

The largest emitters in the UK: annual review

A new annual ranking of official data shows Drax power station is by far the largest emitter of CO₂ in the country, emitting more than the next four largest power stations combined.

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Lead author: Frankie Mayo

About

This report collates official data from the UK Emissions Trading Scheme registry and company annual reports to produce an annual ranking of emitters by specific asset, and by company. The ranking focuses on direct carbon dioxide equivalent (CO₂e) emissions across 2023, emitted within UK borders.

Highlights

14%

Equivalent of UK national emissions from the largest 10 companies

56.2 Mt

CO₂ emissions from the power sector across the UK

11.5 Mt

CO₂ emissions from the UK's largest carbon emitter in 2023, Drax

The UK's top emitters

Biomass burning, steelworks and gas power are top UK carbon polluters

Drax power plant is the largest single source of carbon emissions in the UK, followed by Port Talbot Steelworks and Pembroke gas power station.

The largest sources of emissions in the UK are power stations, steelworks and refineries

Power stations dominate among largest sources of carbon emissions

The UK power stations emitted around 56.2 million tonnes of CO₂ last year, new figures show from recent complete emissions data for 2023. These large power plants include biomass, gas and coal powered electricity, though the last UK coal power plant, Ratcliffe, closes in September 2024.

Over time, UK power sector emissions have reduced as wind and solar power displace coal and gas generation. Emissions have fallen [78% since 1990](#), with UK electricity demand falling by around 6% [across the same period](#).

Other large industrial plants also feature in the top emitters list

Large metalworks sites such as at Port Talbot and Scunthorpe feature in the top 10 largest single sources of emissions, as well as three of the six large UK refineries, Fawley, Pembroke

and Stanlow. In total the refineries and steelworks plants in the UK largest emitters tables emit the equivalent of 5% of total UK emissions, compared to 14% from the power sector.

Some of the largest emitters have existing and planned low-carbon investments

Many of the largest power sector sites are candidates for future low-carbon energy investment, and some of the top emitting companies are also key investors and developers of renewable projects. Electrification is one promising route available to decarbonise large industries such as steelworks, in early 2024 an electric arc furnace was [granted planning permission](#) at Teesside steelworks. Other technologies also the subject of research funding is carbon capture, or the use of hydrogen. At the end of 2023 the first UK [‘hydrogen allocation round’](#) awarded contracts to 11 hydrogen production projects. The government also identified two clusters for CCS funding in the 2020s through its [‘track 1’](#) support process, followed by the announcement in December 2023 of details of ‘track 2’ for two new clusters. However, as this remains a speculative decarbonisation route and relatively few of the top emitters were included in ‘track 1’ support, this is not expected to change the top emitters list in the short term. Biomass burning in particular is not expected to benefit from electrification and its hypothetical combination with CCS remains unproven with uncertain emissions benefits. Further changes, such as the closure of Ratcliffe coal power plant, are expected to change the top 10 table in future years.

