

Chapter 5: Electricity

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Key headlines

Electricity demand reached a record low in 2020 of 330.0 TWh, down 4.6 per cent compared to 2019.

Though electricity demand has been declining year on year since 2015, the larger reduction seen in 2020 was primarily a result of the response to the Covid-19 pandemic.

Restrictions in response to Covid-19 led to decreased industrial and commercial electricity consumption, but higher domestic consumption. Industrial use of electricity, including iron and steel, was down 9.3 per cent in 2020 compared to 2019, and consumption by other final users, including the commercial sector, decreased by 11.2 per cent. Conversely, domestic consumption increased by 3.9 per cent in 2020, in comparison with 2019.

Renewable technologies generated more electricity than fossil fuels in 2020 for the first time in the published time series. Renewable sources generated 134.6 TWh in 2020, a 12.6 per cent increase compared to 2019 and higher than the 117.8 TWh from fossil fuel. This was in the context of electricity generation falling to record low levels in 2020, with total electricity generation in 2020 of 312.0 TWh. This reflects the lower demand for electricity during 2020 as a result of the UK's Covid-19 restrictions. In 2020, 43.1 per cent of UK generation came from renewables.

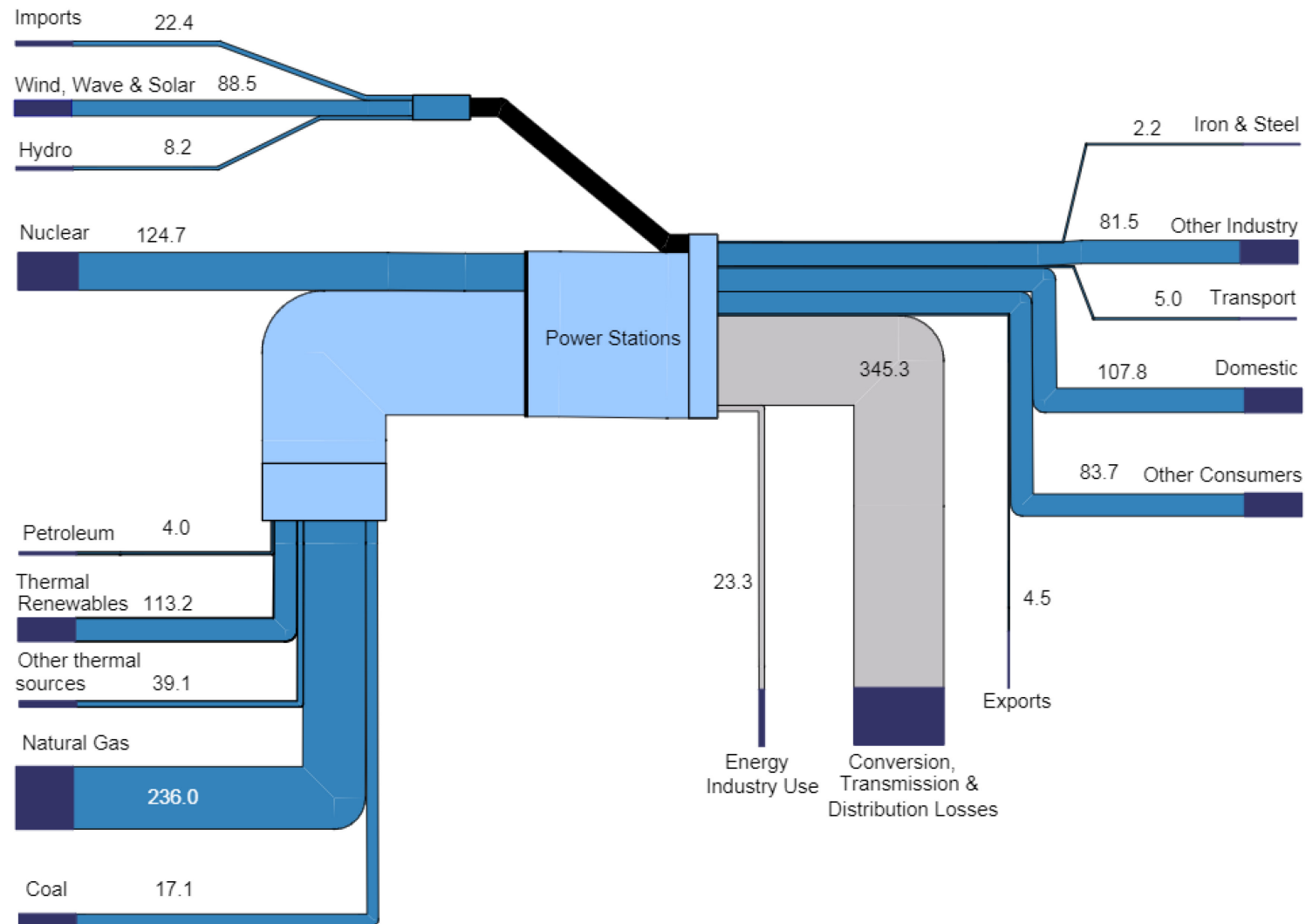
Fossil fuel generation was at a record low in 2020. Low demand for electricity and high generation from renewable sources reduced the need for generation from fossil fuels. Gas continued to be the dominant fuel, but generation was down 16 per cent compared to 2019. Nuclear electricity generation was down 11 per cent due to a series of statutory and unplanned outages at the UK's nuclear plants over the year. In 2020, 37.7 per cent of UK generation came from fossil fuels.

