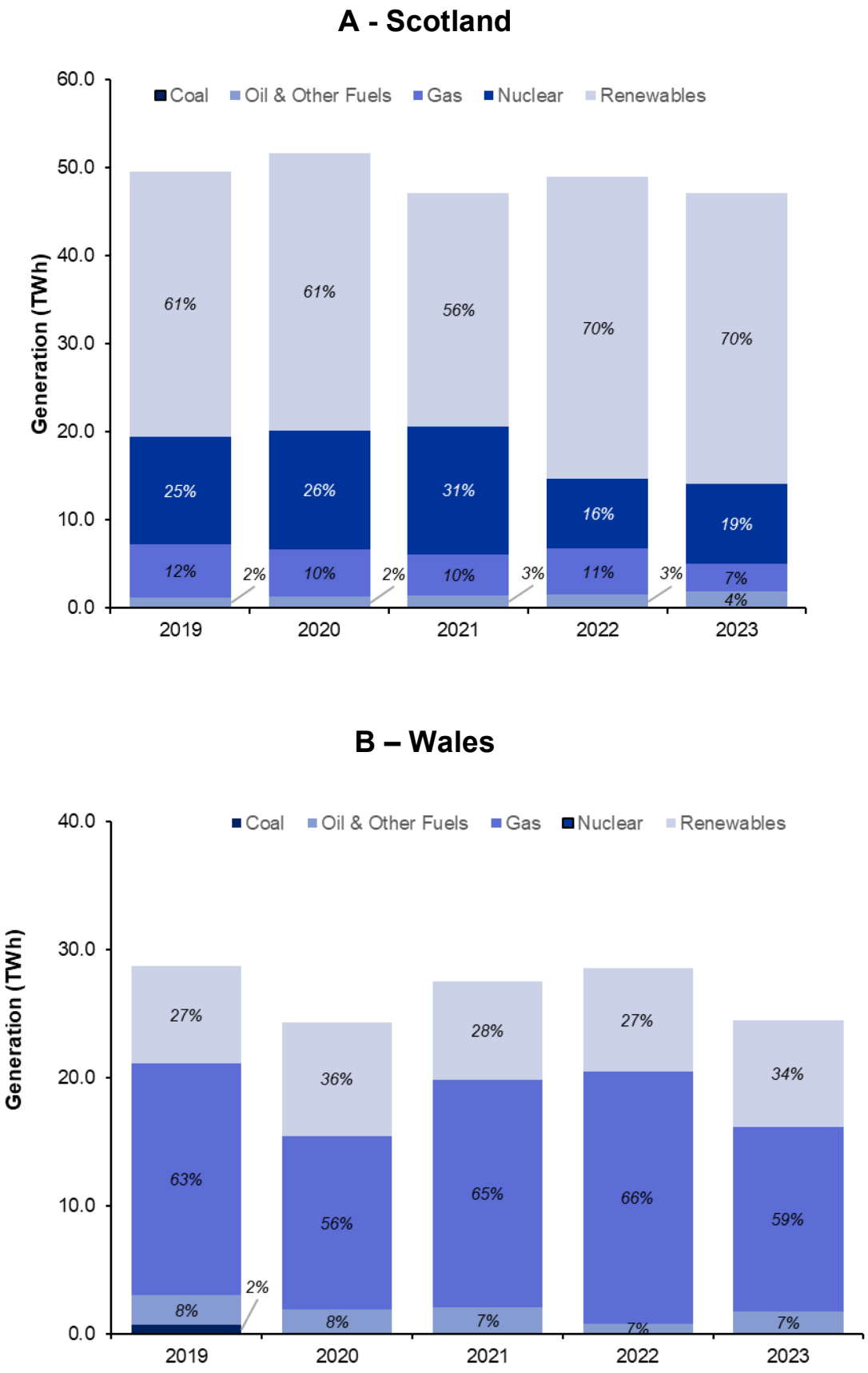
Chart 3: Renewable share of electricity generation by country, 2019 to 2023



