Electricity generation and supply in Scotland, Wales, Northern Ireland, and England, 2018 to 2022

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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 2022. The UK data in this article is taken from chapters 5 and 6 of the Digest of United Kingdom Energy Statistics (DUKES) 2023; the definitions are thus identical to those in DUKES. The main text covers the latest five years of data and the corresponding timeseries (including latest revisions) for 2004 to 2022 can be found in the accompanying excel spreadsheet.

Key headlines

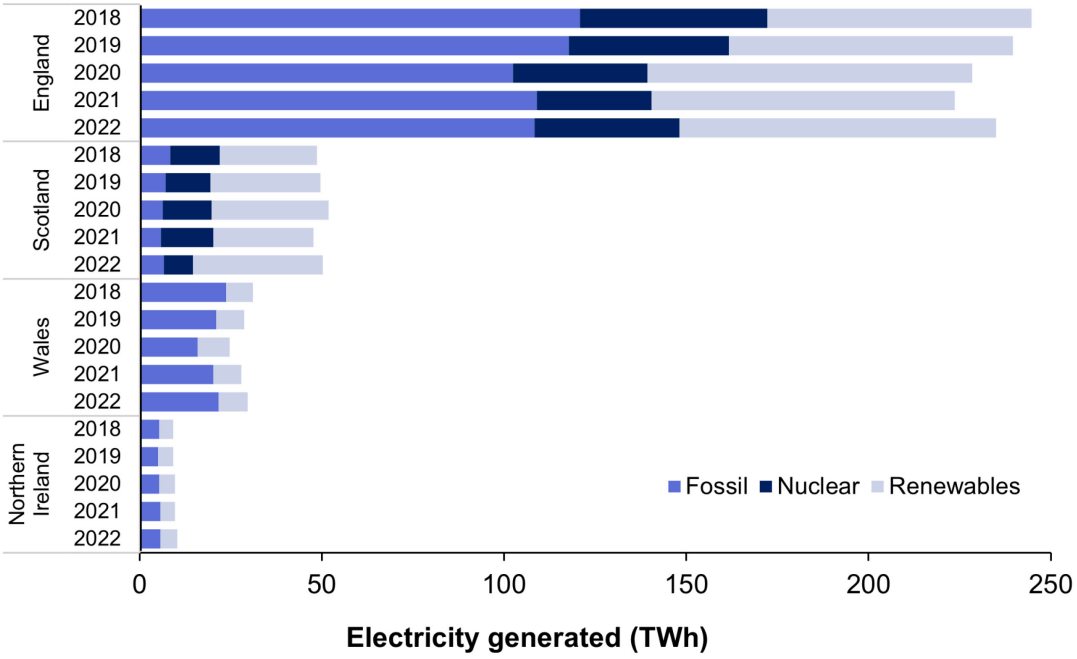
- UK total electricity generation in 2022 was 325 TWh, an increase of 5.3 per cent compared to 2021. This is the highest electricity generation since 2019. Total electricity demand was down 3.8 per cent from 2021 with the difference coming from higher than usual electricity exports.
- UK fossil fuel generation increased 0.9 per cent compared to 2021. Wales and Scotland both saw increases in fossil fuel generation, but their generation remained below 2020 levels. England saw a slight decrease in generation whereas Northern Ireland stayed the same.
- There were record levels of renewable generation with an increase from all four nations in 2022. Scotland has a higher proportion of capacity for these technologies and saw its renewable generation increase by 30 per cent.
- UK nuclear generation increased by 4.0 per cent compared to 2021 but remained at the second lowest level since 1996. Nuclear generation fell by 45 per cent in Scotland due to site closures and outages but rose by 27 per cent in England where fewer outages took place.
- The low carbon share of total UK generation stood at its second highest value on the time series at 56.2 per cent, with a 53.9 per cent share in England, 86.8 per cent in Scotland, 26.8 per cent in Wales, and 44.3 per cent in Northern Ireland.
- The UK exported record amounts of electricity to Europe in 2022, more than it received in imports. Net exports totalled 5.3 TWh, the majority to France to maintain their supply during nuclear outages, this was aided by a new interconnector between England and France.

Generation, consumption, and trade

During 2022 the UK generated 325 TWh of electricity, an increase of 5.3 per cent on 2021 and the highest value since 2018. This is in contrast with a 4.5 per cent reduction in electricity consumption. The different trends between generation and consumption were a result of higher than usual electricity exports, mainly to France as a result of nuclear outages there.

Electricity consumption had been on a downward trend since 2016 though with a small year-on-year increase in 2021 with the lifting of Covid restrictions. The downward trend continued with 279 TWh consumed in 2022, the lowest value on the published data series. From 2021 to 2022, all four nations saw an increase in generation. Scotland increased by 5.3 per cent while England increased 5.1 per cent on 2021; Wales and Northern Ireland saw their generation increase by 6.5 and 6.7 per cent respectively with higher wind generation in all four countries. Scotland, Wales and Northern Ireland also had substantial increases in gas generation, where England saw a 0.5 per cent fall. Despite the rise in generation, 2022 saw UK generation down by 4.3 per cent from its peak in 2016. Chart 1 shows total electricity generation by country, between 2018 and 2022, with generation divided by fossil fuel, nuclear and renewable technologies.