A closer look at the top emission sources

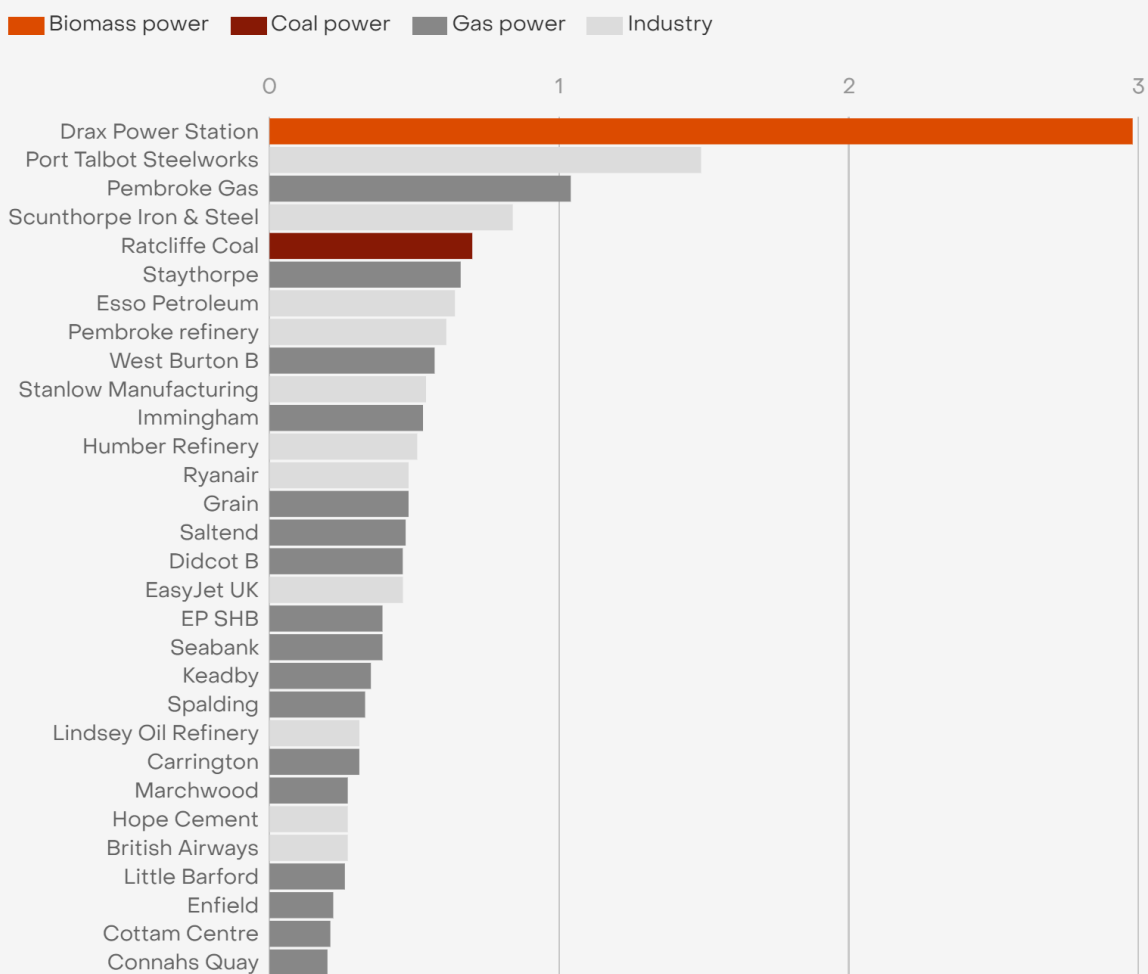
Drax is the largest single source of CO2 in the UK

Emitting 11.5 million tonnes (Mt) of CO2 in 2023, Drax is by far [the largest single CO2 emitter in the UK](#), responsible for the equivalent of 2.9% of total UK [territorial emissions](#). Burning wood for electricity, Drax power station emitted more CO2 than the next four power stations combined, and over four times the emissions of the UK’s remaining coal power plant, Ratcliffe on Soar (2.7 MT CO2e). Although it is [the recipient of public funding](#) earmarked for low-carbon projects, Drax remains the largest single source of CO2 in the country.

Drax power station generated less power (11.5 TWh) in 2023 than in previous years, a fall from 12.7 TWh in 2022. Over the same period, Drax claimed over [£1.0 billion in profits](#), after the [Electricity Generator Levy](#) (commonly known as the windfall tax) was applied. In 2023 Drax generated [11.5 TWh of electricity](#), a fall from 12.7 TWh in 2022, and a further fall from 14.1 TWh in 2021. This now means Drax produces just 8% of renewable electricity in the UK and less than 4% of the UK's total electricity.

