Chapter 6: Renewable sources of energy

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Key headlines

Renewable generation in 2025 reached a new record of 153.0 TWh. Generation was up by 5.9 per cent on 2024, driven by new capacity and more favourable weather conditions for solar PV. This record output was driven by record levels of generation from offshore wind, solar PV and bioenergy.

The share of renewable electricity generation in 2025 was 52.1 per cent, a new record and up by 1.6 percentage points on 2024, which was the first year that renewables had accounted for over half of total generation.

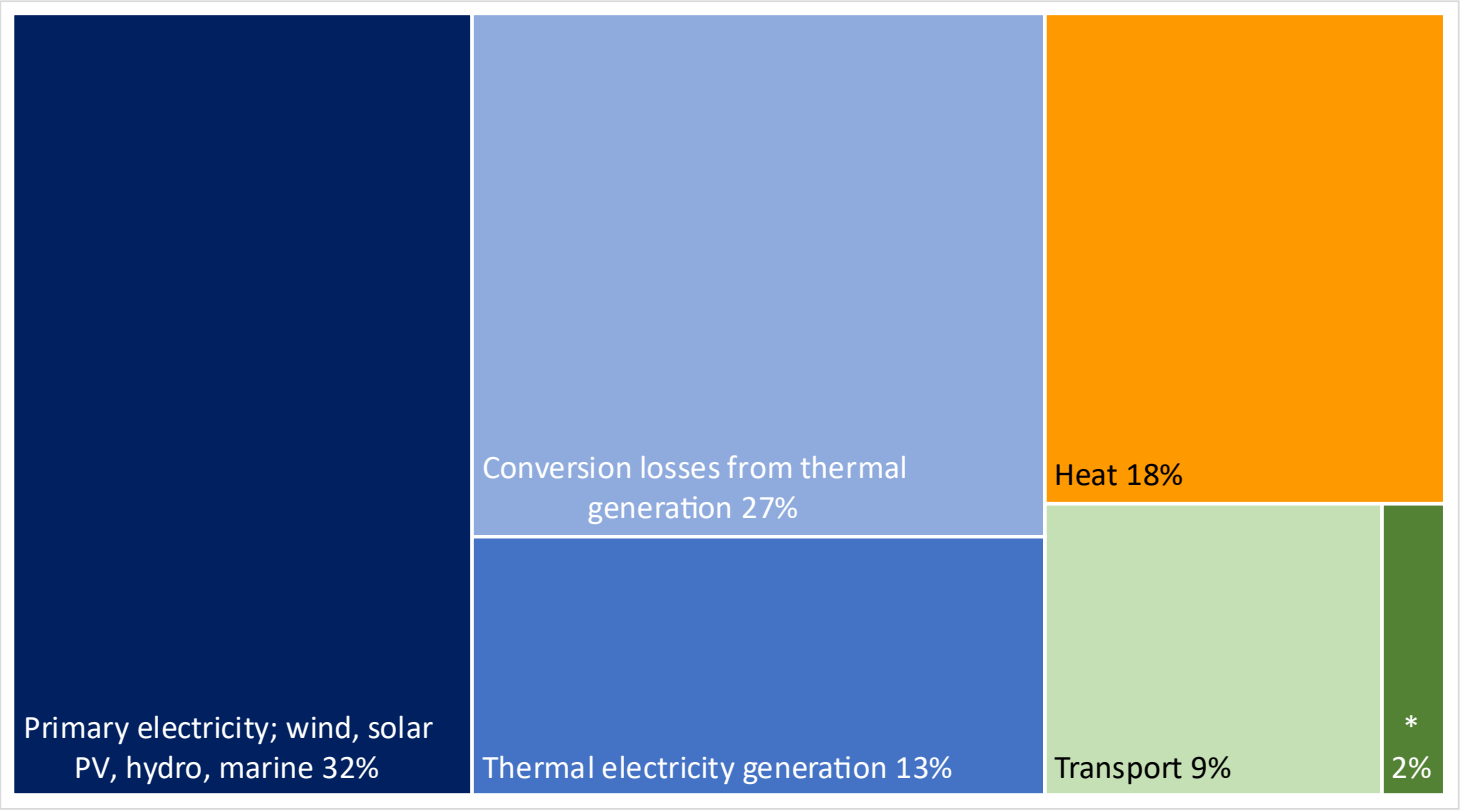
Renewable capacity increased by 5.3 per cent (3.3 GW). This included new capacity at Dogger Bank offshore wind farm and Cleve Hill, the largest solar farm in the UK.

Renewable heat increased by 1.5 per cent with higher heat from heat pumps and wood combustion being offset slightly by decreases in landfill gas and renewable waste. Although heating degree days in 2025 were similar to 2024, higher levels of the stock of heat pumps and domestic wood appliances drove the increase.

As a share of gross final consumption, overall renewables accounted for 16.8 per cent, an increase of 0.4 percentage points on 2024, and the result of an increase in renewables consumption coupled with a fall in total consumption. The largest contribution was from renewable electricity generation.

Renewable fuels include primary energy such as wind, solar, and hydro, and thermal fuels (solid biomass, biogases, and liquids). Thermal fuels are combusted to produce energy and in the case of electricity generation, some is lost during this conversion process. Around 72 per cent of renewable fuels are used for electricity generation, a third of which is lost in the conversion process. Heat accounts for 18 per cent with transport and grid injected biogas accounting for 8.8 per cent and 1.6 per cent. Chart 6.1 below shows the demand for all renewable fuels including losses from the conversion process.

Chart 6.1 Renewable fuel[1] demand, 2025 (DUKES Table 6.4)