The total fuel used for electricity generation decreased substantially in 2020 down 5.2 per cent to 55.6 Million Tonnes of Oil Equivalent (Mtoe). Fuel use has fallen year on year since 2013 due to decreasing demand for electricity and growth in non-thermal renewables, but the larger decrease in 2020 was because of the unusually low demand and generation as a result of the Covid-19 restrictions.

Net imports in 2020 were 17.9 TWh, the lowest level since 2017. Net imports were 5.4 per cent of electricity supplied in 2020.

Total generation capacity decreased in 2020 to 75.8 GW, a 2.7 per cent decrease on the 77.9 GW capacity in 2019. While there were increases in renewable capacity, in particular off-shore wind, this was offset by the closure of coal power station Fiddler's Ferry and nuclear station Dungeness B.

Electricity Flow Chart 2020 (TWh)



Notes on flow chart

This flow chart is based on the data in Tables 5.1 (for imports, exports, use, losses and consumption) and 5.6 (fuel used).

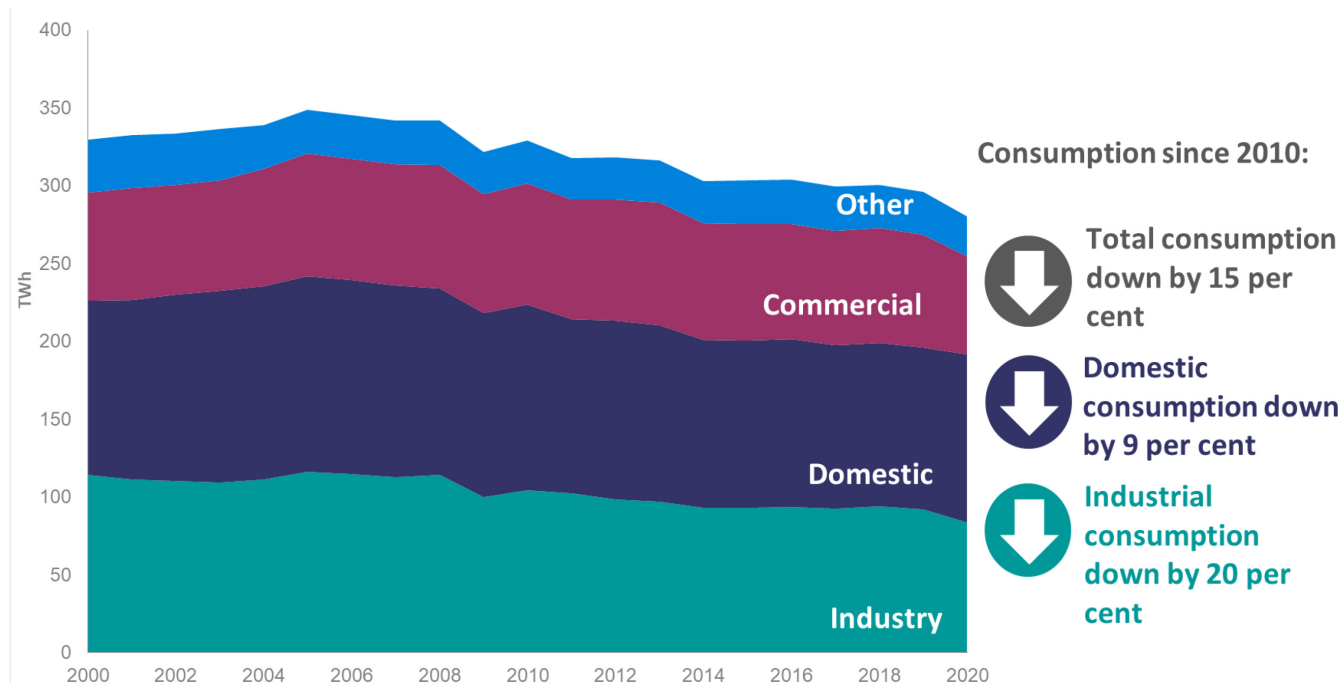
1. Hydro includes generation from pumped storage while electricity used in pumping is included under Energy Industry Use.

2. Conversion, Transmission and Distribution Losses are calculated as fuel used (Table 5.6) minus generation (Table 5.6) plus losses (Table 5.1).

Electricity demand reached a record low in 2020 of 330.0 TWh, down 4.6 per cent compared to 2019.

Though electricity demand has been declining year on year since 2015, the larger reduction seen in 2020 was primarily a result of the response to the Covid-19 pandemic, which restricted the activity of business and industry from March. Similarly, there was a 5.3 per cent fall in levels of final consumption of electricity compared to 2019. 'Final consumption' refers to electricity consumption by end users, excluding electricity consumed in the process of generation and transmission or distribution losses.

