

Electricity generation and supply in Scotland, Wales, Northern Ireland and England, 2016 to 2020

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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 2020. The UK data in this article are taken from chapters 5 and 6 of the [Digest of United Kingdom Energy Statistics \(DUKES\) 2021](#) and the definitions match those in DUKES. The text covers the latest five years of data and the corresponding timeseries (including latest revisions) for 2004 to 2020 can be found in the accompanying Excel spreadsheet.

Key headlines

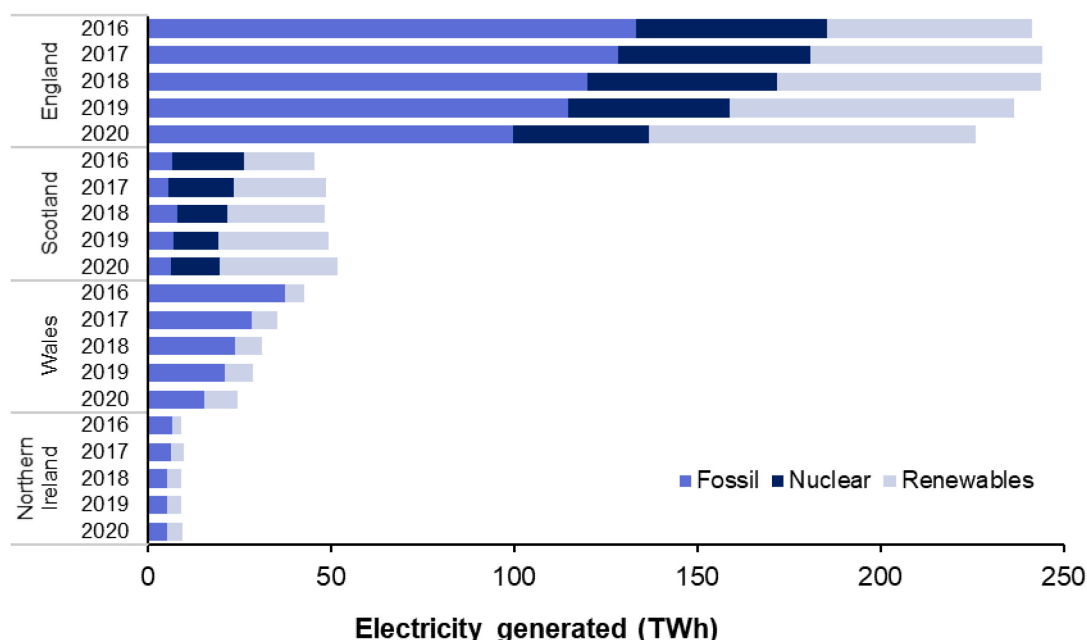
- UK total electricity generation in 2020 was 312 TWh, the lowest value on the published time series and a decrease of 3.6 per cent compared to 2019. Though electricity generation has been declining year on year since 2015, the larger reduction in 2020 reflected lower demand as a result of the response to the Covid-19 pandemic.
- Shares of generation and demand by country remained similar to 2019, with England having the largest share. England's share of demand is larger than its generation share so it continues to transfer electricity from Scotland and Wales as well as import electricity from continental Europe.
- UK fossil fuel generation fell by 16 per cent between 2019 and 2020. Wales had the largest fall in fossil fuel generation, down by 27 per cent, with England having a 15 per cent reduction. This showed the effect of plant closures, including Aberthaw B in Wales, and Fiddler's Ferry in England.
- Renewable generation rose to record levels in all four nations of the UK. This was driven by favourable weather conditions across the year, with UK wide renewable generation increasing by 13 per cent to 135 TWh. This was 43.1 per cent of the total UK generation.
- UK-wide nuclear generation fell by 11 per cent between 2019 and 2020 with the aging nuclear plants needing more frequent maintenance outages. This accounted for 16.1 per cent of the UK's total electricity. Nuclear generation fell by 16.0 per cent in England but rose by 9.2 per cent in Scotland where fewer outages took place.
- The high renewable generation meant that 2020 saw low carbon shares of generation rise to their highest values on the time series for all UK nations, rising to 55.9 per cent in England, 87.6 per cent in Scotland, 36.1 per cent in Wales and 45.6 per cent in Northern Ireland.

Generation, consumption, and trade

During 2020 the UK generated 312 TWh of electricity, a decrease of 3.6 per cent on 2019 and the lowest value on the published timeseries. This came at a time when demand fell by 4.6 per cent, as a result of the response to the Covid-19 pandemic. The sharp fall in generation in 2020 followed a period from 2014 to 2017 wherein generation remained broadly stable at around 338 TWh, before dropping by 1.6 per cent (to 333 TWh) in 2018 and then falling by a further 2.7 per cent (to 324 TWh) in 2019. In contrast to the UK trend, Scotland and Northern Ireland both saw year on year increases in total generation between 2019 and 2020, driven by

increased renewable generation. Chart 1 shows total electricity generation by UK country, between 2016 and 2020, with generation divided by fossil fuel, nuclear and renewable technologies.