* Grid biogas

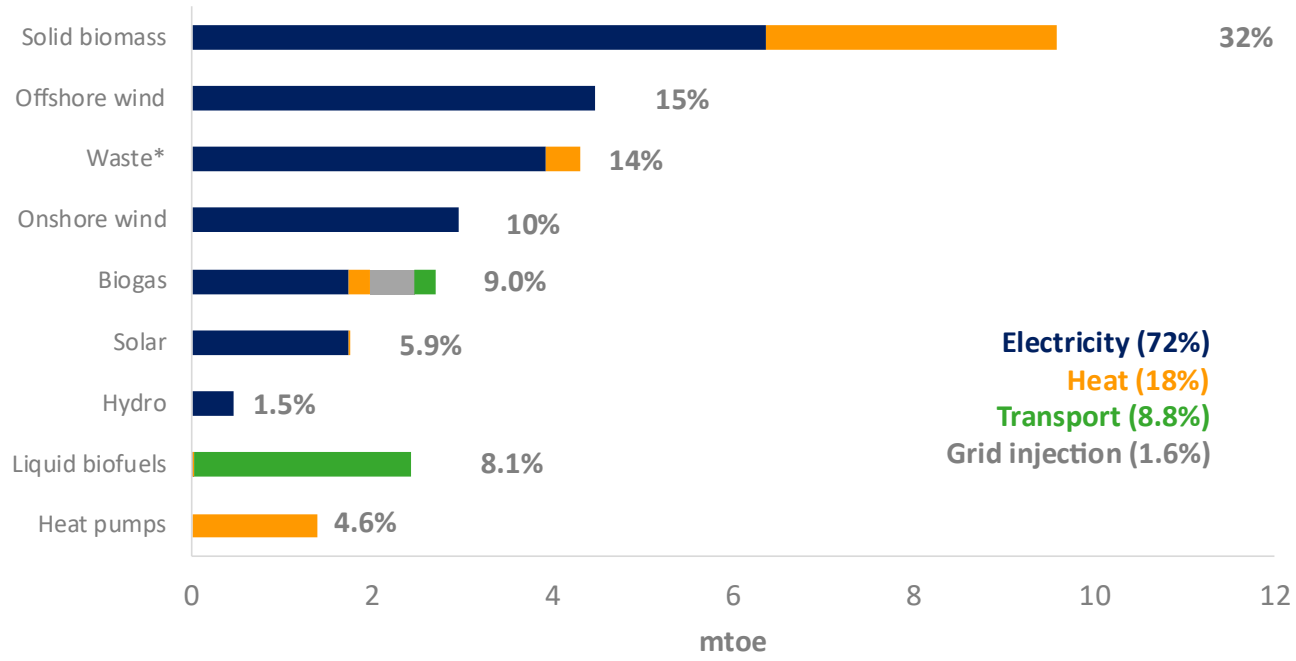
The chart replicates data included in Table 6.4; where this differs to Table 6.2 is the latter includes electricity generation only, i.e. primary generation and thermal generation after losses. The amount of conversion losses depends on the efficiencies of fuels which for renewables varies between around 35 to 40 per cent, with the remainder being lost in conversion. This compares with an efficiency of around 48 per cent for natural gas and around 34 per cent for coal and oil generation.

Some renewable fuels are more versatile than others such as biogases; historically demand had been dominated by electricity generation, but it is now increasingly used for heat generation, injection into the National Grid, and most recently small amounts are consumed within the transport sector. Conversely, primary energy sources such as wind and hydro are consumed solely by the electricity sector and although solar is primarily used in generation, small amounts of solar thermal are used for space and water heating.

Chart 6.2 shows how the individual fuels and technologies are consumed across the end uses (note: thermal fuels include losses incurred during conversion).

[1] Including non-biodegradable waste

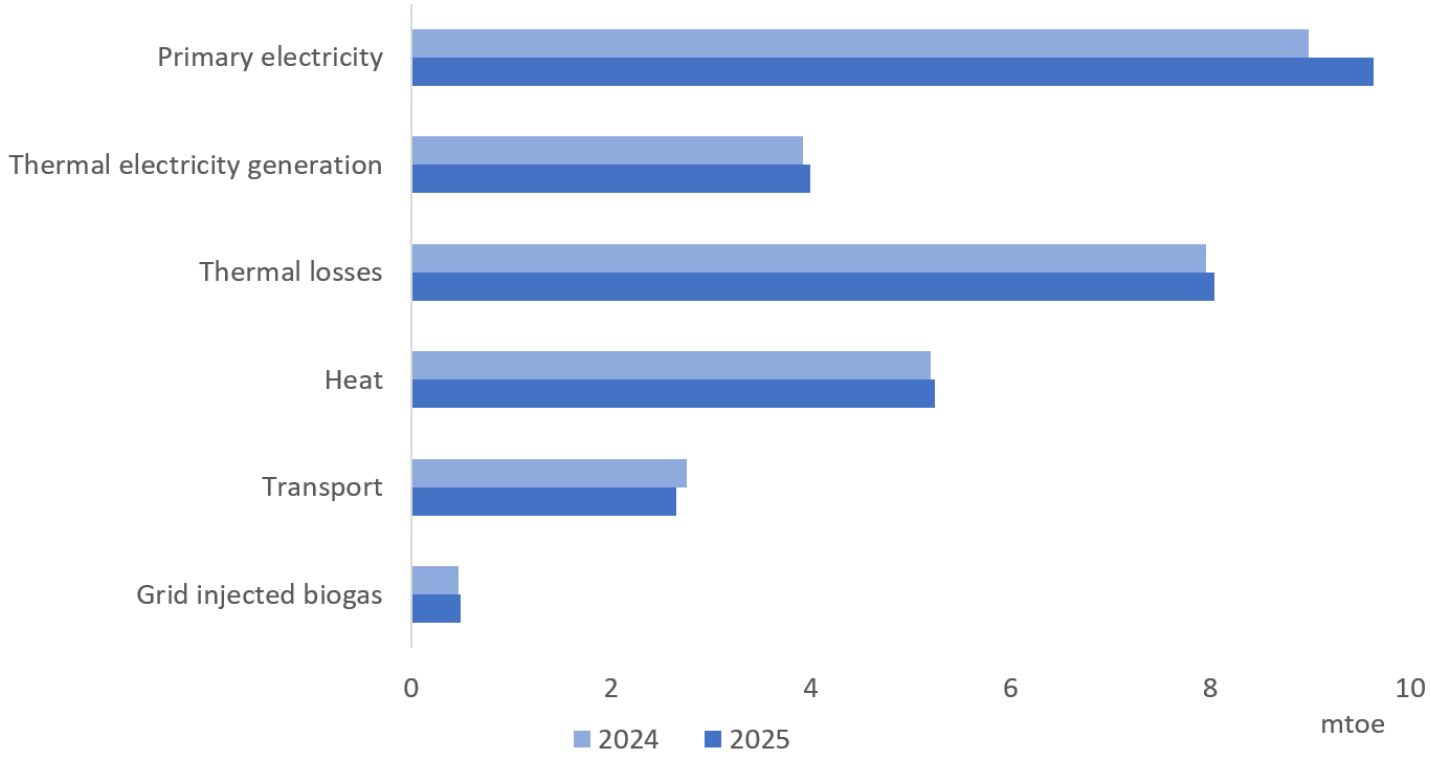
Chart 6.2 Use of renewable fuels, 2025 (DUKES Table 6.4)



Between 2024 and 2025, overall renewable fuel demand increased by 2.5 per cent (including non-biodegradable waste). The increase was driven by greater use of renewables for electricity generation. This included a large rise in use of solar for electricity generation. This was a result of new capacity and average sun hours rising sharply compared to 2024. Use of plant biomass for electricity generation also increased as generation continues to recover following reduced output at two major sites in 2022 and 2023.