Drax biomass power station is the top CO2 emitter, four times higher than Ratcliffe coal power plant

Top 30 emitters by source (% of UK total emissions, 2023)



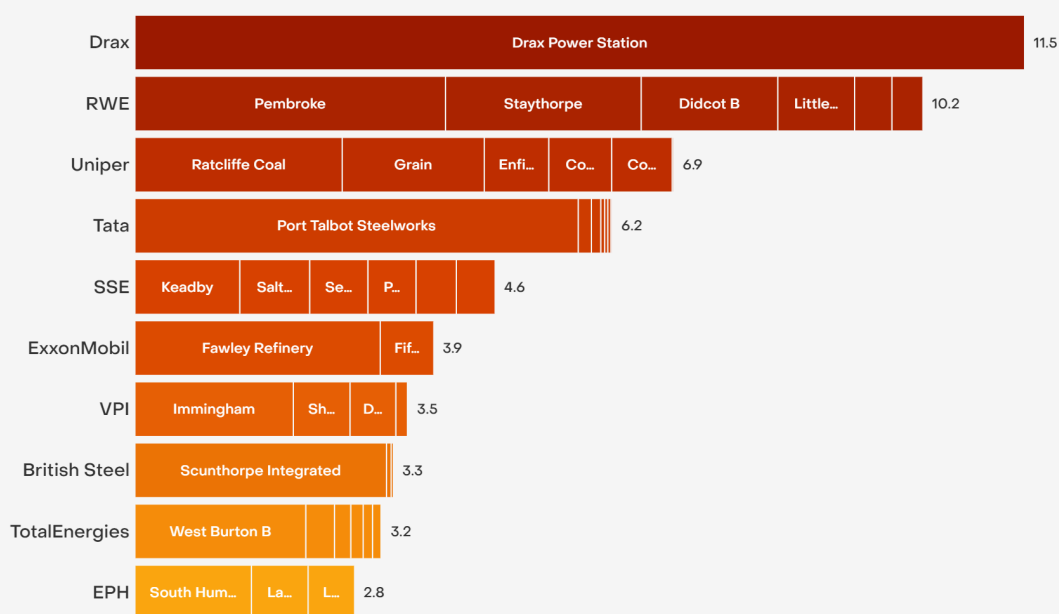
Source: UK Emissions Trading Scheme – 2024 Compliance Reporting Data, Drax 2023 Annual Report

Drax is the most polluting company in the UK

When 2023 emissions are aggregated to a company level, Drax emitted more than any other in the UK. Although RWE is responsible for some of the largest gas power plants in the country, Drax is still responsible for the largest combined total emissions. The companies in the top table are largely responsible for power stations and large manufacturing works, although TotalEnergies also operates fossil fuel extraction facilities in the North Sea. Wood pellets have an equivalent carbon intensity to coal but are burned at higher volumes due to their low energy density, meaning that [burning wood emits more carbon dioxide](#) than coal or gas, per kWh of electricity.

Biomass emissions make Drax the largest polluting company in the UK

Top 10 emitters by company (Million tonnes CO₂e, 2023)



Source: UK Emissions Trading Scheme Reporting, Drax - Annual Report
 Some site names have been truncated for ease of reading.
 Direct emissions only i.e. excludes the sale of fossil fuels, or the use of electricity

Carbon savings not guaranteed from burning biomass

Serious concerns remain about the overall emissions of using biomass for power generation. The EU and UK emissions trading schemes (ETS) do not require wood-burning power

plants to report their emissions, assuming the emissions are offset by forest regrowth. However, direct emissions are reported by Drax itself. This assumption provides biomass power plants in the UK with a sustainability classification meaning that they are eligible for public subsidies, even though the carbon savings are in doubt. From 2002 to 2023, Drax has received [£6.5 billion](#) in public funding.

Unfortunately, the assumed carbon savings from biomass is far from guaranteed. There is a mounting body of evidence and expert opinion that this assumption is critically flawed and must be overturned. The [European Academies Sciences Advisory Council](#) states that using woody biomass for power “is not effective in mitigating climate change and may even increase the risk of dangerous climate change”. Furthermore, BBC investigations have shown examples of [rare old growth forests](#) being cut down and turned into wood pellets, increasing the potential ecological harm inflicted. It is therefore likely that burning biomass to generate power is failing to deliver any carbon savings and is in fact a contributor to climate change. Continuing to subsidise this practice is a very risky gamble that comes at a high cost to consumers.