Chart 1: Total electricity generation by country (all generating companies), 2016 to 2020.



Shares of electricity generated by nation remained broadly stable compared to the previous year, with England accounting for the largest share of electricity generation at 72.4 per cent, falling by 0.5 percentage points relative to 2019. Scotland held a 16.6 per cent share of generation, up 1.3 percentage points on the previous year, while the Welsh generation share fell by 1.0 percentage points to 7.8 per cent of the total. Northern Ireland remained the nation with the lowest generation share (3.1 per cent), which is approximately level compared to 2019. The increase to Scotland's generation share came during a record-breaking year for renewables due to favourable weather conditions. Scotland benefitted more than the other UK nations due to its greater share of generation from renewables (61.8 per cent) compared to the rest of the UK (39.4 per cent).

UK fossil fuel generation fell by 16 per cent between 2019 and 2020. Wales had the largest fall in fossil fuel generation, down by 27 per cent, followed by England with a 15 per cent reduction. The sharp falls in Welsh and English fossil fuel generation came at a time of several power plant closures, with the closure of Aberthaw B in Wales, and Fiddler's Ferry in England. The closure of Aberthaw B marked the end of over 125 years of coal-fired electricity generation in Wales and contributed to Wales's reduced generation share during 2020. As part of the UK's net zero targets, the remaining coal-fired power stations are due to close by October 2024.

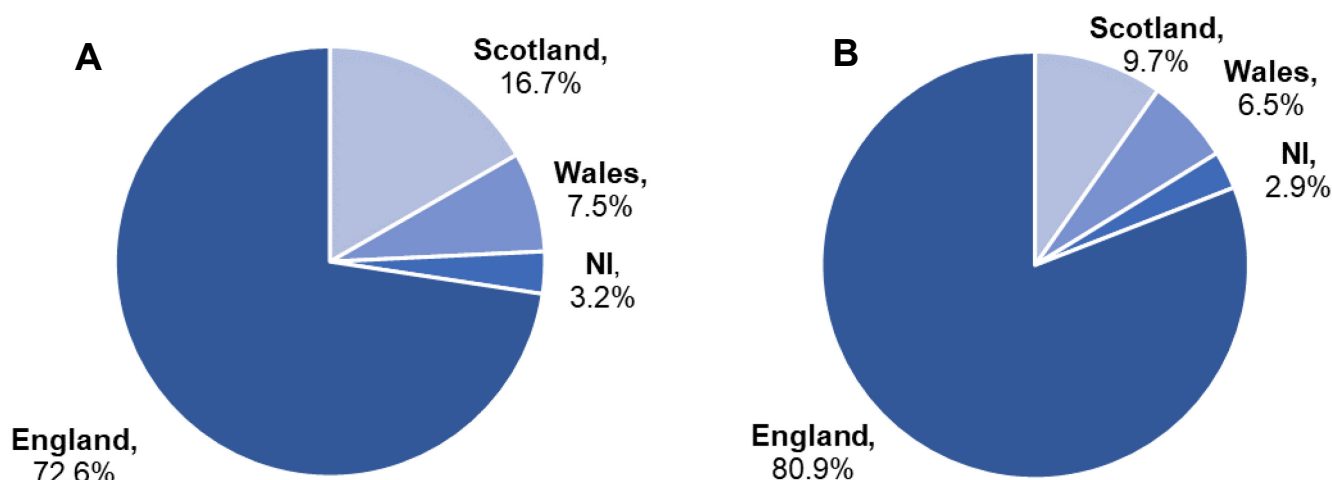
As the UK's nuclear power plants continued to age, UK-wide nuclear generation fell by 11 per cent between 2019 and 2020. This accounted for 16.1 per cent of the UK's total electricity generation, down 1.2 percentage points on the previous year. Since the closure of Wylfa in Wales during 2015, there has been no nuclear generation within Wales or Northern Ireland.

While fossil fuel and nuclear generation fell during 2020, renewable generation rose to record levels in all four nations of the UK. This was driven by favourable weather conditions across the year, with UK wide renewable generation increasing by 12.6 per cent to 135 TWh. This was 43.1 per cent of the total UK generation, a rise of 6.2 percentage points on a year ago. Notably, Scotland almost met its target of 100 per cent renewable electricity generation as a proportion of gross electricity consumption (defined as generation plus transfers into Scotland less transfers out of Scotland). In 2020, Scotland reached a record 98.6 per cent of the renewable target, up 8.8 percentage points on 2019 and up 22.6 percentage points compared to 2018.

Despite the pandemic, shares of annual electricity consumption of the respective UK nations did not significantly differ from 2019, with the majority of demand coming from England (80.9 per cent), 9.7 per cent from Scotland, 6.5 per cent from Wales and 2.9 per cent from Northern Ireland. This was similar to the 2016-

19 period where average consumption shares were 81.2 per cent, 9.9 per cent, 6.2 per cent and 2.7 per cent respectively. Chart 2 shows shares of electricity supply and demand in the UK by country in 2020.