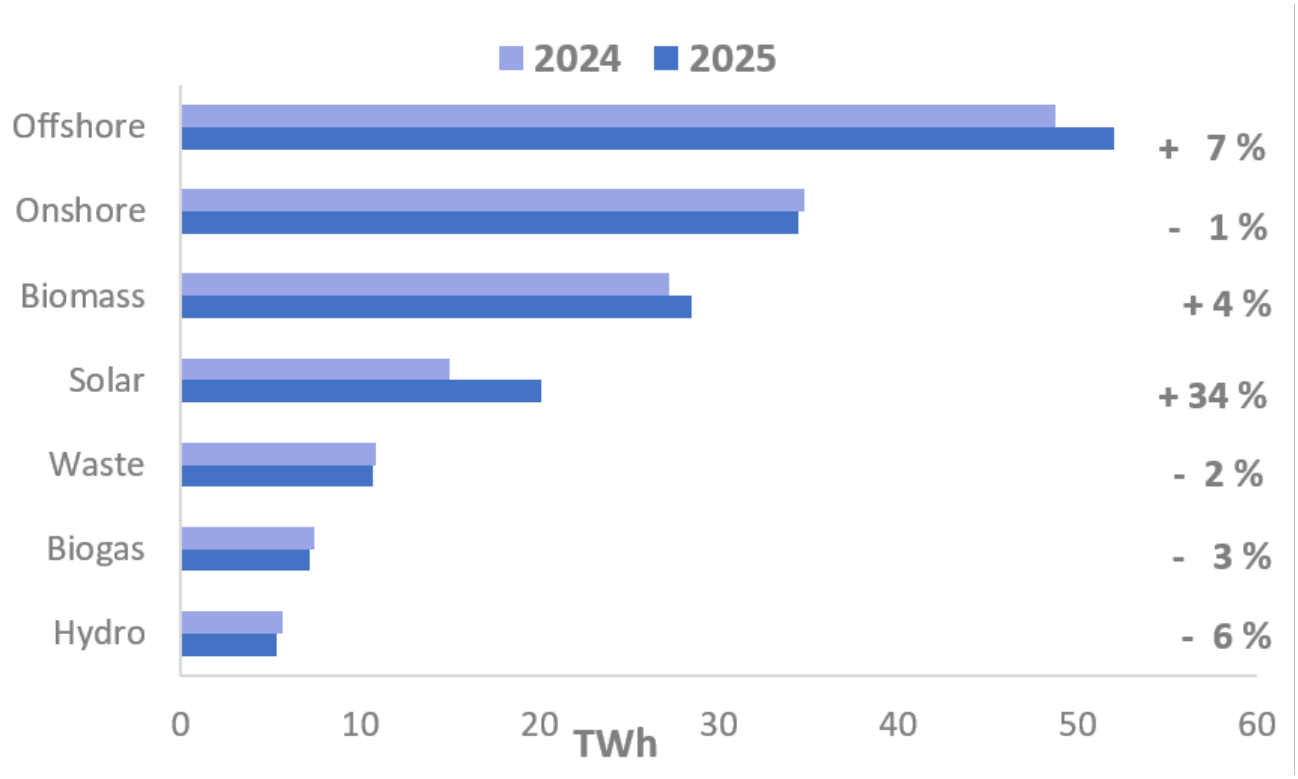
There was a smaller increase for renewable heat generation which was the result of increased use of domestic wood and heat pumps, in line with long term trends. This was partly offset by a fall in renewable fuel used in transport.

Chart 6.3 Change in renewable fuel demand 2024 to 2025 (DUKES Table 6.4)



At 153.0 TWh, overall renewable generation exceeded the current record, set in 2024, by 5.9 per cent. The increase was driven by record generation for solar PV, plant biomass and offshore wind.

Chart 6.4 Electricity generation by fuel, 2024-2025 (DUKES Table 6.2)



Offshore wind generation in 2025 was up by 6.6 per cent on 2024 to a new record of 52.0 TWh, despite reduced wind speed. This represents a large increase in recent years; it is roughly triple the volume seen ten years ago in 2015. The previous record was set in 2023. Average wind speeds were slightly higher in 2024, but offshore wind generation was hampered that year by planned maintenance, unplanned outages and curtailment (including a fault with a subsea export cable). Over the course of the year, capacity increased by 3.2 per cent, this has included additional capacity at Dogger Bank (England) and NNG (Scotland). Dogger Bank is due to expand further in 2026.

Conversely, generation from **onshore wind dipped by 1.1 per cent** to 34.4 TWh. This was due to lower average wind speeds in 2025. Despite this, generation was not far behind the record of 35.1 TWh set in 2022.

Solar PV generation reached a record 20.1 TWh in 2025, 34 per cent higher than the previous year. Higher generation was driven by both record sunshine levels and continued expansion of solar capacity. Average sunshine hours were the highest since our records began in 2001, following the lowest levels on record in 2024. Capacity growth was also strong, with a record number of solar installations completed during the year, including the 373 MW Cleve Hill development, the UK's largest solar farm.

Hydro generation decreased by 6.0 per cent in 2025 to 5.4 TWh. This is in line with a drop in average rainfall of around 6 per cent. In addition, there was very little new capacity, hydro is an established technology and there has been little new capacity in recent years.

Bioenergy was up by 2.2 per cent on last year. The largest component of bioenergy is plant biomass which was up by 4.8 per cent to a new record of 27.8 TWh. Generation has increased from the relatively low levels seen in 2022 and 2023, which were driven by reduced output at two major biomass plants. While generation from plant biomass increased, this was partly offset by lower generation from landfill gas, sewage gas and anaerobic digestion. The decline in landfill gas generation reflects the continuing reduction in gas yields from landfill sites.