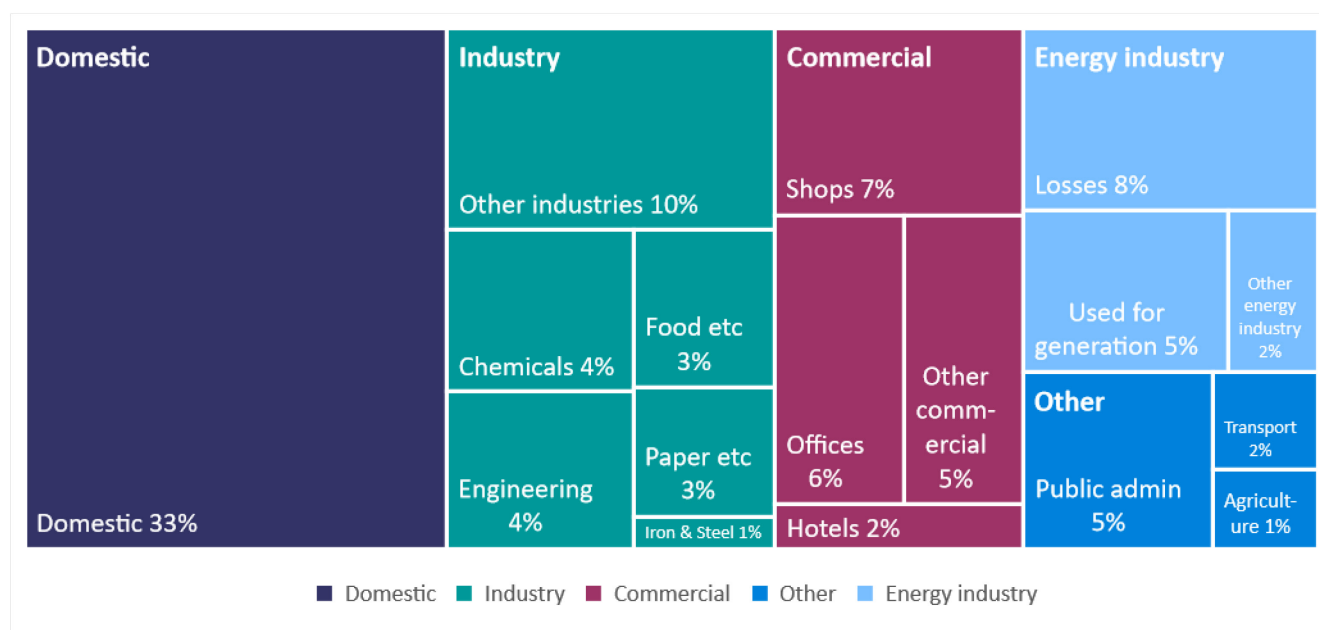
Chart 5.1 Electricity consumption by sector, 2000-2020 (Table 5.1)



Restrictions in response to Covid-19 led to decreased industrial and commercial electricity consumption, but higher domestic consumption. Industrial use of electricity, including iron and steel, was down 9.3 per cent in 2020 compared to 2019, and consumption by other final users, including the commercial sector, decreased by 11.2 per cent. This was due to restrictions placed on the activity of business and industry in response to the Covid-19 pandemic. Conversely, domestic consumption increased by 3.9 per cent in 2020, in comparison with 2019. This reflects the increase in time spent at home, including working from home, raising domestic consumption. This increase is despite higher average temperatures in 2020 than in 2019, which would usually be expected to reduce domestic electricity demand for heating.

Total electricity demand is larger than electricity consumption. This is because total demand also accounts for electricity consumed in the process of generation or to produce fuel for generation, as well as for electricity lost in transmission or distribution from where it is generated to where it is consumed.

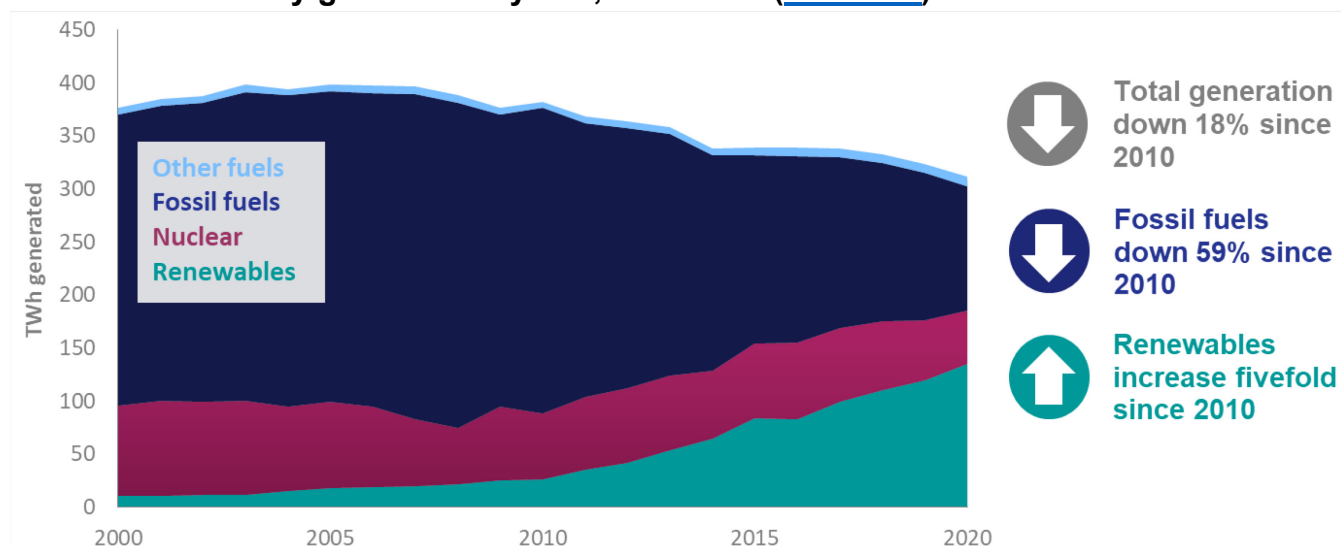
Chart 5.2 Share of total electricity demand split by sector, 2020 ([Table 5.2](#))