Chart 1: Total electricity generation by country (all generating companies), 2018 to 2022.



Generation shares

Shares of electricity generated by nation remained almost identical to the previous year, with England having the largest share of electricity generation at 72.2 per cent, decreasing by 0.2 percentage points relative to 2021. Scotland accounted for the second largest share, at 15.5 per cent, the same as 2021. Wales and Northern Ireland increased their share by 0.1 percentage points to 9.1 per cent and 3.2 per cent respectively.

Fossil fuels

UK fossil fuel generation increased by 0.9 per cent between 2021 and 2022, though was 11 per cent below 2018 levels and a lower share of generation at 40.8 per cent, a reduction of 1.8 percentage points on 2021. The year-on-year increase in fossil fuel use reflects higher total generation including generation to meet demand for exports. Scotland experienced the largest year-on-year increase in fossil fuel generation, up 9.4 per cent, though from 2018 this was a 26 per cent decline. Wales similarly experienced a year-on-year rise of 8.8 per cent between 2021 and 2022, to 19.4 TWh, the highest fossil fuel generation since 2018. Northern Ireland's fossil fuel generation was the same as last year at 5.7 TWh, though Northern Ireland saw an 18 per cent decrease in coal generation, offset by a rise in gas generation. England is the only other country in the UK with coal generation, which fell 14 per cent compared to 2021. This means that coal generation accounted for just 1.7 per cent of total UK generation in 2022, down from a fifth in 2015, with plans for the remaining coal-fired power stations to be phased out by October 2024.

Nuclear

UK-wide nuclear generation increased by 4.0 per cent in 2021 to 47.7 TWh, though this was half the amount generated from nuclear at its peak in 1999. This represented a 14.7 per cent share of total generation. Much of the decline is the result of the UK's aging nuclear infrastructure requiring more frequent maintenance outages. Nuclear generation fell by 45 per cent in Scotland but rose by 27 per cent in England where fewer outages took place. 2022 also saw the decommissioning of Hunterston B in Scotland leaving only one site in Scotland and three in England. Since the closure of Wylfa in Wales in 2015, there has been no nuclear generation within Wales or Northern Ireland.

Renewables

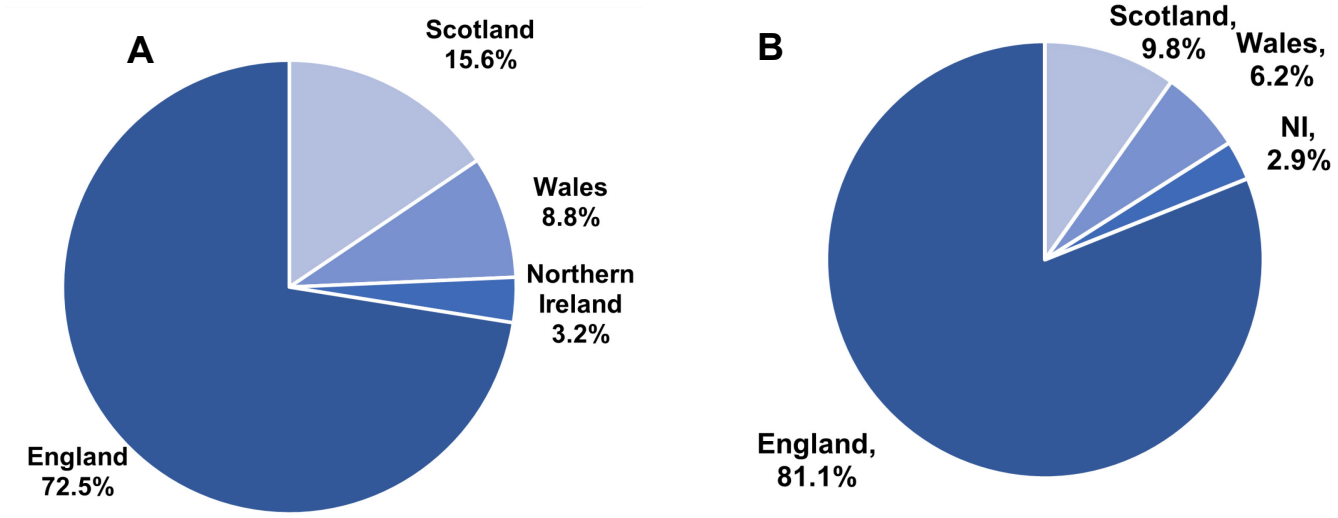
Renewable generation increased by 10 per cent for the UK in 2022, to 135 TWh, the highest value on the published data series. The renewable share of generation was 41.5 per cent, up 2.0 percentage points compared to 2021, and was greater than the share of generation from fossil fuels (40.8 per cent) for the second time. This was driven by increased wind generation, mainly resulting from increased capacity as although average wind speeds were higher than in 2021 they were still below the 10 year average. Weather conditions were also more favourable for hydro with greater rainfall than in 2021 and solar generators with

higher average daily sun hours. Scotland has a larger share of wind and hydro capacity so saw a greater increase in renewable generation as result of the improved weather conditions for these technologies.