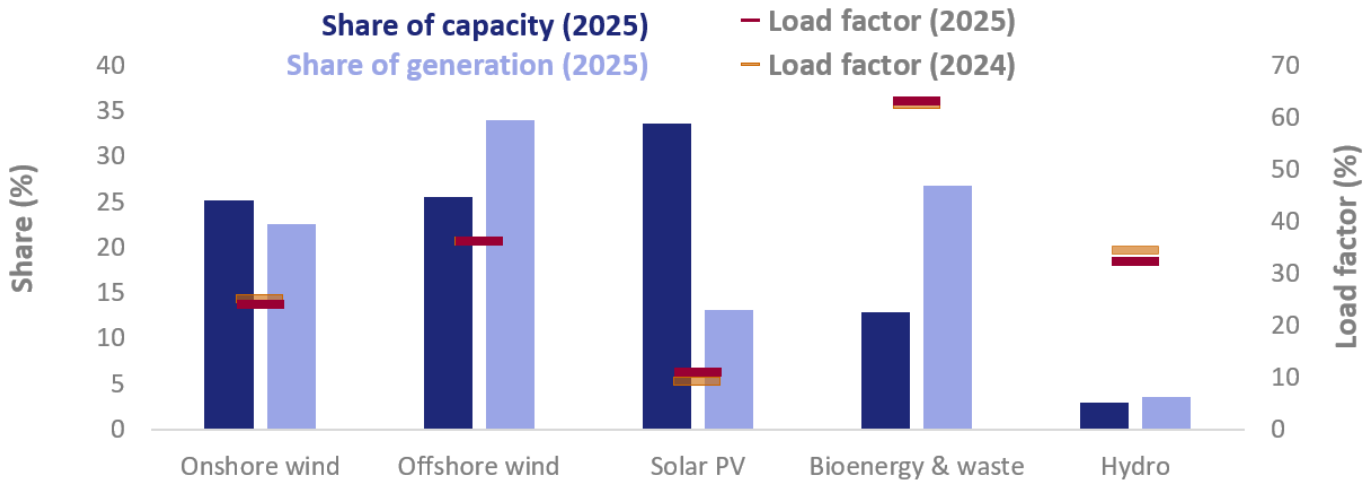
Offshore wind continues to be the leading renewable technology in 2025 for generation, accounting for 60 per cent of all wind generation and 34 per cent of all renewable generation in 2025. Offshore first outstripped onshore generation in 2019, even though offshore wind capacity overtook onshore wind capacity for the first time in 2025. The discrepancy between capacity and generation can be explained by a

combination of stronger and more consistent coastal wind speeds, and offshore turbines tend to be newer and larger than onshore, often yielding a higher load factor.

Plant biomass accounts for around 18 per cent of renewable generation, around the same level as 2024. Despite a large increase in generation in 2025, solar PV accounts for around 13 per cent of renewable generation.

Technologies with a high share of capacity do not necessarily have the highest share of generation because **generation is dependent on the load factor**. Load factors are the ratio of how much electricity was generated as a proportion of the total generating capacity**.** Within renewables, load factors can be heavily influenced by weather conditions: such as wind speeds, sun hours and, to a lesser extent, rainfall. Chart 6.5 compares the key technologies' share of capacity and generation for 2025.

Chart 6.5 Relative share of capacity and generation and load factors 2025 (DUKES Table 6.3)



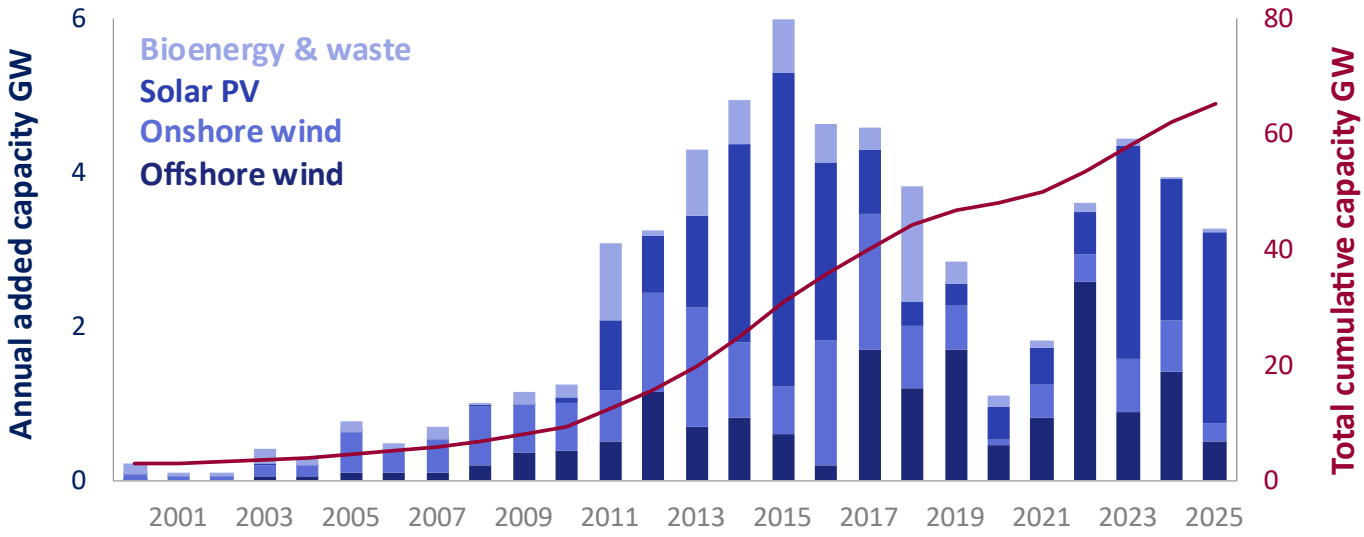
Solar tends to have a lower load factor than other technologies, as shown in Chart 6.5 where a large volume of solar capacity contributes a relatively small amount of generation. In 2025, the load factor for solar PV increased from 9.2 per cent to 11.1 per cent. This was a result of the longer average sun hours, 2025 being the sunniest year in our time series (which started in 2001). However, the load factor for solar remained lower than other renewable technologies.

The load factor for bioenergy was up slightly from 62 per cent in 2024 to 63 per cent.

The load factor for onshore wind was down slightly in 2025 due to lower average wind speeds from 25.0 per cent to 24.1 per cent. The load factor for offshore wind was at broadly the same level, at 36.4 per cent.

Chart 6.6 shows the historic growth in capacity; new capacity has recovered after the stark slowdown during 2020 and 2021 (some projects may have been delayed in 2020 due to COVID-19 restrictions). 3.3 GW of capacity was added during 2025, an increase of 5.3 per cent since 2024. Three quarters of the new capacity was solar PV. New capacity peaked in 2015 when 6.0 GW was installed, 4.1 GW of which was in solar PV.

Chart 6.6 Annual added capacity 2000 to 2025 (DUKES Table 6.2)



Prior to the launch of the Feed-in Tariff (FiT) in 2010, solar PV represented just 1.0 per cent of renewable generation capacity, but by the end of 2025, its share had increased to 33.6 per cent, with the majority (58 per cent) being installed between 2011 and 2017. Following the closure of The Renewable Obligation to new entrants in 2016, growth began to slow in 2017 further exacerbated by the closure of FiT in April 2019. Growth has improved in the last three years with 2.5 GW of capacity being added in 2025, the third highest volume on record and the highest since 2015. The capacity added in 2025 was comprised of 269,000 new installations, the highest on record for any calendar year[2]. Most of these were small-scale installations on domestic and other rooftops. The new capacity also included Cleve Hill (373 MW) the largest solar farm in the UK and 20 other sites each with a capacity over 25 MW.