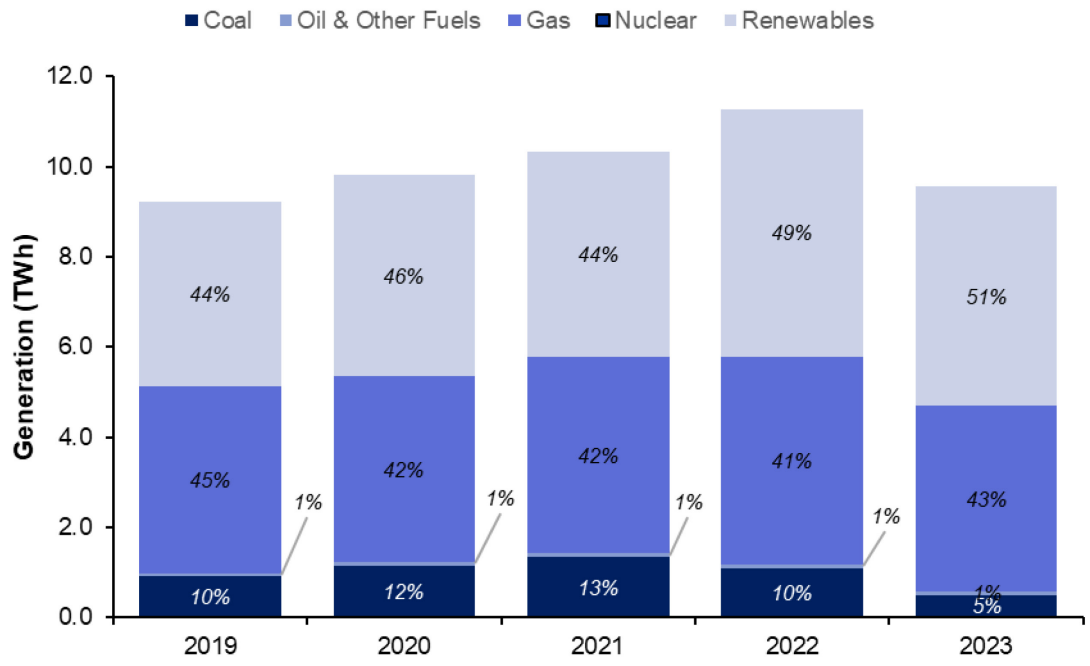
A map illustrating the distribution of Major Power Producers in Scotland, Wales, Northern Ireland and England is provided in Appendix B.

Chart 4 shows electricity generation by fuel (in all generating companies) in each UK country for the period 2018 to 2022. To illustrate the generation mix in each country, shares of electricity generated by fuel are shown as data labels.

