



**EMBER**

# Repeat offenders: coal power plants top the EU emitters list

The ten largest emitters in the EU's Emissions Trading System are all coal power plants, with Germany and Poland dominating the list.

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## About

This report analyses 2022 emissions data from the EU's Emissions Trading System (EU-ETS), released in April 2023, focusing on the power sector.

The EU-ETS sets a market price for carbon across Europe and covers aviation, electricity and heat generation, and energy-intensive industries such as steel, cement and oil refineries. The EU-ETS covers the EU-27, Switzerland, Norway, Iceland and Liechtenstein. As part of the trading system, emissions data is published yearly for all installations.

## Highlights

# 25%

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Top 10 emitters responsible for almost a quarter of all power sector emissions

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Germany and Poland responsible for two thirds of EU coal power emissions

# 6

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RWE, PGE & EPH top utility emissions for six consecutive years

## Executive Summary

# Few repeat offenders dominate Europe's power sector emissions

Dirtiest emitters of 2022 are a familiar list of coal plants

Analysis of emissions recorded in the EU-ETS in 2022 reveals that the ten largest emitters are all coal plants, with Germany and Poland dominating the list. Europe's power sector emissions have declined over the last decade as countries moved towards phasing out coal, with a limited increase during the previous two years as the continent faced an ongoing energy crisis and sky-high gas costs.

## 01 Top 10 power plants emit one quarter of EU-ETS power sector emissions

The top 10 emitting installations of the EU-ETS in 2022 are all coal power plants. Seven have been amongst the top 10 power plants every year for the last decade. Between them, the plants are responsible for one quarter of EU-ETS power sector emissions and 13% of total emissions.

## 02 Germany and Poland responsible for two thirds of coal power emissions

Coal was responsible for more than 60% of power sector emissions in the EU-ETS in 2022, of which Germany and Poland accounted for two thirds.

Coal power emissions rose 6% compared to 2021, but remained below 2019 levels. The long term trend of coal power emissions remains one of decline, with values in 2022 40% lower than a decade ago.

## 03 RWE, PGE and EPH top utility emissions for 6th consecutive year

Three utilities dominate power sector emissions in the EU-ETS, each emitting almost as much CO<sub>2</sub>e as Italy's power sector in 2022. Together they account for 30% of power sector emissions, with lignite plants responsible for the majority of this.

The [IEA Net Zero Pathway](#) states advanced economies must end coal generation by 2030. Many EU Member States have already announced phase out dates in line with this, leaving a limited few such as Poland and Bulgaria at risk of isolating themselves as their neighbours transition towards a clean power sector.

"Coal plants are the repeat offenders of the EU's dirty list. The faster Europe can get off coal power the better. A few countries and companies are responsible for the lion's share of Europe's power sector emissions. Some are making strides towards cutting their coal dependency. The rest risk being left behind if they do not change course soon."

**Harriet Fox**

Energy and climate data analyst, Ember



2022 EU-ETS emissions

# Europe's power sector emissions held in hands of few

Top 10 largest emitters in Europe's emission trading scheme all coal power plants for second year running

Across all EU-ETS sectors, covering aviation, power and industry, the ten biggest emitters for the last two years have all been coal power plants. Out of more than 10,000 installations, these top 10 were together responsible for 13% of total EU-ETS emissions in 2022, and a quarter of emissions from the power sector.

In 2022, the power sector accounted for 739 million tonnes of CO<sub>2</sub>e (Mt CO<sub>2</sub>e), around half of total EU-ETS emissions, and an increase of 3% compared to 2021. In 2022, hard coal and lignite emitted 456 Mt CO<sub>2</sub>e, 62% of power sector EU-ETS emissions. Gas power sector emissions remained the same as 2021 at 170 Mt CO<sub>2</sub>e, around one quarter of power emissions.