New capacity in onshore wind peaked in 2017 when 1.8 GW was added. Growth then slowed to a low of just 76 MW added in 2020, before picking up again to a recent high of 0.7 GW in 2024 but just 0.2 GW of new capacity in 2025. Offshore wind has seen much higher levels of new capacity in recent years with 69 per cent of total capacity being installed over the last ten years. This has included several large sites supported by Contracts for Difference (CfD) such as Hornsea 1 and 2, Triton Knoll, Moray East and Seagreen. In 2025, 0.5 GW of offshore wind capacity was added, mainly from additional capacity at Dogger Bank which is due to expand further in 2026. The amount added is below the record 2.6 GW installed during 2022. Wind now represents around 51 per cent of installed renewable capacity (see wind map at the end of this chapter showing location by capacity).

[2] For more information see the solar deployment tables at: https://www.gov.uk/government/statistics/energy-trends-section-6-renewables

Chart 6.7 Trends in generation by technology 2000 to 2025 (DUKES Table 6.2)

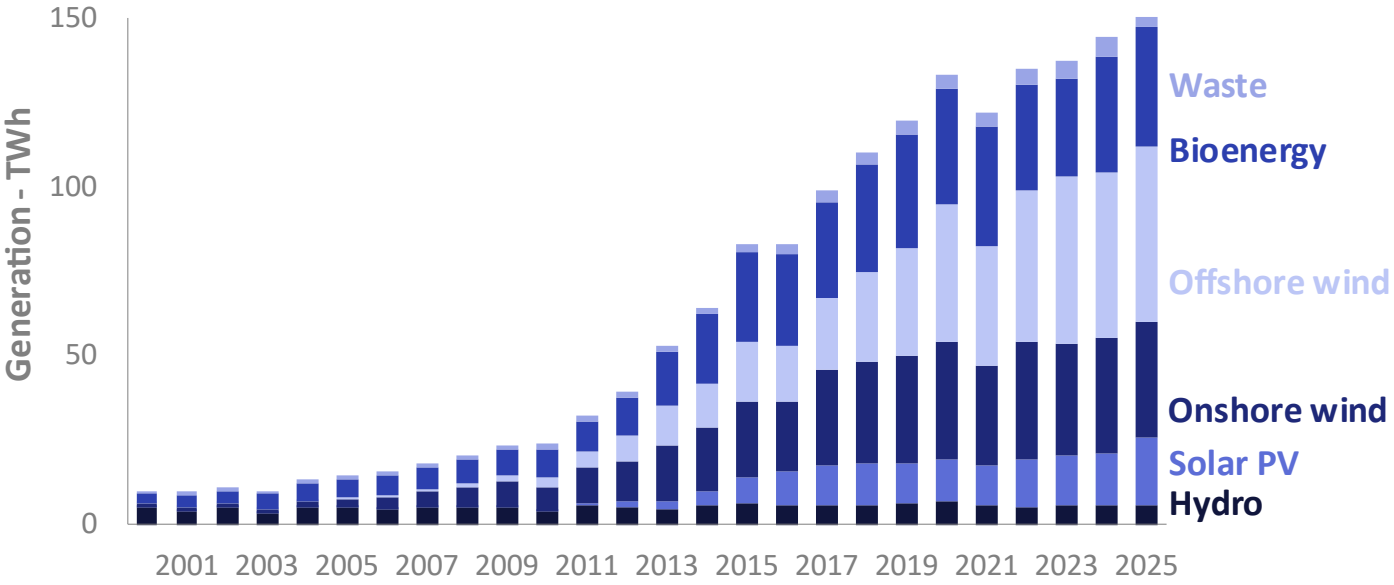
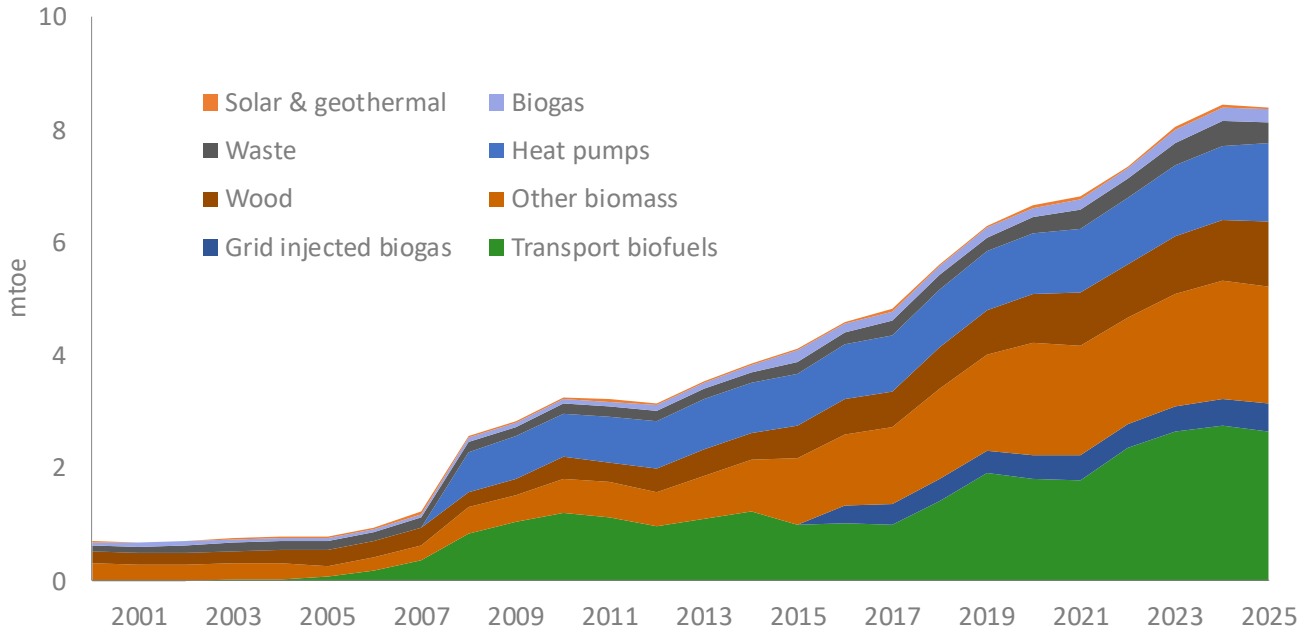


Chart 6.7 shows the overall upward trend in renewable generation and evolving fuel mix since 2000. The underlying trend is driven by increasing cumulative capacity, resulting in a record year for generation in 2025. Year-on-year fluctuations in generation due to weather effects can be observed in the chart, such as the drop in generation between 2020 (an unusually favourable year for wind speeds and rainfall) and 2021.