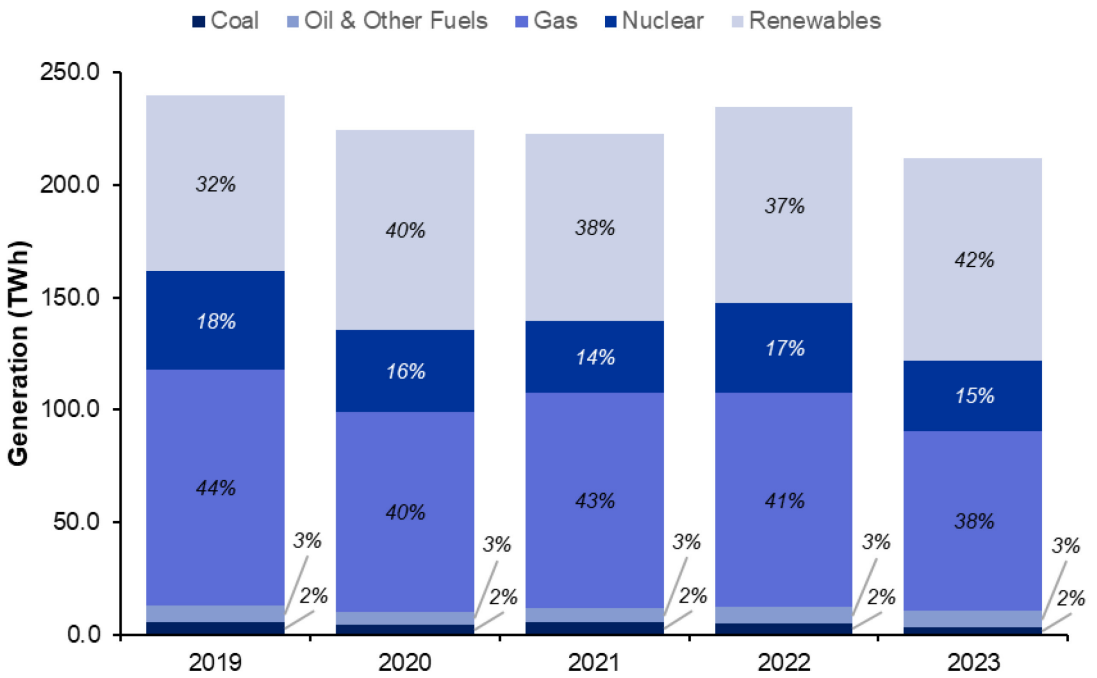
Chart 4: Electricity generation by fuel (with shares of electricity generated) in all generating companies, in Scotland (A), Wales (B), Northern Ireland (C) and England (D), 2019 to 2023.