Consumption

Shares of annual electricity consumption of the respective UK nations did not vary much from 2021 and have been relatively consistent across the reported data series. The overwhelming majority of consumption came from England (81.1 per cent), 9.8 per cent from Scotland, 6.2 per cent from Wales, and 2.9 per cent from Northern Ireland. This reflected minimal difference from the average across the previous extent of the time series (2004-2021), where average consumption shares were 81.8 per cent, 9.9 per cent, 5.7 per cent, and 2.6 per cent respectively. This also shows Scotland and Wales supply more than they consume whereas the reverse is true for England and Northern Ireland. Chart 2 shows shares of electricity supply and consumption in the UK by country in 2022.

Chart 2: Shares of electricity supply (A) and consumption (B) in the UK by country in 2022.



International exports and transfers

For the first time in more than forty years the UK was a net exporter of electricity, exporting more electricity than it imported. This was primarily due to nuclear outages in France reducing availability of electricity there. The UK transferred electricity to continental Europe via interconnectors with France, Netherlands, Belgium, and Norway and a new 1 GW interconnector with France was added in 2022. England was the largest exporter of electricity to Europe, transferring 5.1 TWh an increase of 120 per cent increase from last year, followed by Northern Ireland which transferred 0.8 TWh. Scotland transferred 19 TWh of electricity to England and Northern Ireland transferred 0.3 TWh to Scotland. 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. For the second time in the reported data series, renewable generation had a greater share than fossil fuels. Fossil fuel share has fallen from 44.9 per cent in 2018 to 40.8 per cent in 2022 whereas the renewable share has risen from 33.0 per cent in 2018 to 41.5 per cent in 2022. Even though the share of renewables was greater in 2020 more electricity was generated by renewables in 2022. Notably in Scotland, fossil fuel generation has decreased by 26 per cent since 2018, though increased 9.4 per cent compared to 2021. England saw its fossil fuel generation decrease 12 per cent since 2018, also driven by greatly reduced coal generation which was down 70 per cent since 2018. Northern Ireland was the only nation to have experienced an increase in fossil fuel generation since 2018, up 6.4 per cent.

Coal
The introduction of the Carbon Price Floor (CPF) in April 2013 resulted in the swift decline of coal generation, which accounted for 39.2 per cent of the UK generation mix in 2012, but was only 1.7 per cent in 2022, matching the record low in 2020. At the end of 2022, four coal plants remained in the UK, with Drax, West Burton and Kilroot closing in 2023. There was a decrease in coal generation in both England and Northern Ireland in 2022, down by 14 per cent and 18 per cent respectively.

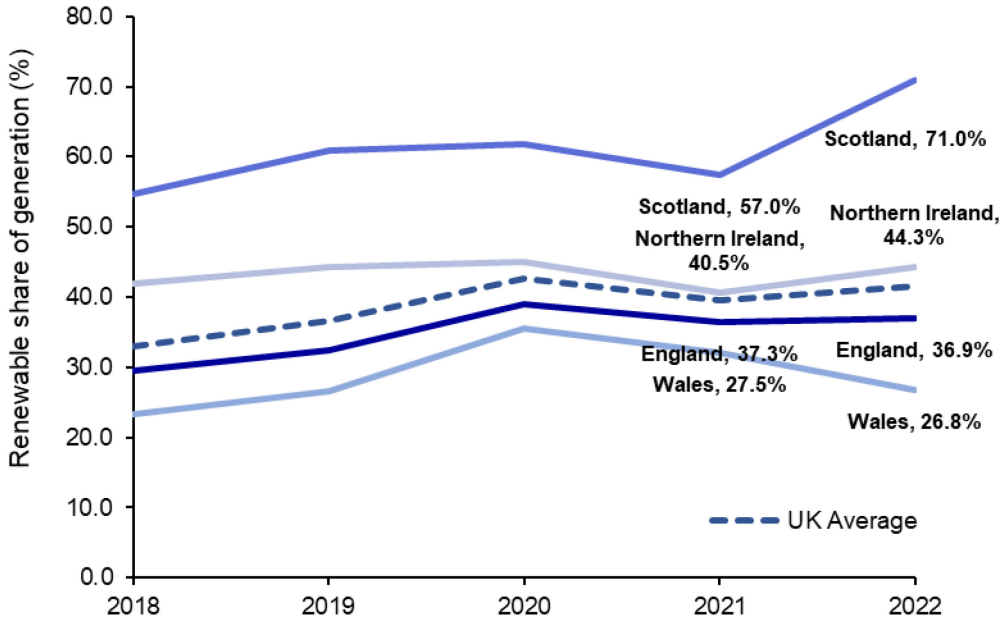
Gas
Gas largely replaced coal in the generation mix since the introduction of the CPF. UK gas generation increased 1.5 per cent to 125 TWh in 2022, remaining as the fuel with the highest generation. Despite this increase, gas generation was down 5.0 per cent since 2018. England had the highest level of gas generation with 95.8 TWh generated in 2022, this is a decrease of 4.6 per cent compared to 2021. The remaining UK nations all saw an increase in gas generation, in particular Scotland had an increase of 9.9 per cent. Despite the year-on-year increases, all nations apart from Northern Ireland have decreased gas generation since 2018, where 2018 had an unusually low value.