Chart 2: Shares of electricity supply (A) and demand (B) in the UK by country in 2020.



To offset the difference between England's electricity generation and demand, net positive transfers from Scotland and Wales, as well as net imports from continental Europe (via the France, Netherlands and Belgium interconnectors) were required. During 2020, these sources provided 17.1 per cent of England's total electricity consumption, down 0.3 percentage points on 2019. In 2020, Scotland exported a record 37.3 per cent of its generation in net transfers to England and Northern Ireland. This was driven by Scotland's increased renewable generation (due to favourable weather conditions), and a 4.5 per cent fall in Scottish electricity demand between 2019 and 2020, which resulted in Scotland having more electricity available to export to both England and Northern Ireland. Meanwhile, Wales exported 11.8 per cent of its total generation to England in 2020, the lowest proportion on the time series. Total generation in Wales has fallen 43.0 per cent since 2016, predominantly driven by the reduction of coal and gas-fired generation in the period. 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 generation mix from fossil fuels towards renewables. As the fossil fuel share of generation fell from 51.9 per cent in 2016 to 37.9 per cent in 2020, the renewable share rose from 24.5 per cent in 2016 to a record 43.1 per cent in 2020. Notably in Wales, fossil fuel generation has decreased by 60 per cent since 2016, with Welsh coal generation ceasing during 2020 following the closure of Aberthaw B. Both England and Northern Ireland saw similar, but less dramatic falls in fossil fuel generation, dropping by 28 and 23 per cent respectively since 2016. While Scotland's fossil fuel generation has remained consistent since 2016, a 65 per cent uplift in renewable generation led to Scotland having the lowest fossil fuel generation share of the UK nations.

The introduction of the Carbon Price Floor (CPF) in April 2013 contributed to the swift decline of coal generation, which accounted for 39.2 per cent of the UK generation mix in 2012, compared to a record-low share of just 1.8 per cent in 2020. Unfavourable economics, as well as the impact of the Large Combustion Plant Directive drove the closure of almost all the UK's coal plants. 2020 saw the closure of both Aberthaw B in Wales and Fiddler's Ferry in England, with the remainder of the UK's coal plants planning to close by October 2024, as the UK works towards net zero emissions by 2050. The closure of Aberthaw B has ended over 125 years of coal generation in Wales, joining Scotland as the only two UK nations with no coal generation. In Northern Ireland, coal generation rose by 16 per cent compared to 2019, the only UK nation to have an increase in coal generation.

Gas largely replaced coal in the generation mix in 2016, since then its share of generation has fluctuated around the 40 per cent mark. Overall, the share of UK gas generation dropped to 35.7 per cent in 2020, down

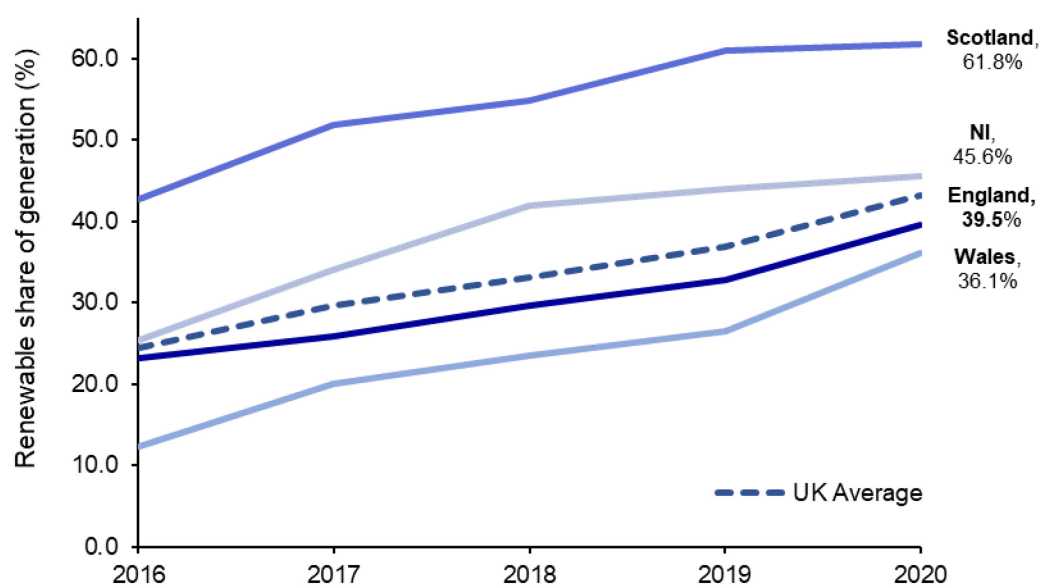
5.0 percentage points on 2019, the lowest value since 2015. The fall in gas generation share was linked to the high generation share from renewables, which rose by 6.2 percentage points to 43.1 per cent of the total generation. Wales remains the UK nation with the highest proportion of gas generation, with gas generation accounting for 55.7 per cent of the total, though down 7.2 percentage points on 2019 and the lowest value since 2015. England, Scotland and Northern Ireland also saw substantial falls in the share of generation from gas.