Domestic users accounted for almost a third (32.7 per cent) of total electricity demand in 2020, higher than the share in 2019 (30.0 per cent). Consumption by industry represented 25 per cent and commercial consumption represented 19 per cent. Compared to 2019, the domestic share increased by 2.7 percentage points, whereas the industrial share decreased 1.3 percentage points and the commercial share by 1.7 percentage points, in line with the effects of Covid-19 restrictions in 2020.

Electricity generation and supply fell in 2020, due to reduced demand for electricity. Demand for electricity is mainly met by UK generation and supplemented with imports from Europe. Electricity generation measures what is generated while electricity supply measures what was supplied to the grid, excluding the electricity used in the process of generation. Total electricity supplied plus imports needs to match with demand to ensure there is always enough electricity available. Total electricity supplied in 2020 was 329.9 TWh, with net imports of 17.9 TWh, 5.4 per cent of electricity supplied.

Chart 5.3 Electricity generation by fuel, 2000-2020 ([Table 5.6](#))



Electricity generation fell to record low levels in 2020, with total electricity generation in 2020 of 312.0 TWh, 3.6 per cent less than in 2019. This reflects lower demand for electricity during 2020 as a result of the UK's Covid-19 restrictions. 2020 also continued the shift away from generation by Major Power Producers (MPPs), which was down 5.1 per cent to 253.9 TWh, partly offset by a 3.8 per cent increase in generation from autogenerators and other generators to 56.7 TWh. The generation by MPPs was the lowest value on the published data series, partly due to the lower demand but also the ongoing trend towards smaller renewable sites.

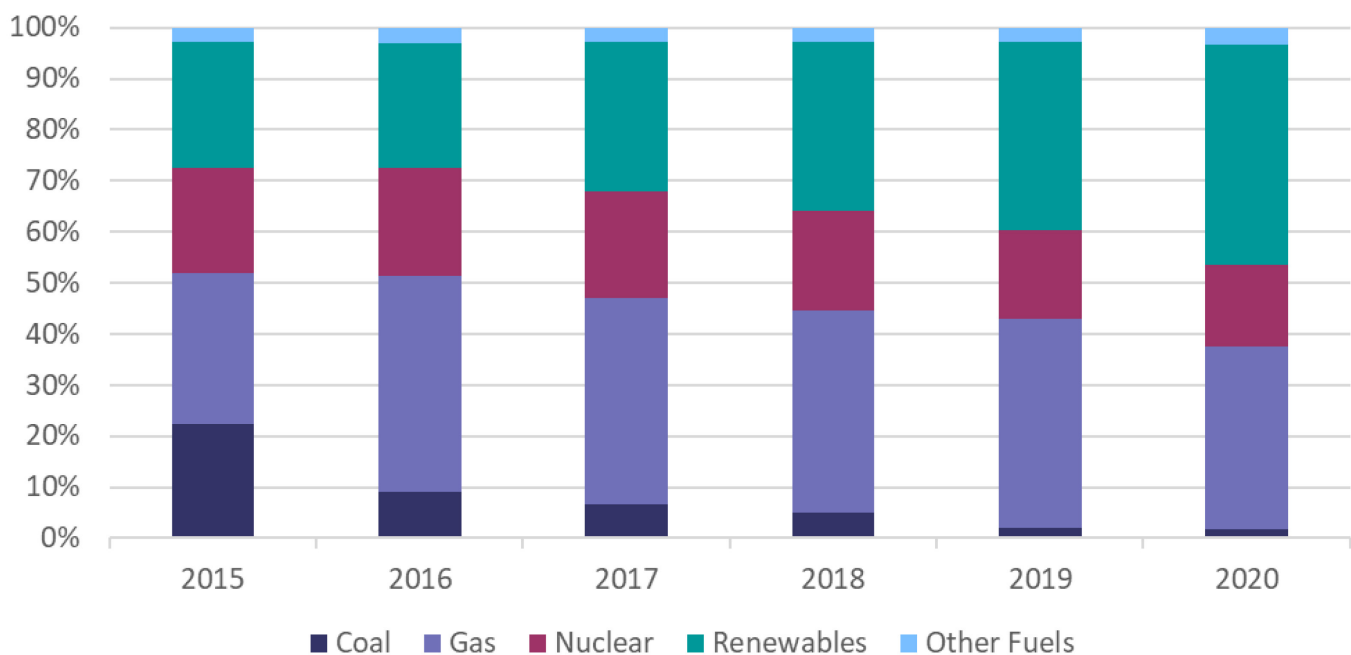
Generation from renewable sources in 2020 was higher than fossil fuels for the first time in the published time series. Renewable sources generated 134.6 TWh in 2020, a 12.6 per cent increase compared to 2019 and higher than the 117.8 TWh from fossil fuel. The high renewable generation was driven by increased wind generation, up by 18 per cent compared to 2019 to 75.4 TWh. This reflected favourable conditions for generation and increased capacity, particularly for offshore wind, which generated 27 per cent more electricity in 2020 than in 2019. In particular, the East Anglia One offshore wind farm became fully operational in 2020, adding 0.7 GW to the UK's offshore wind capacity. Weather conditions were also favourable for hydro generators, which saw a 15.5 per cent increase compared to 2019, to 6.8 TWh. There was also a 5.4 per cent increase in generation from bioenergy, in line with increased capacity.