Nuclear
The UK's overall nuclear generation increased for the first time in five years, increasing by 4.0 per cent to 47.7 TWh. Despite the increase in generation, 2022 saw the closure of both Hinkley Point B in England and Hunterston B in Scotland. These site closures and outages at the remaining sites saw Scotland's nuclear generation decreased by 45 per cent whereas England saw an increase of 27 per cent. Even with the increase in overall generation all the UK's nuclear plants were on outage at times during the year, and both England and Scotland have decreased in generation since 2018, 23 per cent and 42 per cent respectively. Since the closure of Wylfa in 2015 there has been no nuclear generation in Wales.

Low carbon
There was an increase of 8.7 per cent in low carbon generation compared to 2021. This is due to greater nuclear and renewable generation, particularly the increased wind generation. Despite the low nuclear generation in Scotland, low carbon generation increased by 4.1 per cent in 2022. England, Northern Ireland and Wales all saw an increase in low carbon generation in part due to the more favourable weather conditions. They increased by 10 per cent, 16 per cent and 4.7 per cent respectively. These increases were also associated with an increase in the share of generation from low carbon sources, which was 56.2 per cent for the UK but with a wide variation across the 4 nations at 86.8 per cent of generation in Scotland, 44.3 per cent in Northern Ireland and 26.8 per cent in Wales. The share of generation from low carbon sources increased for the UK as a whole and in England and Northern Ireland but decreased in Scotland and Wales. The increase in share was particularly large for Northern Ireland, up by 3.7 percentage points.

Renewables
Renewable generators saw their share of generation increase to 41.5 per cent (up 2.0 percentage points on 2021) as capacity increased and weather conditions were more favourable for wind, solar and hydro generation. Installed capacity for renewables increased by 7.7 per cent, increasing wind capacity and allowing for increased generation. There was also increased rainfall in 2022 compared to 2021 resulting in a 4.5 per cent increase in hydro generation. Chart 3 shows the renewable share of total electricity generation in each UK country from 2018 to 2022, in comparison to the UK average.

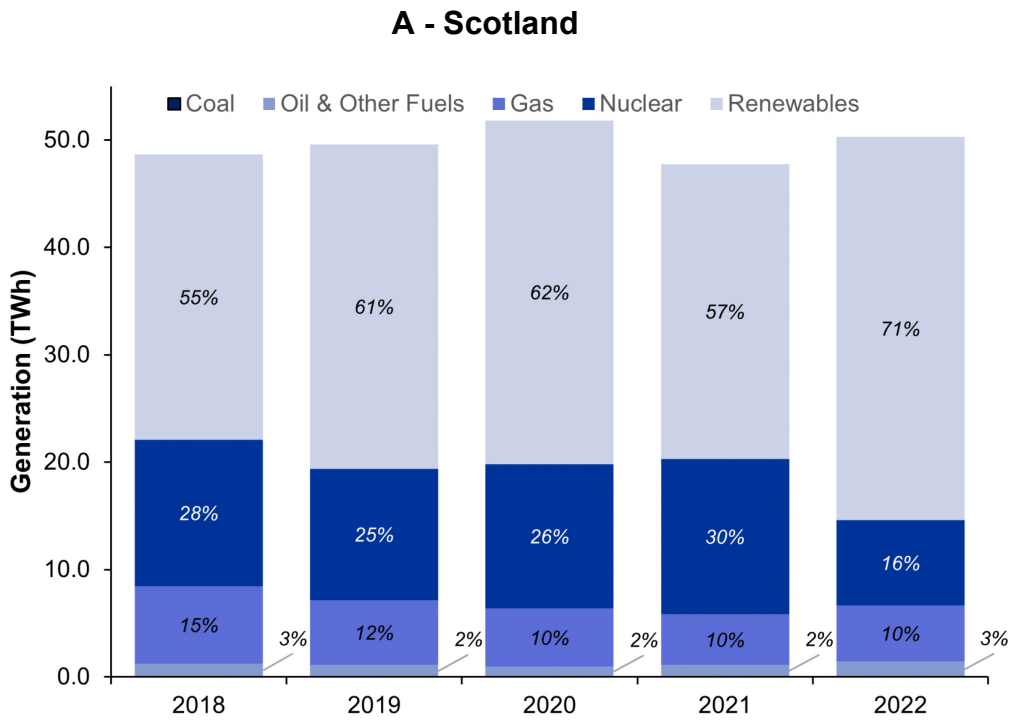
Chart 3: Renewable share of electricity generation by country, 2018 to 2022.