## Top 10 plants responsible for one quarter of EU power sector emissions

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In total, the top 10 emitters in the 2022 EU-ETS released 175 Mt CO<sub>2</sub>e into the atmosphere in 2022, accounting for **almost one quarter** of power sector emissions in the EU-ETS. To put this in perspective, this is more CO<sub>2</sub>e than the power sectors of Spain, Italy and Czechia combined. As was the case [last year](#), the largest 10 emitters were all lignite or hard coal

plants, with PGE’s Bełchatów in Poland topping the list as it has done since the scheme began in 2005. It is not alone in its repeat offending - six others have also been amongst the top 10 power plants every year for the last decade.

The plants are spread over just three countries - six in Germany, three in Poland and one in Bulgaria. The Bulgarian plant Maritsa East 2 rejoined the top 10 for the first time since 2019 with the largest year-on-year emissions increase of 60%, equivalent to an extra 4 million tonnes of CO<sub>2</sub>e. The only other new entry came from the Polish plant Turów, where an additional unit added mid-way through 2021 pushed up emissions.

### Top 10 emitters in Europe all coal power plants

EU Emissions Trading System, 2022

Power Plant	Owner	Fuel	Position	Emissions 2022 (Mt CO <sub>2</sub> e)
 Bełchatów	PGE	Lignite	1	35.06
 Neurath	RWE	Lignite	2	24.22
 Boxberg	EPH	Lignite	3 (▲2)	19.13
 Niederaußem	RWE	Lignite	4 (▼1)	17
 Kozienice	ENEA	Hard Coal	5 (▼1)	15.54
 Jänschwalde	EPH	Lignite	6	15.31
 Weisweiler	RWE	Lignite	7	14.93
 Lippendorf	EPH/EnBW	Lignite	8 (▲1)	11.91
 Turów	PGE	Lignite	9 (▲2)	11.22
 Maritsa East 2	BEH	Lignite	10 (▲7)	10.93

Source: EU-ETS  
Europe covers EU-27, Switzerland, Norway, Iceland and Liechtenstein.

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## Limited uptick in coal leads power sector emissions to increase 3%

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Coal power emissions in the EU-ETS were 6% higher in 2022 than in 2021, but remained lower than 2019 levels.

As the energy crisis continued and fossil gas prices reached unprecedented highs in 2022, Europe was faced with a twin crisis of [unexpected nuclear outages and a 1-in-500 year drought](#) causing hydro output to plummet. The impact of this was a rise in fossil fuel generation, leading many to fear a 'coal comeback' in Europe. However, [this did not materialise](#) and in fact coal generation fell year-on-year in the last four months of 2022, a trend which is continuing into 2023.

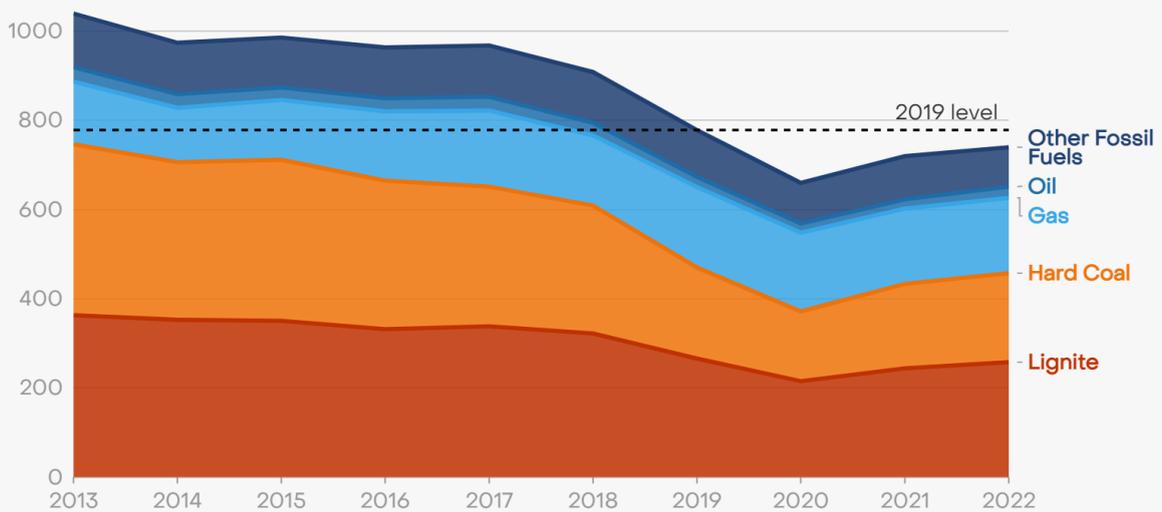
Due to an increase in coal generation in the first half of 2022, total coal generation in the EU was up by 7% in 2022 compared to 2021. This is reflected in a 6% rise in coal plant emissions in the EU-ETS. Despite this uptick, coal plant emissions in 2022 remained lower than 2019, and the increase was significantly lower than the 17% jump in 2021 when the [majority of gas-to-coal switching occurred](#). The long term trend of coal power emissions remains one of decline, with values in 2022 40% lower than a decade ago. Going forwards, [coal generation is expected to decrease in 2023](#).