Hydro generation has been the most stable over the timeframe reflecting the maturity of the technology in the UK. With limited new capacity, generation tends to fluctuate in line with rainfall. In contrast, solar PV generation has increased rapidly since 2011 reflecting the surge in new capacity. As a result, solar PV's share of renewable generation increased from just 0.1 per cent in 2010 to 10.8 per cent in 2023, this slipped to 10.4 in 2024 when sun hours were very low but surged again in 2025 to 13.2 per cent due to new capacity and better weather conditions. Bioenergy increased rapidly between 2012 and 2016, with generation doubling in that period. This was a result of several large power stations converted from coal to plant biomass (mainly wood pellets). The rate of growth has been slower since then. At 27.8 TWh, plant biomass generation set a record in 2025. Outages dampened generation in 2022 and 2023 but recovered in 2024. Generation from landfill gas peaked at 5.3 TWh in 2011 but has fallen in each year since then as extraction rates have declined at landfill sites. This fall has been offset by increases in generation from anaerobic digestion so that in total, generation from biogases has remained stable since 2015.

Whilst electricity generation represents the largest share (72 per cent) of renewable fuel demand, heat also accounts for a sizable proportion (18 per cent), followed by transport biofuels (8.8 per cent) and biogas injected into the gas grid (1.6 per cent).

Chart 6.8 Other renewable fuel uses[3]; heat, transport, and grid injected biogas (DUKES Table 6.4)



Renewable heat demand[3] is largely met by solid biomass, accounting for 61 per cent of fuel for heat in 2025, with the next largest share being heat pumps (26 per cent). The remainder is largely made up of wastes and biogases (7.4 per cent and 4.4 per cent respectively), with primary sources (such as active solar heating and geothermal) accounting for around 0.7 per cent. Renewable heat demand[3] increased in 2025 by 0.9 per cent; although average heating degree days were similar, an increase in heat pump installations and domestic wood stoves boosted renewable heat[4].

Renewables used in transport are liquid and gaseous biofuels, supplied either as additives or as a replacement ("drop-in") for fossil fuels. Biogasoline and biodiesel dominate the fuel mix, together representing 80 per cent of renewable transport demand (down from 82 per cent in 2024). Since 2018, small but rapidly increasing amounts of new biofuels became available in the UK. In 2025, 9.1 per cent of renewable transport fuels were biogases, compared to less than 1 per cent in 2018, while bio-LPGs (bio propane and bio butane) accounted for 0.6 per cent, though supply is particularly volatile. Bio-jet fuel accounts for 11 per cent of all transport renewables (up from just 3.2 per cent in 2023) but only 2.1 per cent of total aviation demand.

Demand for transport biofuels fell by 3.8 per cent to 2,647 ktoe; although biogasoline grew by 9.0 per cent, biodiesel fell by 17 per cent. This is likely due to the fact that biogasolines are cheaper to procure than biodiesels, as well as price increases in HVO due to trade measures and increased demand.

Indigenous production of bioliquids decreased by 20 per cent in 2025, with two major plants closing down during the year. Not all liquid biofuels are consumed in transport; use in autogeneration and non-mobile road machinery account for around 1.1 per cent of total consumption.

To place renewable energy in context, DUKES Table 6.5 provides a measure for the share of renewables across the various energy flows, as well as estimates for the renewable proportion of **Gross Final**

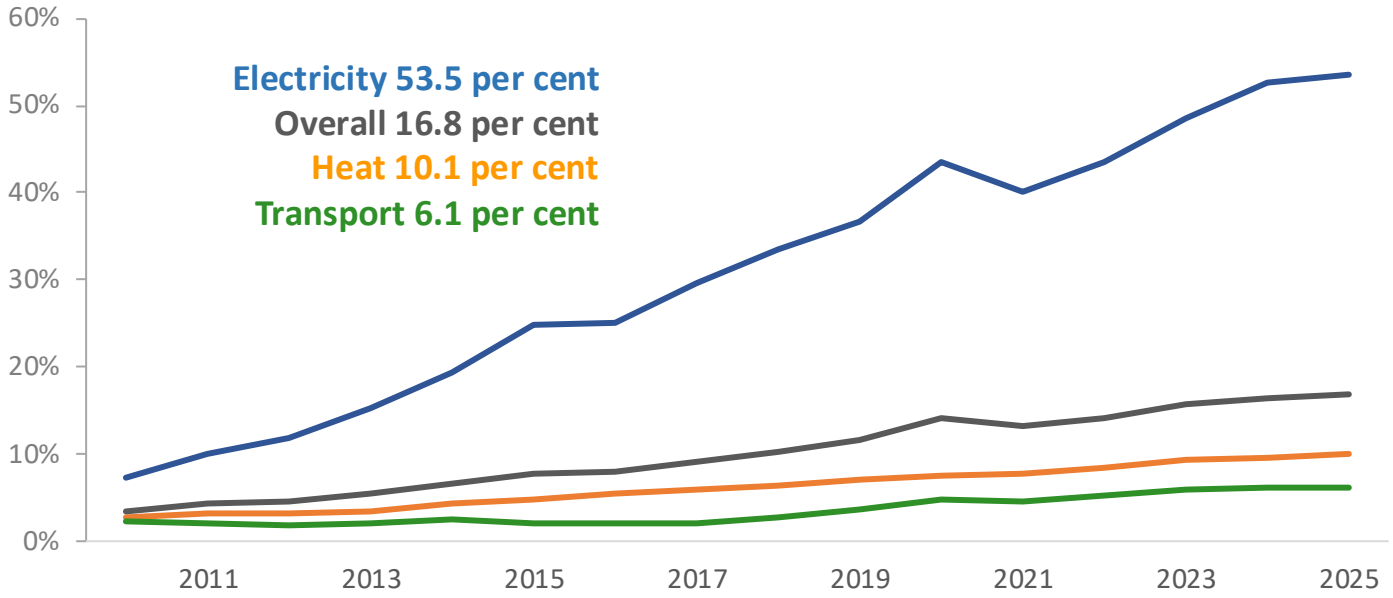
[3] Including non-biodegradable waste

[4] DUKES 2024 included preliminary results of a new domestic wood survey undertaken by The Department for Environment, Food and Rural Affairs (Defra). Since then, Defra has published its final report available via the following link;
Evaluation of the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 and Monitoring of domestic burning practices in the UK - AQ1043
These final results have had no discernible impact on the baseline compared to 2024; any variations are down to weather effects and the stock of appliances. On this basis, no longer term revision has been undertaken.