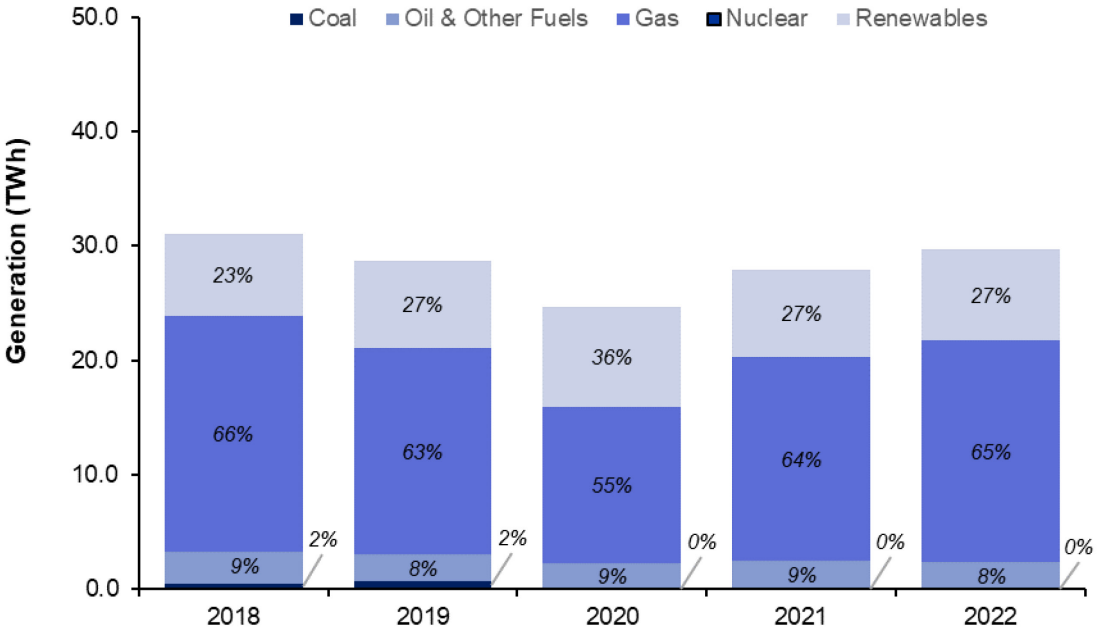
A map illustrating the distribution of Major Power Producers in Scotland, Wales, Northern Ireland and England is provided in Appendix B.

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.

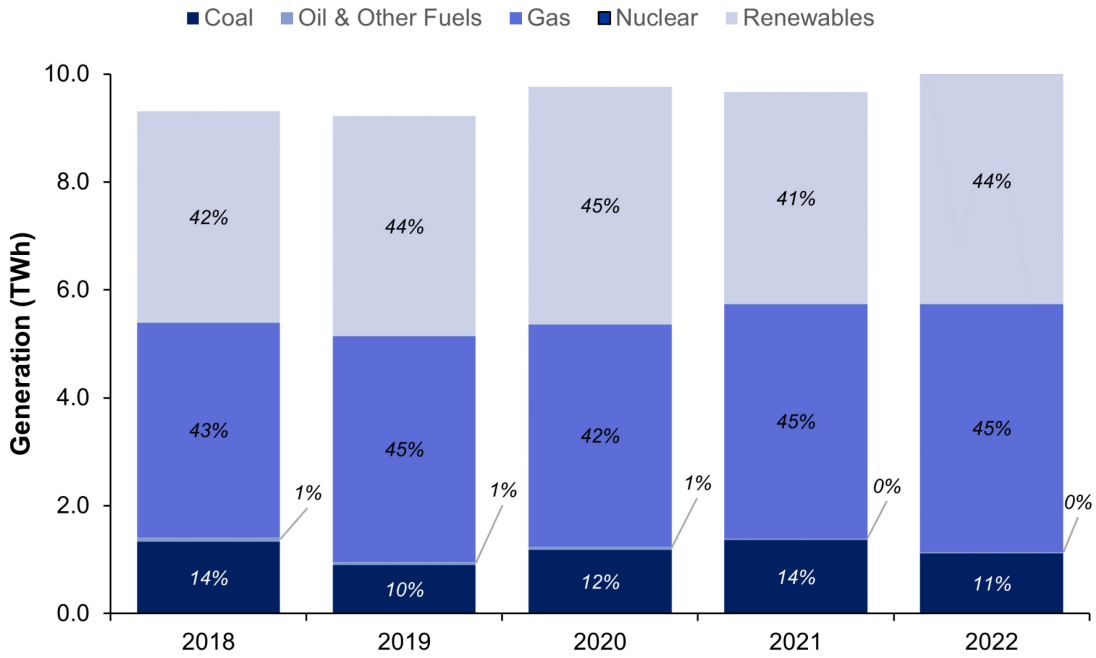
Chart 4: Electricity generation by fuel (with shares of electricity generated) in all generating companies, in Scotland (A), Wales (B), Northern Ireland (C) and England (D), 2018 to 2022.