Fossil fuel generation was at a record low in 2020, down 15.9 per cent to 117.8 TWh. This came as low demand for electricity and high renewables generation reduced the need for generation from fossil fuels. Gas continued to be the dominant fuel, generating 111.4 TWh in 2020 but this was down 16 per cent compared to 2019. During 2020 there were several substantial periods with no coal-fired generation in Great Britain, including a record 67 day period between April and June 2020. Northern Ireland operates on a separate electricity network where some coal generation continued. Just four coal-fired power stations remain in the UK, following the closure of Fiddlers Ferry and Aberthaw B in March 2020, with plans to phase these out by 2025.

Nuclear electricity generation was 50.3 TWh in 2020, down 11 per cent compared to the previous year. This was the lowest amount in more than twenty years as all of the UK's nuclear plants were on outage at times during the year. While some of these were statutory outages (planned in advance for maintenance purposes), there were also a number of unplanned outages for repairs, including Dungeness B being unable to generate all year. This also included Sizewell B operating at half capacity from May to September at the request of National Grid because of the lower demand for electricity.

As well as absolute generation, it is also useful to consider the overall shares of generation, which are less affected by changes in demand. This is particularly important for 2020, which saw unusual demand patterns as a result of Covid-19 restrictions.

Chart 5.4 Shares of electricity generation by fuel, 2015-2020 ([Table 5.6](#))



In 2020, the proportion of electricity generation coming from renewable sources exceeded that of fossil fuels for the first time in the published data series. The renewable share rose sharply in 2020, to 43.1 per cent of UK generation, an increase of 6.2 percentage points compared to 2019. This was substantially higher than the share of generation from fossil fuels (37.7 per cent) for the first time in the published data series. All the renewable technologies including bioenergy saw increases in generation shares

in 2020, with the largest being a 3.7 percentage point increase in wind generation share. Wind provided 24 per cent of the total generation in 2020. The share of generation from low carbon sources increased again in 2020 to 59.3 per cent, up 5.0 percentage points compared to 2019, because of the high share of generation from renewables.

The fossil fuel share of generation was the lowest on the published data series, down by 5.5 percentage points to 37.7 per cent. Gas continues to be the dominant fuel in the UK generation mix, generating 35.7 per cent of the total in 2020, although this was down 5.0 percentage points on 2019. The fall in the use of fossil fuels has largely been driven by a significant reduction in coal generation, which has fallen from a fifth of generation in 2015 to just 1.8 per cent in 2020.

Nuclear share of electricity generation fell to its lowest level since 2010, accounting for 16.1 per cent of generation in 2020, down 1.2 percentage points on 2019.

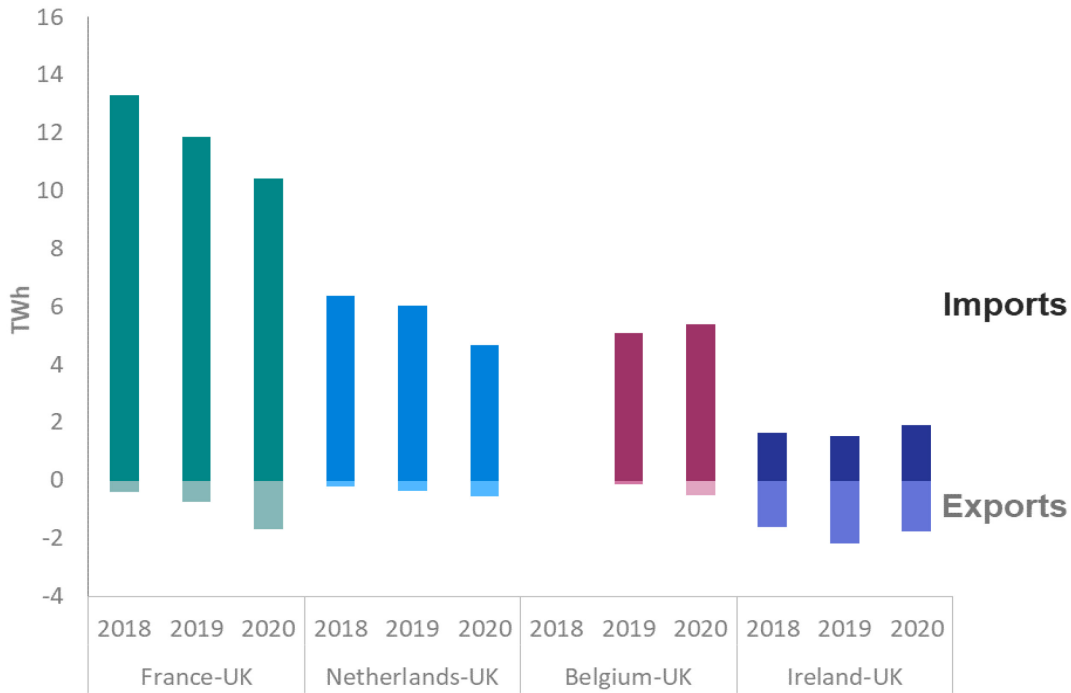
The total fuel used for electricity generation decreased substantially in 2020, down 5.2 per cent to 55.6 Million Tonnes of Oil Equivalent (Mtoe). This was the lowest value on the published data series with fuel use falling year on year since 2012. In the last ten years, total fuel use has fallen 28 per cent due to decreasing demand for electricity and growth in non-thermal renewables which do not incur conversion losses¹. The larger decrease in 2020 compared to 2019 was because of the unusually low demand and generation as a result of the Covid-19 restrictions.