Consumption (i.e. before losses) for electricity and heat. The renewable share of transport fuels is on an actual basis as presented in the final consumption by sector chart (Chart 6.9).

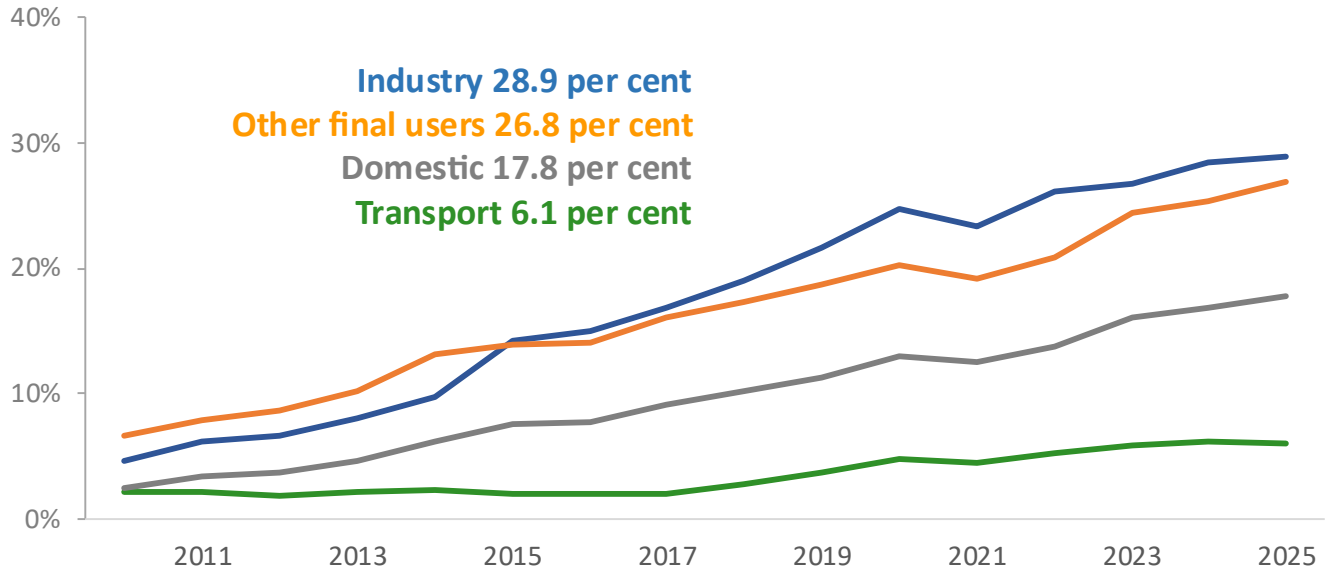
The proportion of electricity from renewables differs to that for generation and supply in that it excludes generation ultimately consumed in transport which is allocated to the transport measure. The underlying trend is however similar in that weather impacts are visible particularly between 2020 and 2021. Weather influences can also be seen between 2015 and 2016; despite this being a period of strong renewable capacity growth, generation was flat for the year with lower wind speeds, sun hours and rainfall. The heat measure is based on renewable fuels allocated to heat in Table 6.4; although some electricity will be consumed for heating purposes, this is allocated to electricity. Although over time, renewable fuels used in transport and heat have increased, both remain modest when compared with renewable electricity.

Chart 6.9 Renewable energy as a proportion of total gross final consumption (DUKES Table 6.5a)



The renewable proportion of fuels consumed by sectors, regardless of end use, varies depending not only on the proportion of thermal fossil fuels and bioenergy, but also on the share of electricity consumption which has seen its renewable proportion dramatically increase over the time period. Chart 6.10 below shows the changing proportion of renewables for each consuming sector.

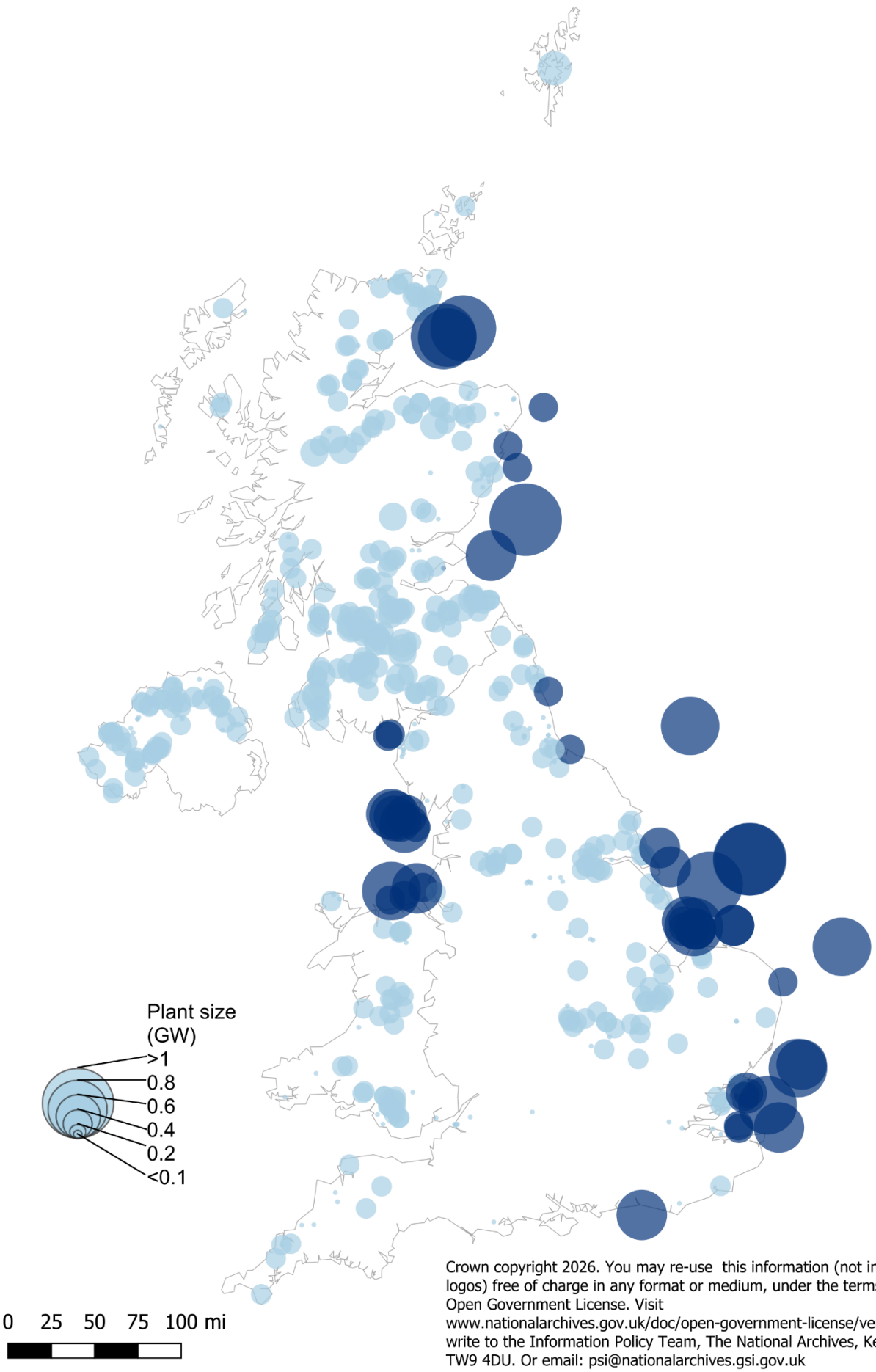
Chart 6.10 Renewables' share of final energy consumption by sector (DUKES Table 6.5b)