The UK's overall nuclear generation fell for the fourth consecutive year, decreasing by 11 per cent on 2019, with the aging nuclear plants leading to more frequent maintenance outages. Additionally, Sizewell B operated at half capacity from May to September at the request of National Grid because of the lower demand for electricity. Between 2019 and 2020, nuclear generation fell by 16.0 per cent in England but rose by 9.2 per cent in Scotland. The rise in Scotland reflects that there were fewer maintenance outages in 2020 than 2019, when both plants were on outage for much of the year. Since the closure of Wylfa in 2015, there has been no nuclear generation in Wales.

High renewable generation meant that 2020 saw shares of low carbon generation (nuclear plus renewables) rise to their highest values on the time series for all UK nations, rising to 55.9 per cent in England, 87.6 per cent in Scotland, 36.1 per cent in Wales and 45.6 per cent in Northern Ireland. The low carbon generation shares for both Wales and Northern Ireland are lower than those of England and Scotland due to a combination of these nations having no nuclear generation capacity, alongside lower proportions of renewable capacity.

Renewable generators saw record levels of generation in 2020, accounting for 43.1 per cent of the UK's total (up 6.2 percentage point on 2019) as the UK saw favourable weather conditions for renewables, alongside increases (albeit smaller than previous years) in both wind and bioenergy capacity. In Scotland, 61.8 per cent of electricity was generated by renewable fuels in 2020, accounting for just under a quarter of the UK's renewable electricity. While Scotland remains the UK leader for renewable generation, all four nations saw record shares, with renewable electricity accounting for 39.5 per cent, 36.1 per cent and 45.6 per cent of generation for England, Wales and Northern Ireland respectively. Chart 3 shows the renewable share of total electricity generation in each UK country from 2016 to 2020, compared to the UK average.

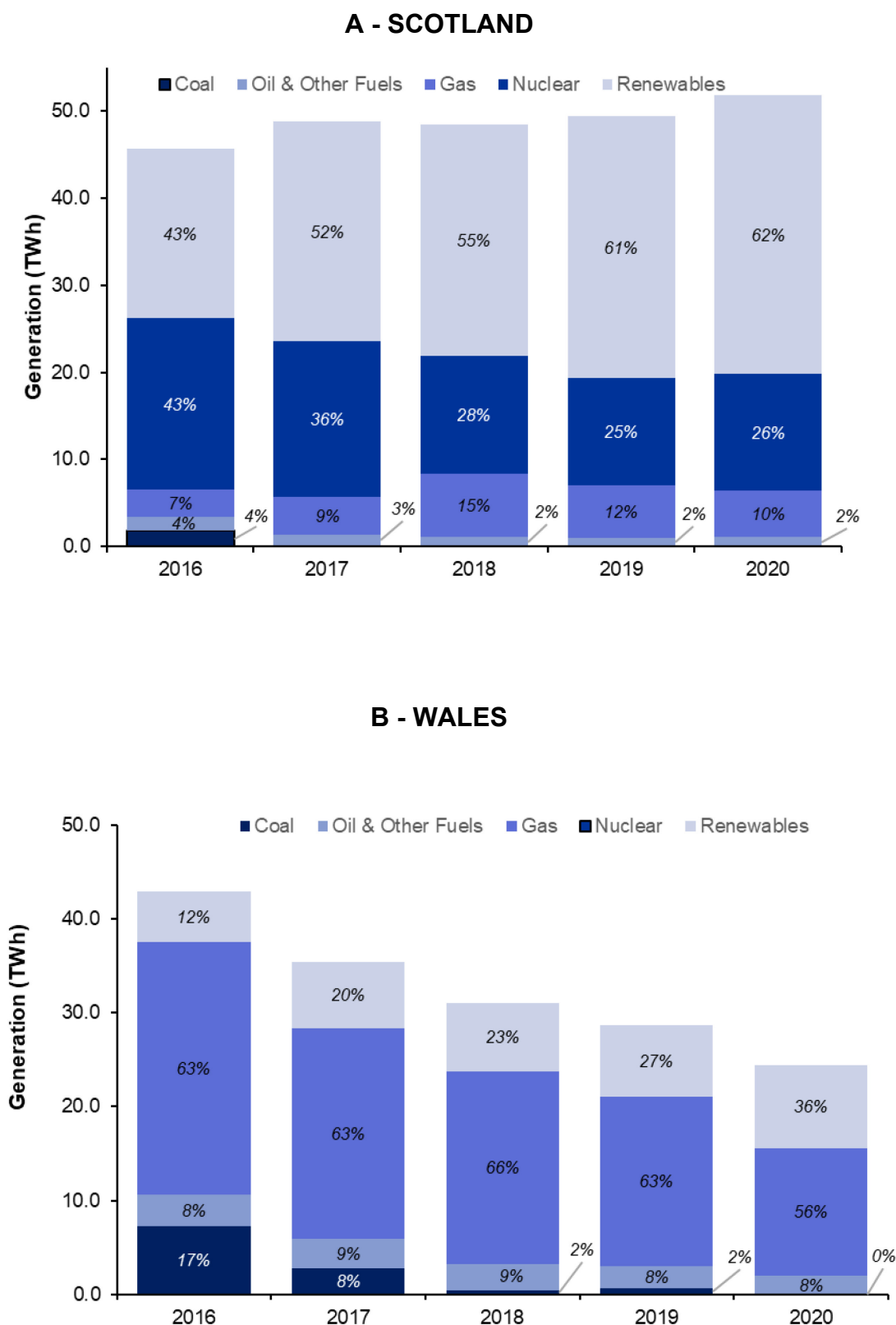
Chart 3: Renewable share of electricity generation by country, 2016 to 2020.