Trends in fuel used mirror those in electricity generation, with record low amounts of fossil fuel used, record low use of nuclear fuel and record highs for fuel used by renewable generators. Gas continues to dominate the UK generation mix, with 20.3 Mtoe used in 2020, while coal use has continued to decline with just 1.47 Mtoe used in 2020. This was a 21 per cent reduction on 2019 and 94 per cent lower than 2010 levels.

The UK continued to support its own generation by importing electricity from Europe to meet demand, though total net imports were down by 15 per cent in 2020. Net imports in 2020 were 17.9 TWh, the lowest level since 2017 and represented 5.4 per cent of total electricity supplied, down 0.7 percentage points on 2019. Total imports were 22.4 TWh in 2020 (down 8.8 per cent compared to 2019) while total exports were up 32 per cent on 2019 to 4.5 TWh.

¹ For wind, hydro and solar, the fuel used is assumed the same as the electricity generated, unlike thermal generation where conversion losses are incurred. Therefore, for example, if one unit of electricity produced from coal is switched to wind, the fuel used will show a fall from around three units (as coal's thermal efficiency is around one-third) to one unit.

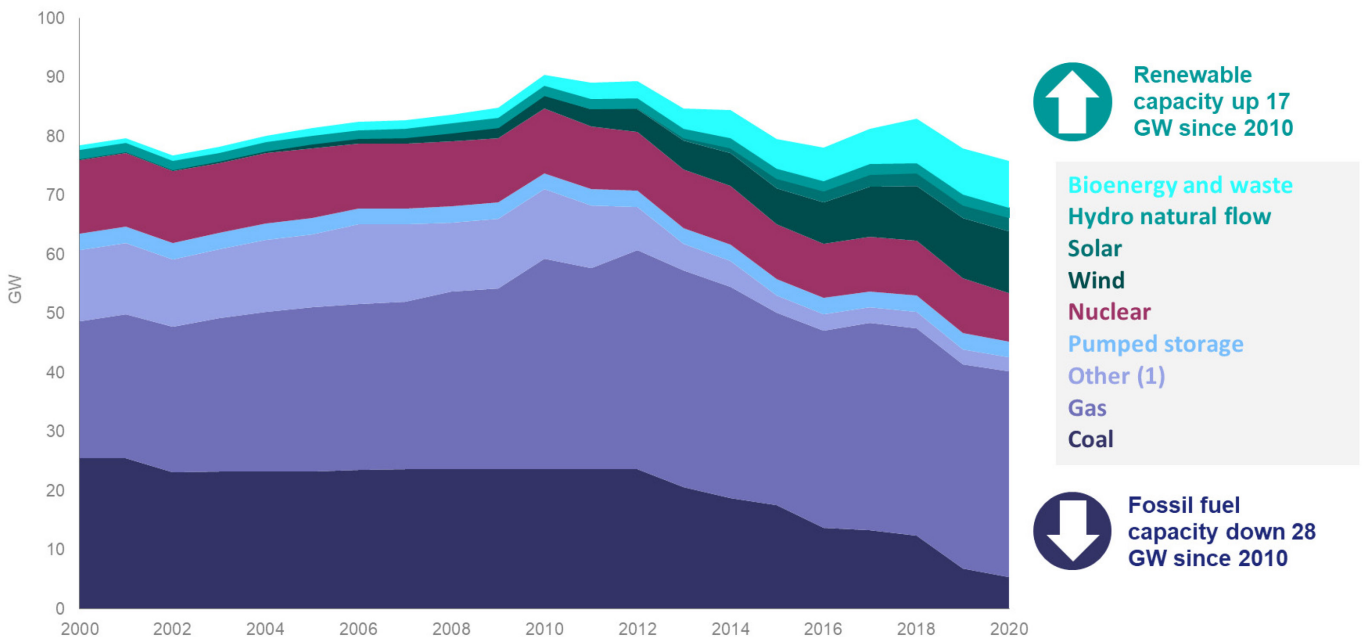
Chart 5.5 Electricity imports from Europe (Table 5.13)



Just under half of the UK’s electricity imports (47 per cent) were from France, with the French IFA interconnector providing net imports of 8.7 TWh, although this was down 22 per cent on 2019. Belgium and the Netherlands also have substantial amount of net imports, 4.9 and 4.1 TWh respectively, though the lower demand in 2020 meant that both saw a decrease compared to 2019. The Northern Ireland – Ireland interconnector remains the only interconnector where exports of electricity exceed imports with net imports of –0.8 TWh in 2020.