All sectors show an increase in their share of renewable consumption, in line with an increase in renewable electricity supply. Prior to 2015, the proportion of renewables consumed by industry aligned with that for other final consumers, though remained slightly lower. This historic trend was driven by the shift from the high-grade heat requirements of heavy industry to lighter, less energy intensive industries. In 2015, industry's share of renewables exceeded other users' share for the first time. Although the fuel switching within sectors over this period is subtle, it has largely been driven by a relatively higher increase in the share of bioenergy and electricity consumption in industry combined with a fall in the share of natural gas, compared to an increase for other sectors. In 2025, industry continued its upward trend of its renewable share; by 0.5 percentage points. Other users showed the largest increase (1.4 percentage points), followed by domestic (0.9 percentage points). The transport sector showed a slight decrease of 0.1 percentage points.

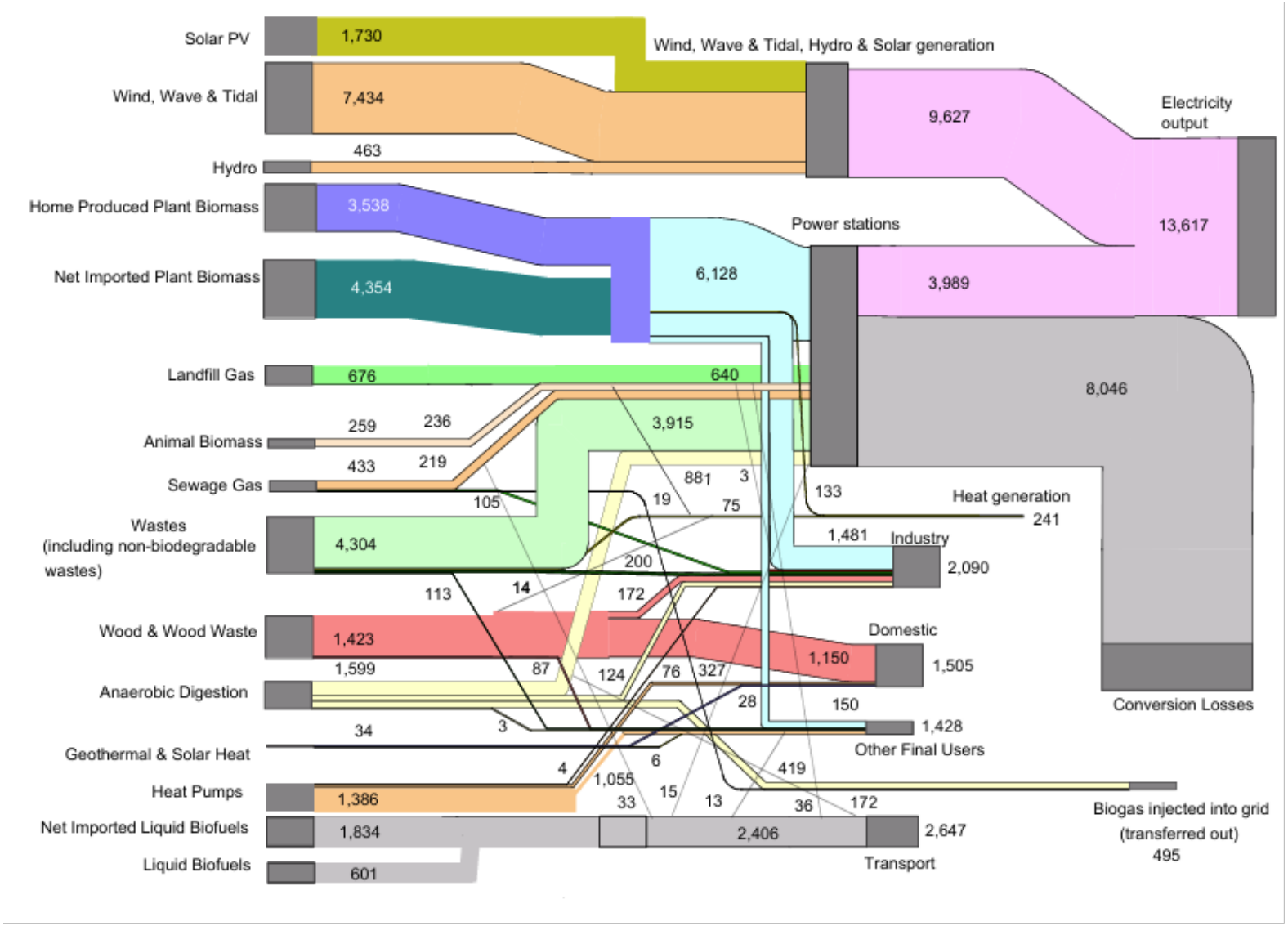
The map below shows UK wind farms that were operational at the end of 2025 with a capacity 5 MW or more; there are around 9,000 sites below this threshold and other sites are excluded due to a lack of precise location data. The locations are representative and not exact.

Map of UK wind capacity, end 2025 (5 MW and over)



Renewable energy flow chart 2025 (DUKES Tables 6.1 and 6.2)

The renewable energy flow chart overleaf summarises the flows of renewables including production, net imports through to final outputs by sector. It also shows the conversion losses associated with thermal renewable generation. The data are sourced from the commodity balance Table 6.1, and Table 6.2 for electricity outputs.



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