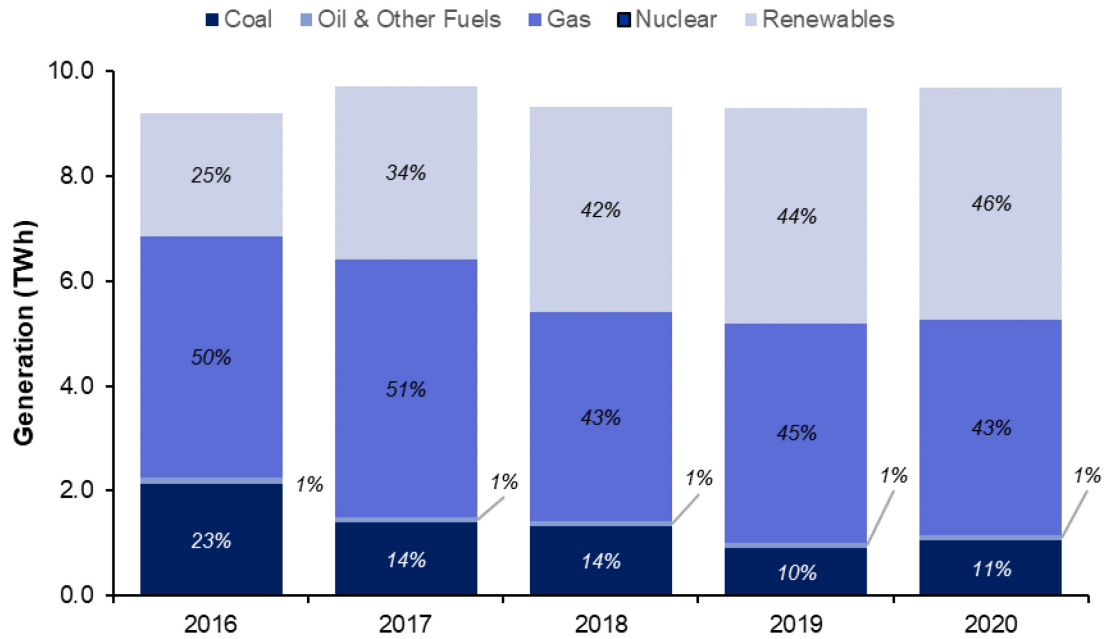
A map illustrating the distribution of Major Power Producers in Scotland, Wales, Northern Ireland and England is provided in Appendix B.

Chart 4 shows electricity generation by fuel (in all generating companies) in each UK country for the period 2016 to 2020. To illustrate the generation mix in each country, shares of electricity generated by fuel are shown as data labels.