In 2022, after years of over-reliance on fossil gas, Europe was forced to bring in temporary emergency measures to ensure energy security. These included lifting coal capacity limits, allowing some coal units to return to operation or extending their lifetimes beyond scheduled shutdown dates. A study on the [potential impact of Europe's temporary return to coal](#) estimated an additional 30 Mt CO<sub>2</sub>e a year from these emergency measures. In reality, the 6% increase in coal emissions released an extra 24 Mt CO<sub>2</sub>e compared to 2021. This is significantly less than this estimate, especially given it includes *all* coal plants from the EU-ETS, not just those covered by emergency measures.

With countries desperately trying to reduce gas consumption, nuclear and hydro issues across Europe's power sector left countries with little room to manoeuvre, and gas power generation remained unchanged in 2022. Similarly, gas power sector emissions remained the same as 2021 in spite of the escalating gas costs that Europe faced throughout 2022.

### Power sector emissions increase 3% in 2022 but remain below 2019 levels

EU-ETS power sector emissions (million tonnes CO2 equivalent)



Source: EU-ETS  
 Power sector includes plants that produce both electricity and heat (CHPs), as well as electricity only. Other fossil fuel includes peat and blast furnace gas.

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## Coal-reliant countries dominate power emissions

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When it comes to power sector emissions by country, the obvious culprits are those still burning coal. Germany and Poland are consistently responsible for around half the total EU power sector emissions, reaching their highest share of 53% in 2022. Coal features heavily in their emission mix - accounting for 78% and 87% respectively.