Import reliance means energy security remains a concern for top emitters

Like the gas power plants which also make up a large proportion of the largest emitters, the UK large biomass power sector is highly dependent on imports. Drax power station consumed 5.8 million tonnes of wood biomass, none of which was sourced in the UK. The UK imports around [50% of its gas requirements](#), and is the [third-largest importer of timber in the world](#), after China and the USA. Altogether, the UK produced only [0.3 million tonnes](#) of wood pellets in 2023, meaning that Drax power station consumes just under 20 times the UK’s domestic pellet production annually.

Drax is a wood pellet producer as well as a consumer of pellets at Drax power station, meaning that energy supply is just one of its competing priorities. When pellet prices soar, it may be more profitable to sell the fuel on the market rather than use it to generate power in the UK. The result of this equation is that during times of high electricity demand in the European gas crisis in 2022, Drax’s power plants sat idle for weeks, costing the UK consumer an [estimated £639 million](#) in foregone cost reductions. Alongside gas power plants, UK biomass power plants therefore also represent an energy supply risk, emitting large amounts of CO₂ with uncertain climate and biodiversity impacts.

Energy security is possible without largest polluters

Many of the largest emissions sources are power plants, however security of supply can be achieved without the need for billions in public subsidies for the largest emitters. A range of technology, infrastructure and market solutions are available to reduce consumer bills and ensure energy security.

Rapid roll-out of cheap generation is needed. The UK government has announced ambitious [wind and solar deployment targets](#), with the latest renewable contracts guaranteeing power around [50% cheaper](#) (48% to 67% cheaper) than that from Drax power station. Accelerating renewable energy deployment requires [electricity grid upgrades](#), which should also reduce bottlenecks to make the network more efficient.

Other technological solutions are already being deployed to smooth out natural supply variations, including short and long-duration energy storage, interconnector cables to other countries, and consumer responses to high or low supply. The National ESO [Operability Strategy Report 2024](#) also highlights innovative technologies that may support longer-term supply security, including hydrogen power generation. Renewable energy and storage solutions are much less reliant on fuel imports than biomass or gas power plants meaning that, once built, the cost is far less exposed to international price spikes. As the power sector becomes progressively decarbonised, a range of solutions and levers are available to balance supply and demand, without needing large subsidies for the UK's largest emitters.

Methodology

Direct emissions

Ranking of CO₂ emitters calculated through analysis of UK and EU ETS. The [UK Emissions Trading Scheme](#) has published the 2023 dataset for direct emissions, so excludes upstream and downstream indirect emissions. For example, this excludes upstream emissions from purchased electricity, or downstream emissions from the sale of fossil fuels.

Biomass burning for power generation is effectively excluded from UK carbon accounts, so Ember has sourced emissions from biomass power station annual reports. The UK ETS uses the same biomass emissions factor as the [EU ETS directive 2003/87/EC](#). Annex IV of the Directive 2003/87/EC states: "The emission factor for biomass shall be zero". Drax emissions are taken from the Drax Group plc [Annual report](#) and published [financial results for 2023](#). Lynemouth emissions have been calculated by Ember from company generation data as emissions are not published. According to [UK national statistics](#) total UK emissions from power plants in 2023 excluding biomass were 44.1 Mt CO₂e, when Drax and Lynemouth power stations are included, this rises to 56.2 Mt CO₂e.

Comparison to total UK territorial emissions

The Office of National Statistics reports on [UK total greenhouse gas emissions](#) in different ways, 'territorial emissions' focuses on emissions within national borders and excludes, for instance, imported goods. It also excludes 'biogenic emissions' i.e. from burning woody biomass in Drax. For this reason, Drax emissions are described as 'equivalent proportion of total emissions' if territorial emissions are expanded to include its direct emissions.

Company-level emissions

The ETS data has been categorised by company, and wherever possible the company ownership share has been represented. For example, SSE has a 50% stake in multiple large power plants, and therefore has only been assigned 50% of the reported 2023 emissions from those sites. Companies under the same umbrella organisation have been grouped into a single name for the purposes of comparison.

Subsidy projections

Ember estimates the value of future biomass subsidies in line with the index they are tagged to: ROC prices increase each year by Retail Price Index (RPI), which currently stands at 4.5%. CfDs increase each year by the Consumer Price Index (CPI), which currently stands at 3.8%.

Acknowledgements

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