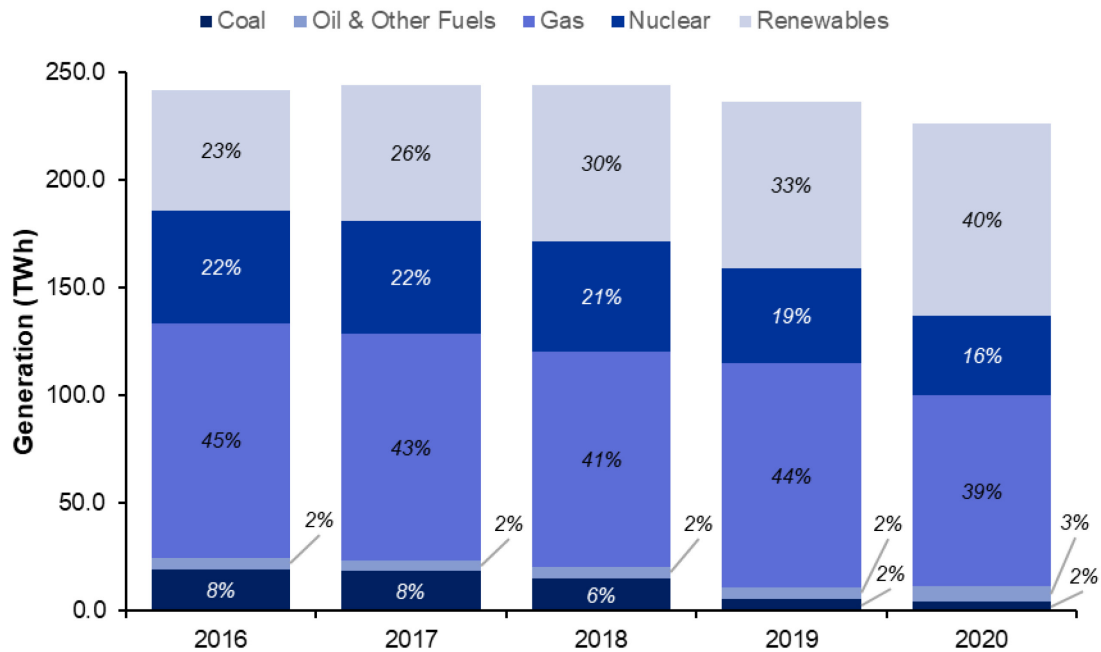
Chart 4: Electricity generation by fuel (with shares of electricity generated) in all generating companies, in Scotland (A), Wales (B), Northern Ireland (C) and England (D), 2016 to 2020.



C – Northern Ireland



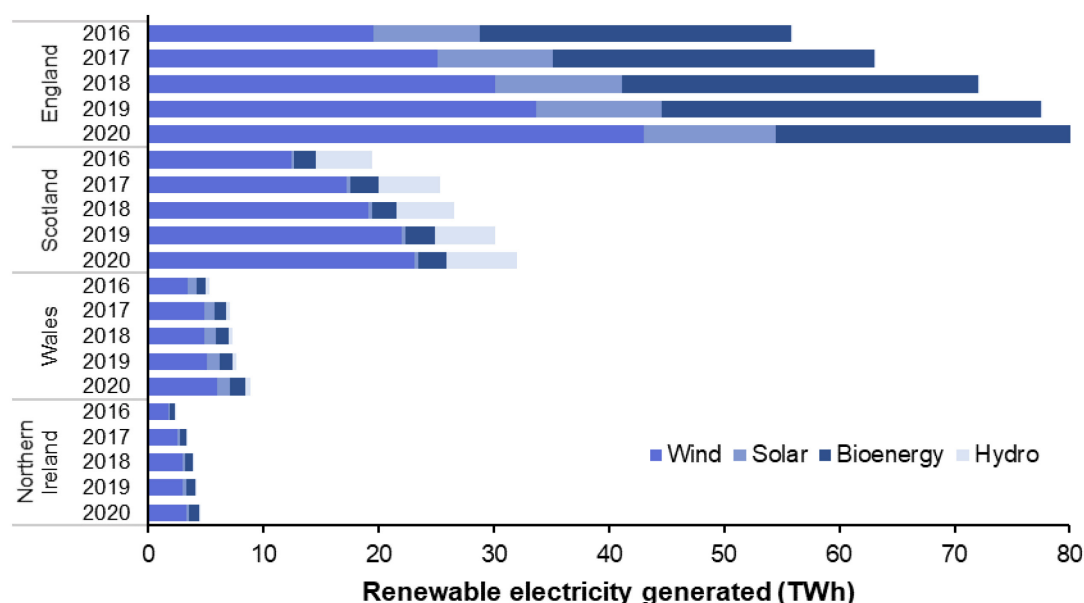
D – England



Low carbon and renewable electricity

Renewable electricity generation and capacity has increased dramatically in recent years as the UK works 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 2016 and 2020.

Chart 5: Renewable electricity generation by technology, in each UK nation between 2016 and 2020.



Since 2016, there has been an upsurge in renewable generation, increasing by 62 per cent between 2016 and 2020. This trend was continued between 2019 and 2020, with a 13 per cent increase in renewable generation. In previous years, the increase in renewable generation was attributed to increasing renewable capacity, but for 2020 it was primarily driven by favourable weather conditions. Compared to 2019, the UK's renewable capacity (derated for intermittency) increased by just 1.8 per cent. In comparison, between 2018/19, renewable generation increased by 8.7 per cent, with a corresponding increase in derated capacity of 6.5 per cent.

Wind generation has been particularly prominent, with UK wind generation more than doubling between 2016 and 2020. Wind power accounted for close to half of Scotland's total generation in 2020, more than double the average for the rest of the UK (20.1 per cent). Wind generation increased in all four countries, with a 28 per cent increase in England and substantial increases for Wales (18 per cent) and Northern Ireland (8.8 per cent), while Scotland had a smaller increase of 4.8 per cent. Notably, 2020 saw the opening of the East Anglia ONE offshore wind farm with a capacity of 714 MW. The UK plans 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 had a 12.6 per cent generation share in 2020 with most bioenergy generation (88.2 per cent) occurring in England. Since the conversion of coal units at Lynemouth and Drax to biomass in 2018, the majority of biomass generation by major producers now takes place at these two sites, which are both in England. Biomass capacity continued to grow in 2020, and now represents over a tenth of UK generation capacity. Increases in bioenergy capacity fuelled a 23 per cent rise in Welsh bioenergy generation alongside with a 5.2 per cent rise for England and an 8.2 per cent increase in Northern Ireland.