UK electricity is generated from a range of technologies and fuels which will be used at different times in response to demand and also to changes in weather. Monitoring capacity along with load factors allows us to see how the capacity is being used and monitor the security of electricity supply.

Chart 5.6 Installed capacity of UK electricity generation assets by fuel, 2000 to 2020 (Table 5.7)



Total generation capacity decreased in 2020 to 75.8 GW, a 2.7 per cent decrease on the 77.9 GW capacity in 2019. While there were increases in renewable capacity, in particular off-shore wind, these were offset by the closure of two large coal power stations and nuclear station Dungeness B. These large plant closures meant that the peak demand for electricity during the winter 2020/21² was equivalent to 75.5 per cent of UK MPP generation capacity, up 3.2 percentage points compared to 2019. In this section, wind, small scale hydro and solar PV capacity is de-rated to account for intermittency, to enable direct comparison with conventional fuels which are less dependent on the weather.

The largest reduction in generation capacity during 2020 was seen in coal-fired generation, which fell to 5.4 GW, with the closure of Fiddlers Ferry (2.0 GW). This leaves just four coal plants operating in the UK, with plans to phase these out by 2025, and reflects the shift away from coal for electricity generation. Nuclear capacity fell by 12.1 per cent with the closure of Dungeness B³. Gas-fired generation capacity remained relatively stable, up by 0.6 per cent.

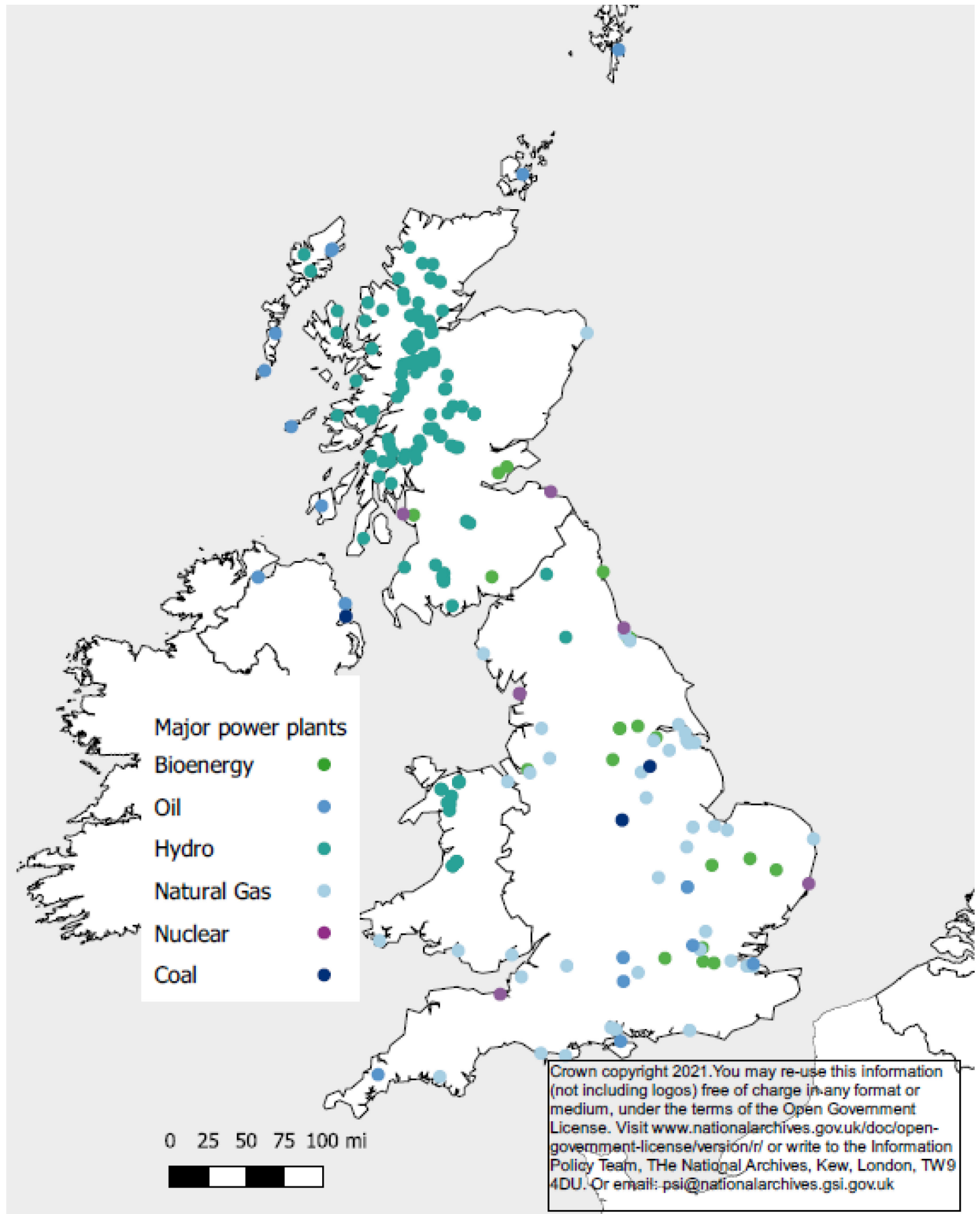
Renewable generation capacity continued to increase in 2020, with 0.4 GW of renewable capacity added to take the total to 22.4 GW. Without derating, this is an increase of 1.0 GW which brings the total installed capacity for renewable generation to 47.8 GW, as detailed in Table 6.4. Half of the additional capacity was for offshore wind generation, including the opening of East Anglia One which added 0.5 GW over the course of the year. Solar generators and municipal solid waste generation also saw additional capacity.