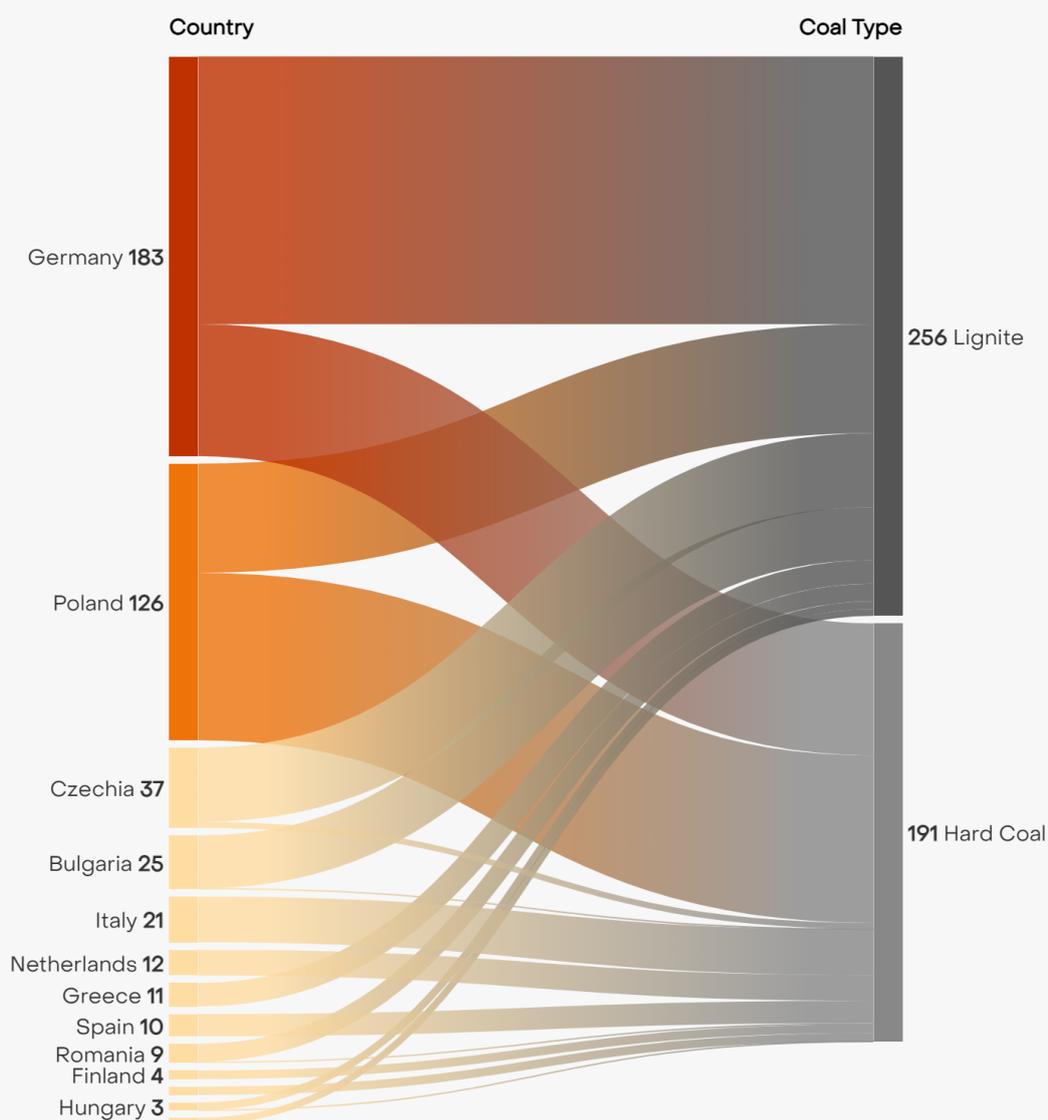
Coal power emissions are highly concentrated within a small number of countries in the EU-ETS. In 2022, Poland and Germany were responsible for two thirds of coal power emissions, add in Czechia and Bulgaria and this jumps to 80%.

However, in the last decade, German power sector emissions have dropped by one third as they reduced coal emissions by 100 Mt CO<sub>2</sub>e (-37%) compared to 2013, whilst Poland has cut coal power sector emissions by only 12%. In fact, Poland's share of EU-ETS coal power emissions has increased, jumping from 19% in 2013, to 28% in 2022. Germany's share of coal emissions has remained stable at 40%.

Fossil gas was responsible for around one quarter of power sector emissions in 2022, with Germany, Italy and Spain accounting for 60% of this.

## Germany and Poland responsible for two thirds of EU-ETS coal power emissions

EU-ETS power sector emissions 2022 (million tonnes CO2 equivalent)