Solar generation increased by 4.6 per cent between 2019 and 2020. The largest increase was seen in England (up 5.2 per cent), followed by smaller increases for Wales (up 1.3 per cent) and Scotland (up 0.3 per cent). These increases were driven by a 1.8 per cent increase in UK-wide derated solar capacity compared to 2019, alongside a marginal increase in UK-wide sun hours. Northern Ireland was the only UK nation that saw a decrease in solar generation, with a marginal 0.3 per cent fall. This was likely due to lower average sun hours as solar capacity in Northern Ireland remained level in this period.

The vast majority of the UK's hydro generation assets are in Scotland, where generation increased 16.2 per cent on the previous year, 15.5 per cent for the UK as a whole. This was in line with a 24.6 per cent increase in UK rainfall, weighted by location of UK hydro resource, as de-rated hydro capacity remained broadly level.

For further detailed renewable statistics on a sub-national and regional basis, please refer to the [special feature article](#) published in the September 2021 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.

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Revisions

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

<https://www.gov.uk/government/collections/energy-trends-articles>

References

Digest of UK Energy Statistics 2021 (DUKES) – Electricity (Chapter 5):

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

Electricity generation and supply article and accompanying data for Scotland, Wales, Northern Ireland and England, 2015 to 2019:

<https://www.gov.uk/government/publications/energy-trends-december-2020-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 2020:

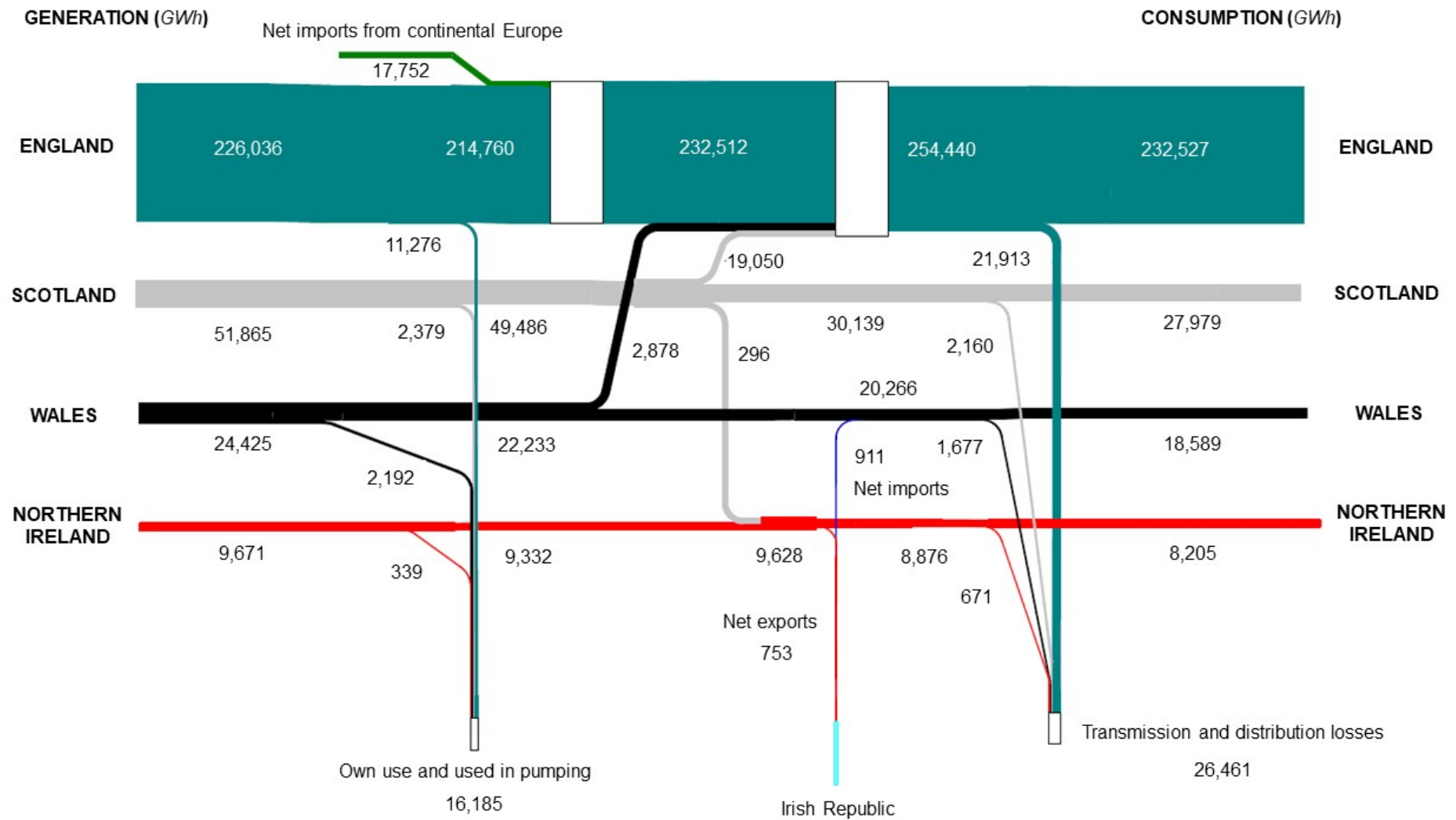
<https://www.gov.uk/government/publications/energy-trends-december-2020-special-feature-articles>