C – Northern Ireland



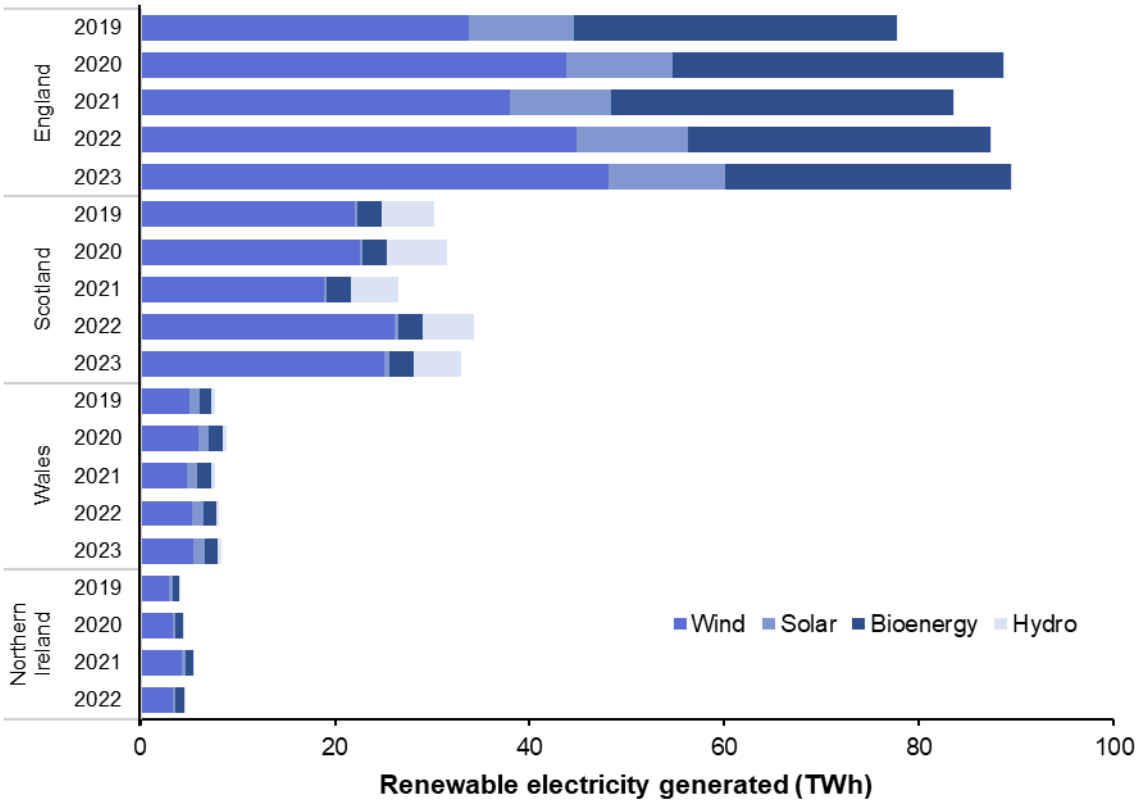
D – England



Low carbon and renewable electricity

Renewable electricity generation and capacity has increased dramatically in recent years, as the UK strives towards a cleaner future, working towards its goal to achieve net zero carbon emissions by 2050. Chart 5 shows electricity generation by renewable technology in each UK nation between 2019 and 2023.

Chart 5: Renewable electricity generation by technology, in each UK nation between 2019 and 2023



Wind had the largest generation of the renewable technologies at 82.3 TWh in 2023, with generation increasing by 2.2 per cent compared to 2022. Wind power accounted for 53.4 per cent of Scotland's generation in 2023, the highest wind share for any nation and more than double the proportion of English and Welsh wind generation (22.7 per cent and 22.5 per cent respectively). Wind generation increased in Wales and England but decreased in Scotland and Northern Ireland.

Bioenergy was the second largest category of renewable generation in 2023, at 11.7 per cent of total generation. Since the conversion of coal units at Lynemouth and Drax to biomass in 2018, most bioenergy generation by major power producers takes place at these two sites, which are both in England. Bioenergy generation decreased 5.9 per cent in 2023 across the UK, with outages at key sites reducing the generation. These trends were similar for England (down 5.3 per cent) and Wales (down 7.3 per cent) with generation remaining consistent in Northern Ireland and Scotland.

Solar generation increased in 2023 by 4.1 per cent, compared to a 9.0 per cent increase in capacity. Average daily sun hours were lower than in 2022, and slightly below the 20-year mean. All nations apart from Northern Ireland saw an increase in solar generation. Scotland increased the most by 14 per cent, Wales by 5.6 per cent and England by 3.9 per cent, compared to a 6.9 per cent decrease in Northern Ireland.

The vast majority of the UK's **hydro** generation assets are in Scotland. There were no changes in capacity but lower average monthly rainfall in some months of 2023 meant hydro generation decreased by 2.2 per cent across the UK as a whole, with a decrease of 4.8 per cent in Scotland.

Further Details

For further detailed renewable statistics on a sub-national and regional basis, please refer to the special feature article published in the September 2024 issue of Energy Trends. For weather data, weighted by location of renewable resources, refer to Energy Trends section 7: weather.

Note that previous versions of this article included reference to renewable generation under the Renewables Obligation (RO). This is no longer included since the RO closed to new generating capacity in March 2017, with a grace period ending in 2018. Since this date, the expansion of renewable capacity renders renewable generation under the RO less significant.

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Revisions

Previous versions of the data in this article remain available online for comparison at:

www.gov.uk/government/collections/energy-trends-articles

References

Digest of UK Energy Statistics 2024 (DUKES) – Electricity (Chapter 5):

https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes

Electricity Statistics: data sources and methodologies

https://www.gov.uk/government/publications/electricity-statistics-data-sources-and-methodologies

Electricity generation and supply article and accompanying data for Scotland, Wales, Northern Ireland and England, 2019 to 2023:

https://www.gov.uk/government/publications/energy-trends-december-2024-special-feature-articles

UK electricity generation and consumption (Energy Trends 5.1 to 5.6):

https://www.gov.uk/government/statistics/electricity-section-5-energy-trends

Renewable electricity generation and capacity (Energy Trends 6.1):

https://www.gov.uk/government/statistics/energy-trends-section-6-renewables

Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2023:

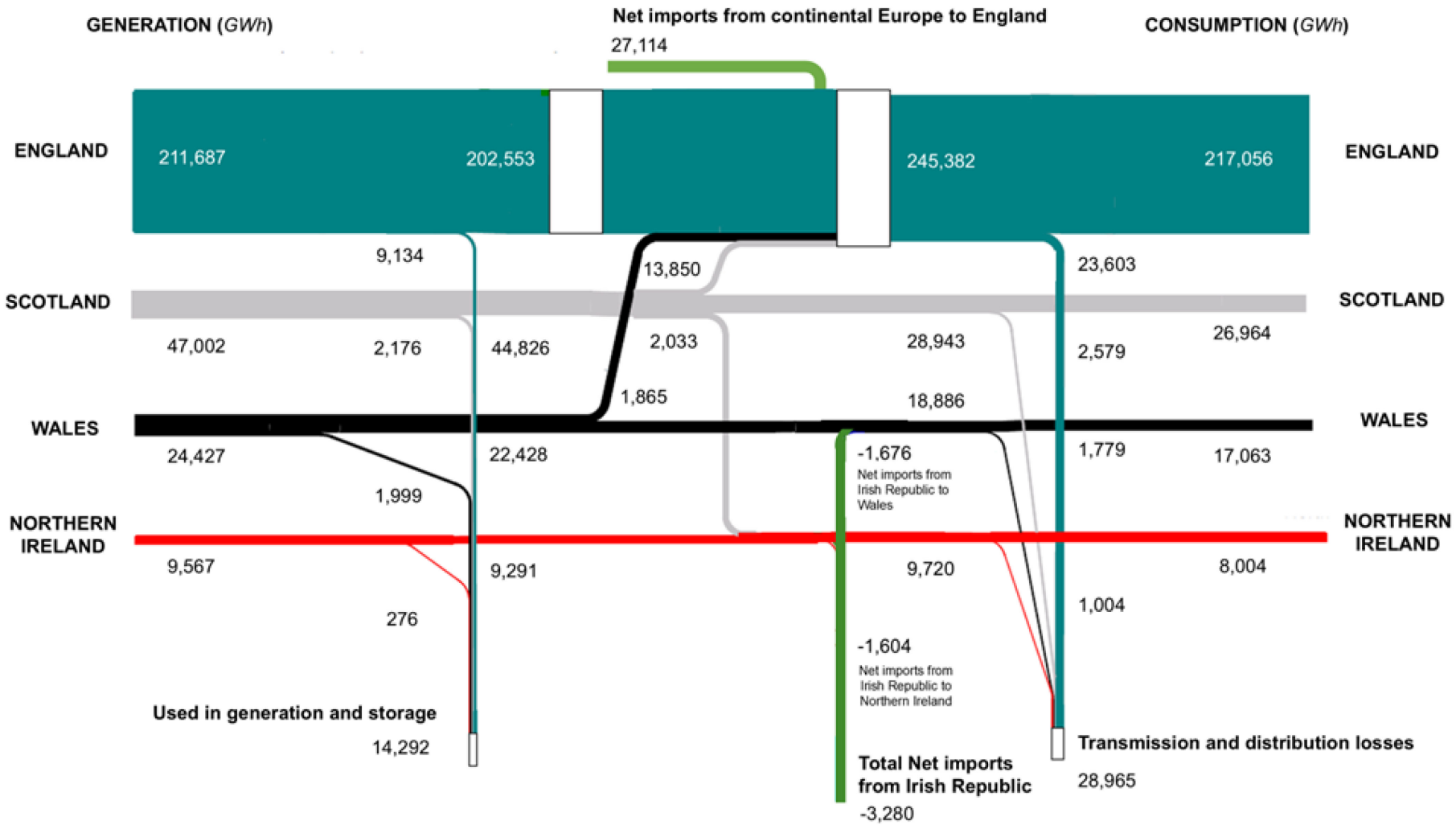
https://www.gov.uk/government/statistics/regional-renewable-statistics