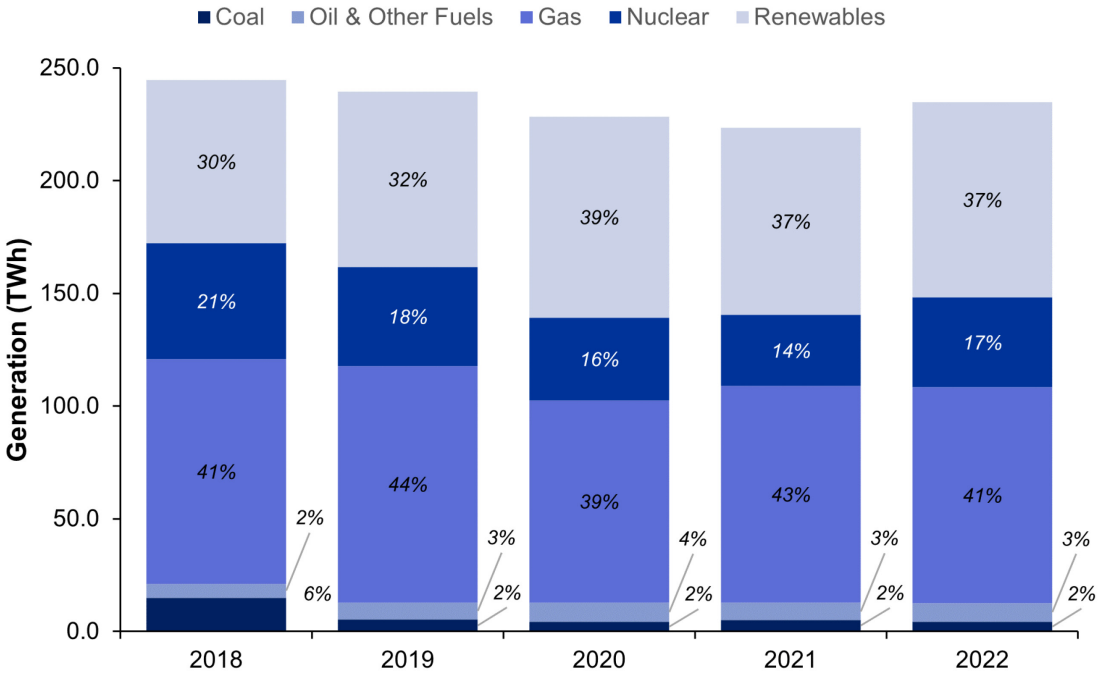
B - Wales



C – Northern Ireland



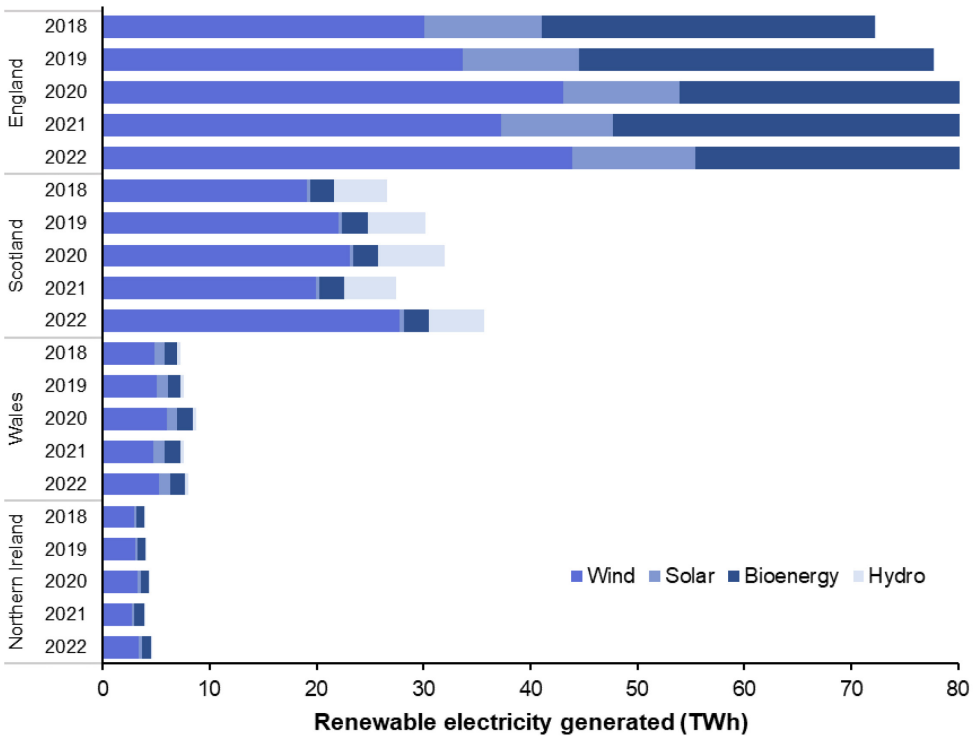
D – England



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. In 2019, the UK became the first global economy to enshrine this commitment in law. Chart 5 shows electricity generation by renewable technology in each UK nation between 2018 and 2022.

Chart 5: Renewable electricity generation by technology, in each UK nation between 2018 and 2022.