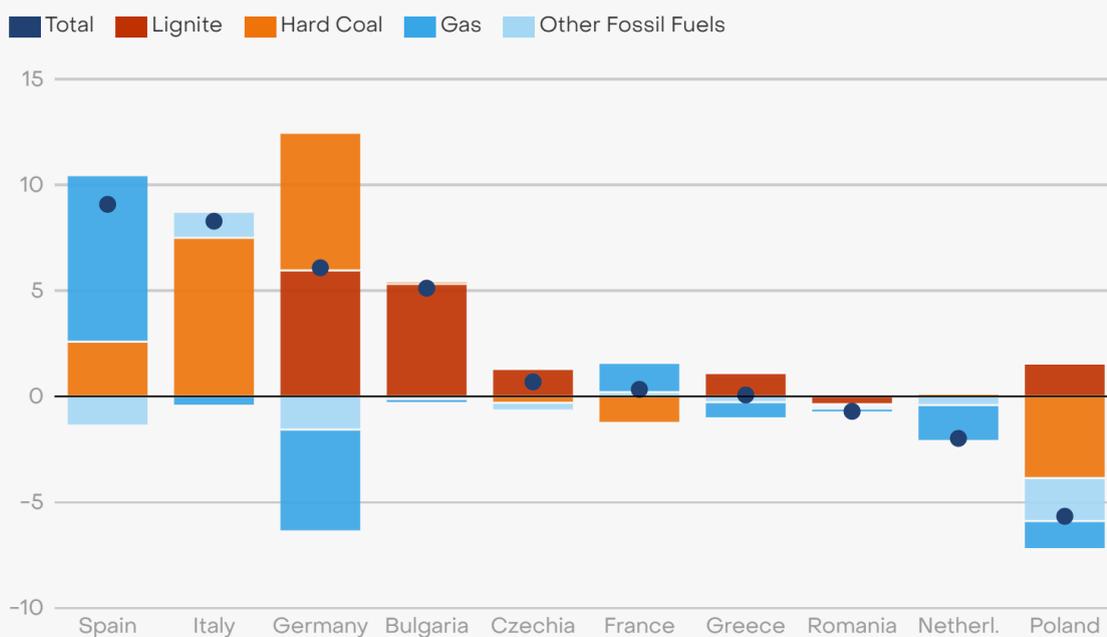
Source: EU-ETS  
 Countries with coal emissions lower than 3 Mt not included. Other fossil fuels includes peat and blast furnace gas.

Compared to 2021, Spain saw the largest increase in power sector emissions, as [subsidies were introduced](#) to reduce the cost of gas-fired power plants and [exports increased to France](#). German power sector emissions increased by 6 Mt CO2e as a drop in nuclear and hydro output led to increased coal.

Polish emissions saw the largest year-on-year drop of around 6 Mt CO<sub>2</sub>e (-4%) thanks to a drop in demand and increase in wind and solar power displacing gas and coal. However, long term, Poland has seen some of the lowest ambition in the EU on reducing power sector emissions, cutting them by just 13% since 2013. Only Bulgaria, Slovakia and Cyprus have made less progress.

### Spain sees largest increase as Poland reduces power sector emissions

Year-on-year change in EU-ETS power sector emissions 2022 (million tonnes CO<sub>2</sub> equivalent)



Source: EU-ETS  
 Top 10 countries by total power sector emissions 2022 displayed. Other fossil fuels includes oil, peat and blast furnace gas.

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## RWE, EPH & PGE top emitters for 6 years running

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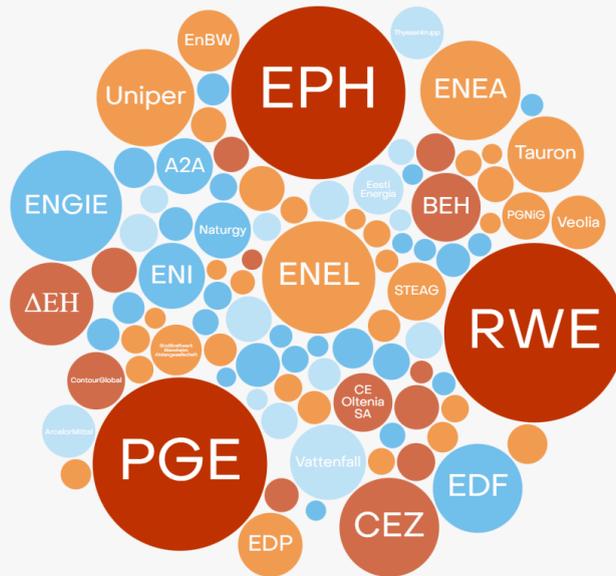
For the last six years, the top three emitting utilities have remained the same - German RWE, Polish PGE and Czech EPH. In 2022, RWE was responsible for the largest power emissions from a utility - 75 Mt CO<sub>2</sub>e, an increase of 3% compared to 2021 and roughly equal to the power sector emissions of Italy. PGE came in just behind with 70 Mt CO<sub>2</sub>e, followed by EPH at 69 Mt CO<sub>2</sub>e. The emissions of these three utilities account for 30% of power sector emissions and dwarf those of their companions - fourth place in 2022 was taken by Enel who were responsible for 29 Mt CO<sub>2</sub>e.