In addition to decreased capacity, the MPP power plants were less intensively deployed than they were last year, with a load factor of 41.6 per cent. Load factors indicate the proportion of the time the plant is producing electricity and decreased by 0.7 percentage points compared to 2019. Load factors vary by technology, with nuclear stations the highest at 59.8 per cent and the lowest being pumped storage hydro at 5.8 per cent. Full load factors for renewable generation are given in Table 6.5.

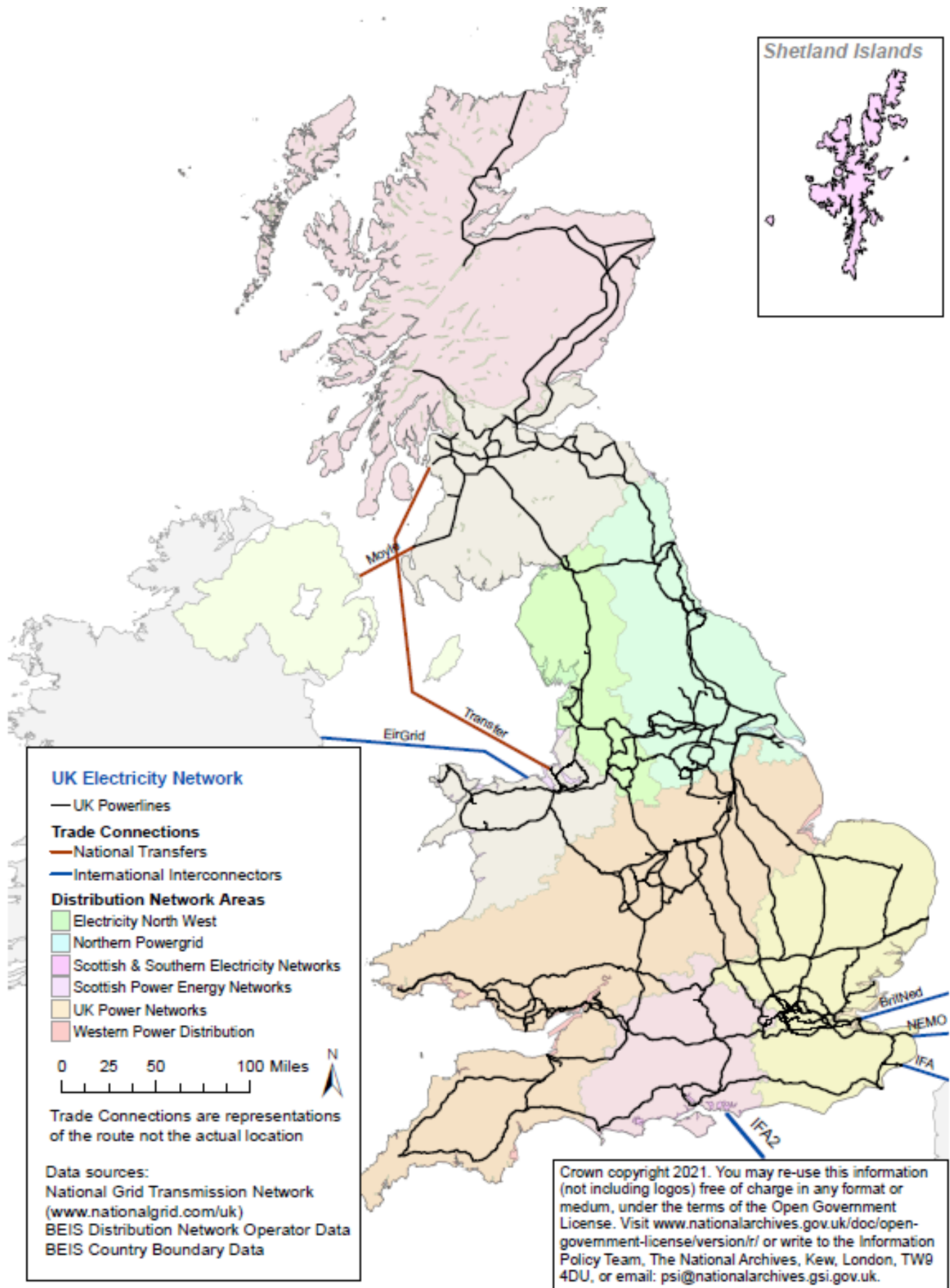
² 7th January 2021 in the half hour ending 17:00

³ It was announced in June 2021 that Dungeness B would begin defueling prior to closure. It has not generated since 2018, so has been excluded from the 2020 capacity tables.

Map of Major Power Producers in the UK (operational May 2021)



UK Distribution Network Operating Areas and GB Power Lines Map





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