Wind
Wind has the largest generation of the renewable technologies at 80.3 TWh in 2022, with UK wind generation increased 41 per cent from 2018 to 2022. Wind power accounted for 55.2 per cent of Scotland's generation in 2022, the greatest proportion of any nation and more than double the proportion of English and Welsh wind generation (18.7 per cent and 17.6 per cent respectively). Wind generation increased in all four nations in 2022 against 2021, this is due to higher average wind speeds and increased capacity than in 2021. Total wind capacity increased 12 per cent to 28.8 GW in 2022, notably including the completion of Moray East Offshore Windfarm in Scotland and Hornsea 2, located off the coast of Yorkshire, the largest offshore wind project in the world which totalled 1.3 GW of capacity. The UK is committed to increase its installed capacity for offshore wind generation to 40 GW by 2030, increasing overall wind capacity to over 50 GW, in line with the commitment to achieve net zero carbon emissions by 2050.

Bioenergy
Bioenergy was the second largest category of renewable generation in 2022, at 11.0 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 capacity was similar in 2021 and 2022, rising only 0.1 per cent to 8.2 GW. Bioenergy generation decreased in all four countries compared to 2021 but increased compared to 2018 with the largest increase in Northern Ireland (up 31 per cent), Wales (up 19 per cent), followed by Scotland (up 9.5 per cent) and England (up 0.3 per cent).

Solar
Solar generation increased in 2022 with increased capacity and more favourable weather conditions. Average daily sun hours were up 21 per cent against 2021, and up 13 per cent against the 20-year mean. Overall, this meant that UK solar generation increased 10.0 per cent in 2022, in part due to a 5.3 per cent capacity increase. All nations saw an increase in solar generation. Scotland had by far the greatest increase in generation (up 19 per cent) with England following with an increase of 10 per cent. Wales and Northern Ireland increased by 4.7 per cent and 4.8 per cent respectively.

Hydro
The vast majority of the UK's hydro generation assets are in Scotland. There were no changes in capacity but higher average monthly rainfall in 2022 (up 12 per cent) meant hydro generation increased 6.2 per cent in Scotland. In turn, UK hydro generation increased by 4.5 per cent as a whole in 2022.

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 2022 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 2022 (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, 2017 to 2021:

https://www.gov.uk/government/publications/energy-trends-december-2022-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 2022:

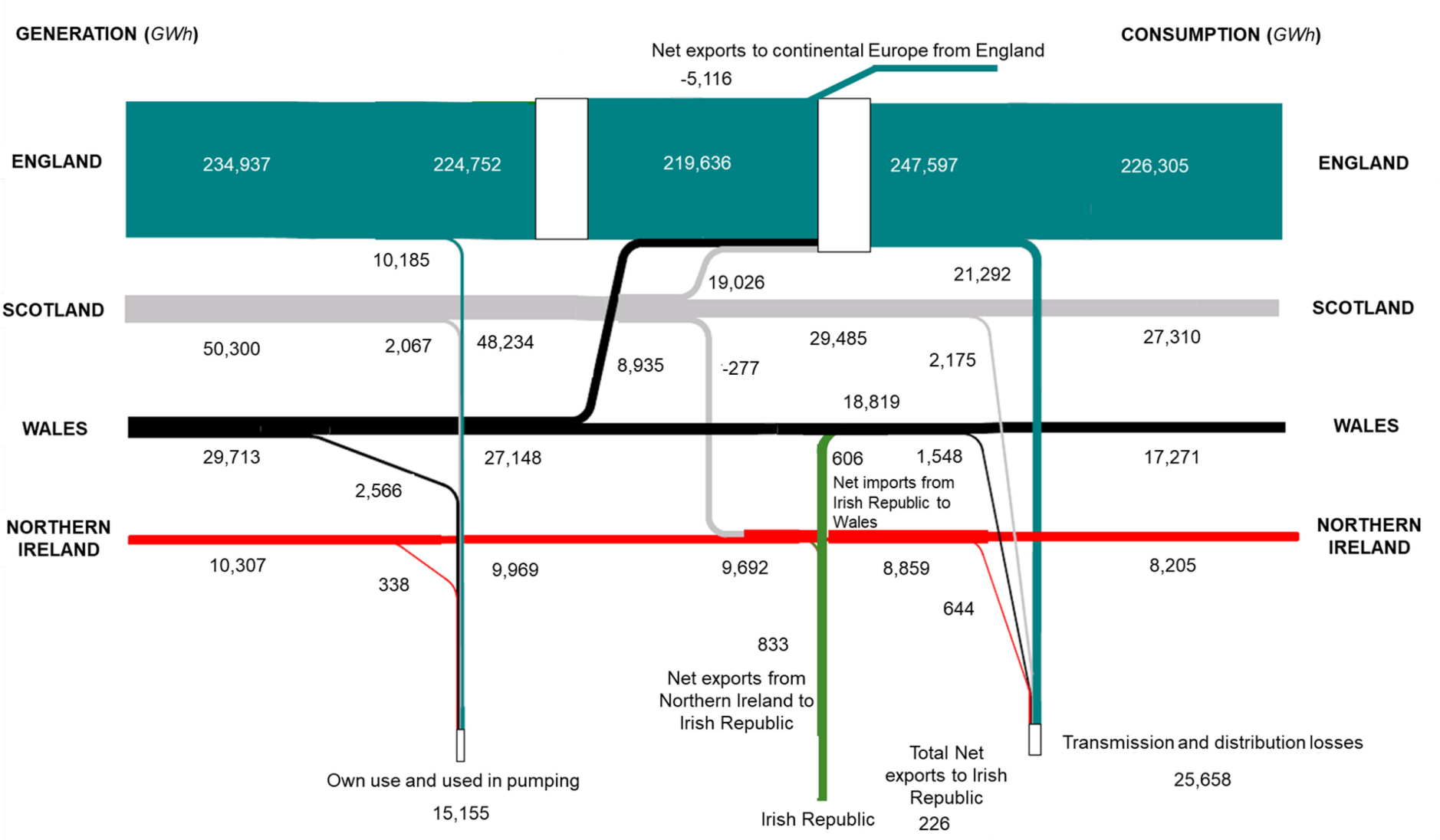
https://www.gov.uk/government/publications/energy-trends-september-2023-special-feature-articles