In 2022, lignite was responsible for 79% of emissions from these three big emitters, with another 15% from hard coal. In October 2022, RWE announced that they will [end lignite generation by 2030](#) - a huge step in the right direction and crucial if Germany is to reach its [clean power target of 80% by 2030](#). Sadly, no similar announcements have come from PGE or EPH. In fact, EPH is [actively prolonging the fossil fuel industry](#) - buying up old coal plants to continue running them and heavily investing in new gas infrastructure.

### 3 utilities outweigh others in EU power sector emissions

Utility EU-ETS power sector emissions 2022 (million tonnes CO2 equivalent)

■ Lignite ■ Hard Coal ■ Gas ■ Other Fossil Fuel



Source: EU-ETS  
 Colour represents fuel type responsible for largest share of utilities' emissions. Other fossil fuel includes peat and blast furnace gas. Utilities with emissions higher than 5 Mt CO2e named.

## Conclusion

# Coal emissions rise but long term trend remains one of decline

Uptick in coal power emissions temporary and limited detour on Europe's journey towards a clean power system

Europe's power system faced an unprecedented year in 2022. A combination of factors, including sky-high gas prices, low nuclear and hydro output and an urgent need to get off Russian gas conspired to create a temporary increase in Europe's coal emissions. Evidence shows this increase will be limited, both in size and duration, with coal power generation already starting to fall year-on-year from the end of 2022, a trend which is continuing into 2023.

The energy crisis has laid bare the risk of continued reliance on fossil fuels and many countries are responding by [raising renewables ambition](#). However, [certain governments](#) are using the crisis to shoe-horn in disproportionate emergency fossil fuel measures, which in most cases are not needed to meet demand. Total emissions in the power sector are held in the hands of a limited few repeat offenders, placing a duty on these countries or utilities to address the sources of their emissions responsibly. In order to provide secure, affordable and clean energy for their customers or citizens, they must begin enacting policies and transition plans that shift rapidly towards a renewables-based energy system.

## Supporting Materials

# Methodology

### **Missing Installations**

Some installations had not yet reported emissions when the data was downloaded on 1st May 2023. These installations accounted for roughly 9 Mt CO<sub>2</sub>e, less than 1 % of emissions in 2021. For these installations, emissions for 2022 were estimated provided their account status was 'open', they were not excluded from the ETS and they reported in 2021. To calculate their estimated emissions, a percentage change from 2021 was applied according to the sector the installation belongs to.

From 2021 onwards, the UK no longer reported emissions as part of the EU-ETS. This report looks exclusively at EU-27, Norway, Switzerland, Liechtenstein and Iceland emissions, however, previous Ember analysis of the EU-ETS is based on EU-ETS + UK data and may therefore appear different to the results presented here.

### **Multiple Keys**

Some installations are recorded under multiple keys in the EU-ETS data and must be added together to calculate their total emissions. For example, Boxberg power plant is split under DE 1453 and DE 1454.

### **Power Sector Definition**

The EUETS power sector records include combined heat and power plants along with power only. In this analysis, power sector is taken to include combined heat and power installations alongside power only installations.

Biomass and some waste generation is not included.

### **Fuel Categories**

Mappings for installation fuel types have been taken from previous Ember analysis and the [ETC/CME Dataset 1/2021](#).

Peat, non municipal waste, oil and blast furnace gases were all mapped to other unless clearly stated separately. In addition the primary fuel for many very small installations could

not be researched. These are also mapped to other, but are most likely small oil and gas plants, or oil and gas cofired in biomass plants.

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