Energy Trends: weather

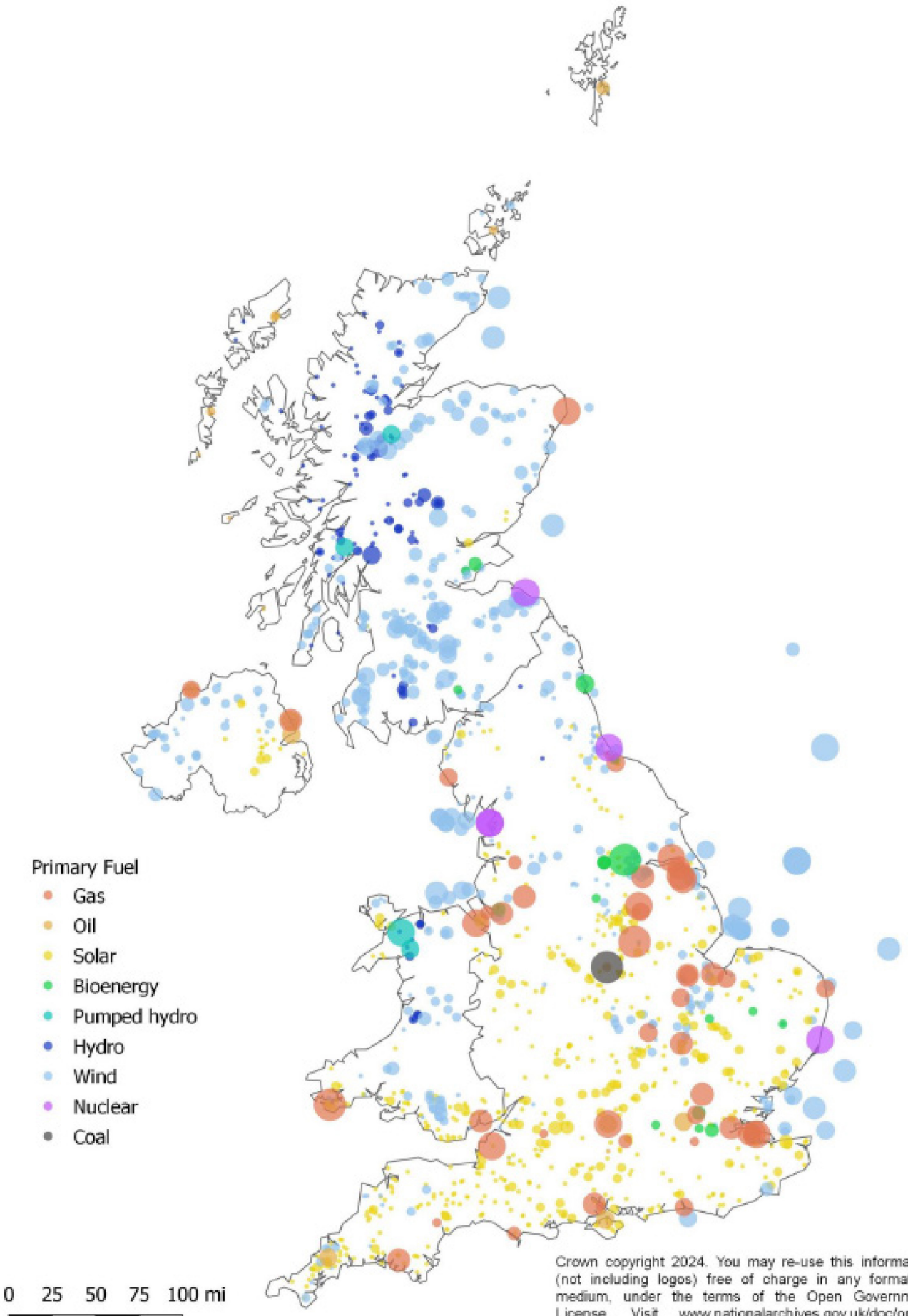
www.gov.uk/government/statistics/energy-trends-section-7-weather

Appendices

Appendix A: Electricity generation and consumption in Scotland, Wales, Northern Ireland and England



Appendix B: Distribution of Major Power Producers (MPPs) in the United Kingdom (as of May 2024)



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