Energy Trends: weather

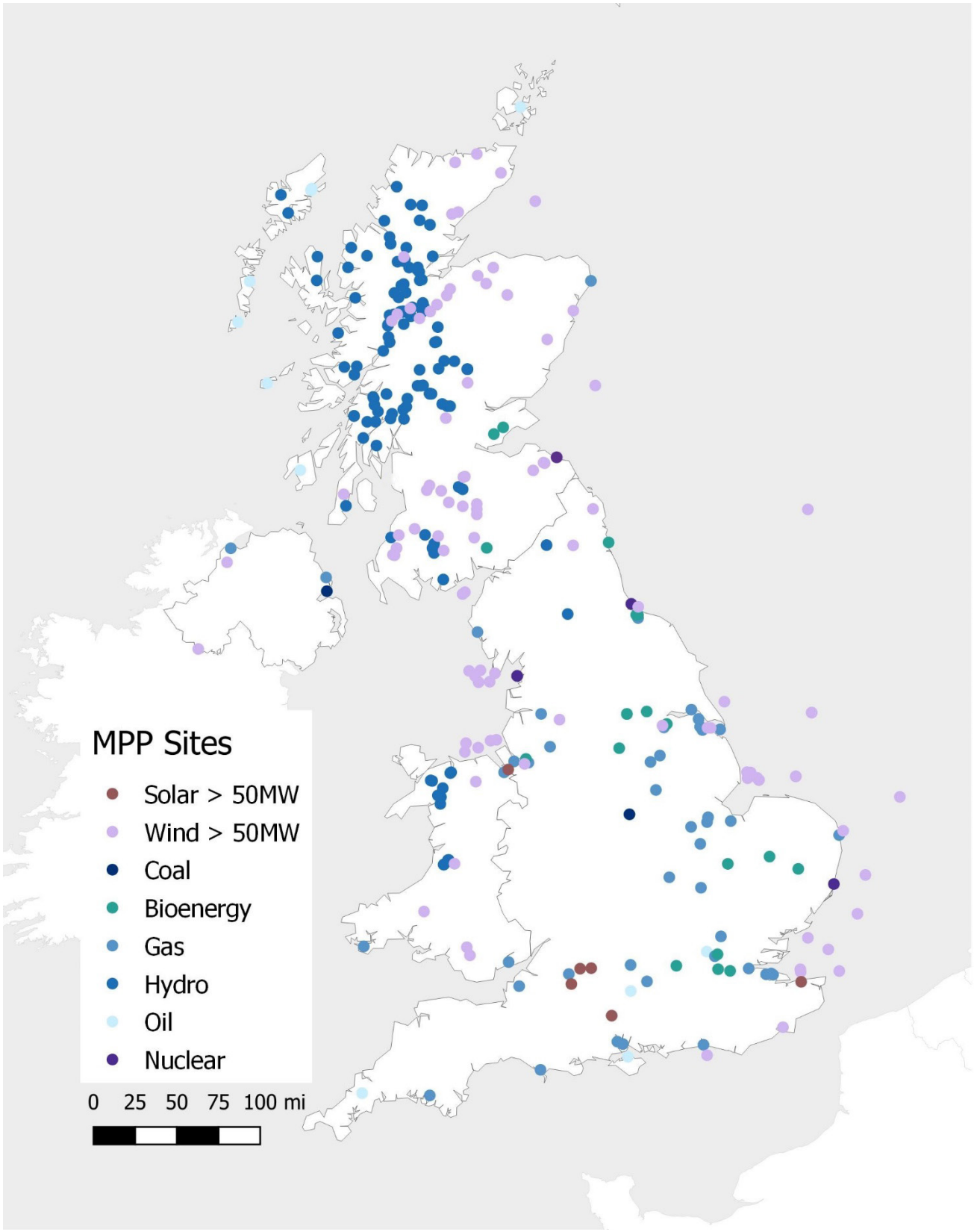
www.gov.uk/government/statistics/energy-trends-section-7-weather

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 2023)



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