Energy Trends: weather

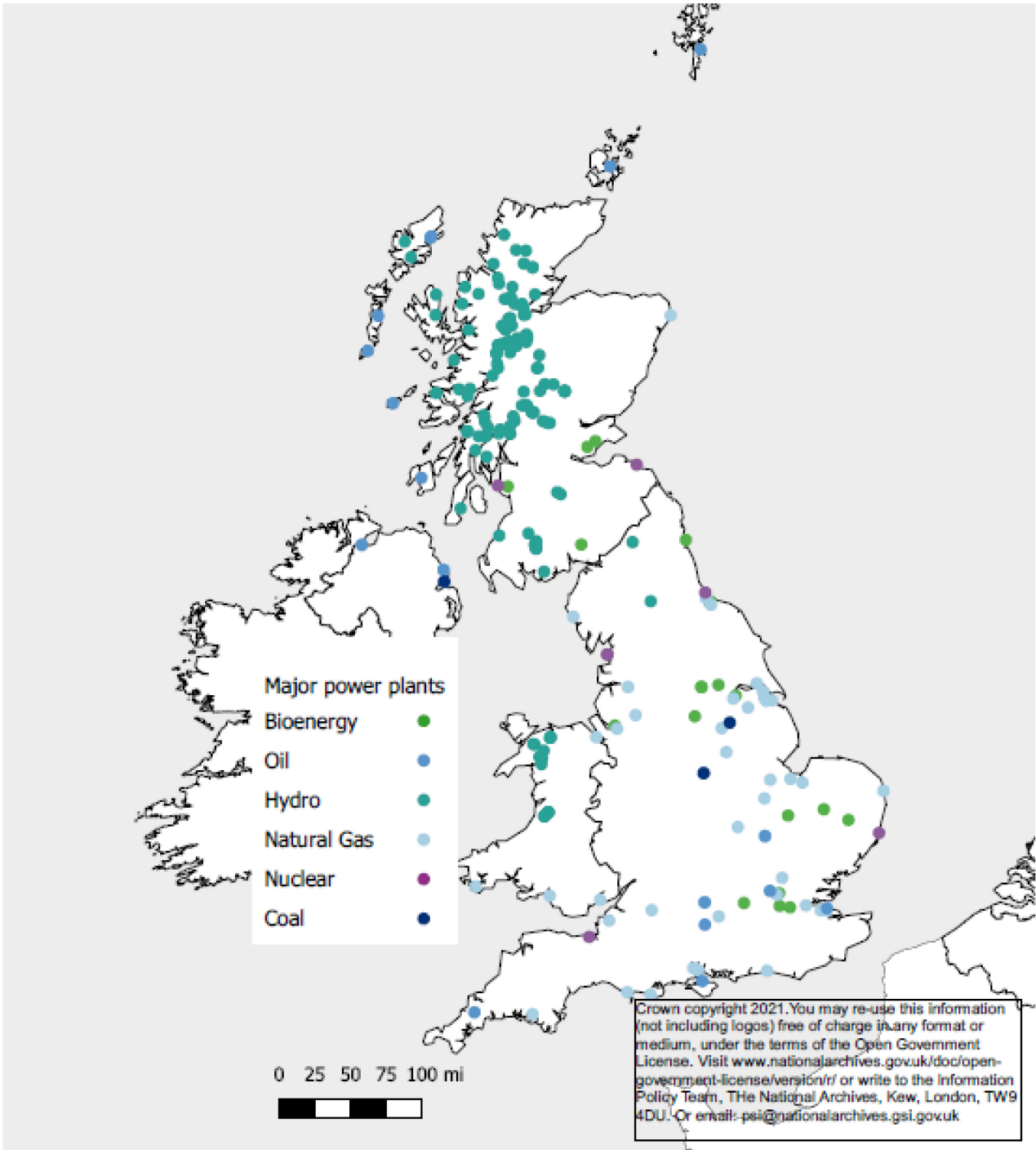
<https://www.gov.uk/government/statistics/energy-trends-section-7-weather>

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





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