

A photograph of a large, conical pile of coal in the foreground. In the background, a long conveyor belt system is visible, supported by a tall metal structure, extending across the frame under a clear blue sky.

Coal generation in OECD countries falls below half of its peak

As the UK, the birthplace of the Industrial Revolution, closes its last coal power plant, almost all OECD countries are making good progress on phasing out coal power, replacing it predominantly with solar and wind.

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Lead author : Dave Jones



About

This report analyses annual generation data from Ember's Data Explorer, to show how the electricity generation of the 38 OECD countries is evolving.

Lead authors

Dave Jones

Contributors

Data visualisation from Jivan Zhen Thiru and Chelsea Bruce-Lockhart. There was drafting support from Hannah Broadbent, Euan Graham and Kostantsa Rangelova.

Cover photo

Credit: [cbpix](#) / Alamy Stock Photo.

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Highlights

-52%

Decline in OECD coal generation since it peaked in 2007

17%

Share of coal generation in the OECD in 2023

27

Of the 38 OECD countries are committed to being coal-free by 2030

Halving coal power

The OECD's century-long reliance on coal power is rapidly coming to a close.

Ratcliffe-on-Soar, the UK's last coal power plant, closed at midnight on the 30th September 2024. And with it, a long chapter of coal power in the UK comes to a rapid close. It's not just the UK though: many countries around the world expanded coal power and are now in the process of moving away from it.

Among the world's richest countries, who were the first to embrace coal and will be the first to move away from it, the decline in coal power is rapidly accelerating.

01

OECD coal generation halved since its peak in 2007

OECD coal generation peaked in 2007, and last year reached half that level for the first time (-52%). Rapid growth in solar and wind was responsible for 87% of the fall in coal during this period. Consequently, coal generation fell to just 17% of the OECD total electricity generation in 2023, down from 36% at its peak in 2007.

02

A third of OECD countries are now coal-free

The UK is the 14th of 38 OECD countries to achieve a coal-free power system. Among the remaining 24 OECD countries that still have coal-fired electricity, 19 have seen coal power generation fall by at least 30% from its peak in 2007. Only four OECD countries have seen less than a 30% fall in coal from their peak, including South Korea and Japan. Türkiye was the only OECD country to set a new coal power record in 2023.

03

Three-quarters of OECD countries will be coal-free by 2030

Of the 38 OECD countries, 13 are targeting a Paris-aligned coal phase-out by 2030, on top of the 14 countries that are already coal-free. Most countries have good plans for expanding wind and solar which means coal power will continue to collapse this decade, even in the 11 countries that have not explicitly committed to a phase-out by 2030.

Good progress is being made to phase out coal power across the OECD, and that will continue throughout this decade. Many are now targeting a fully decarbonised power system by 2035, which means not only phasing out coal power, but also phasing out the majority of unabated gas power. They are doing this by doubling down on renewable electricity, to both replace fossil fuels and meet the increase in electricity demand as countries move to electric vehicles and heat pumps.

Coal power globally still hit a new record in 2023 as the fall in OECD coal power was outweighed by rising coal power in emerging economies in Asia. But the era of growing coal is coming to a close, as emerging economies switch investment from coal to clean power.

Once, coal power was a byword for industrial growth. Now clean energy is being used to drive industrial growth – not just in high-income countries, but throughout the world.

“Coal power is on its way out in the world’s richest economies. It may surprise some that the shift was not primarily to gas, but rather directly to solar and wind. It is encouraging to see mature economies now switch their focus to repowering their whole economy with clean energy, to ultimately close the chapter not only on coal, but on all fossil fuels.”

Dave Jones

Global Insights Programme Director, Ember



OECD coal power is half its peak

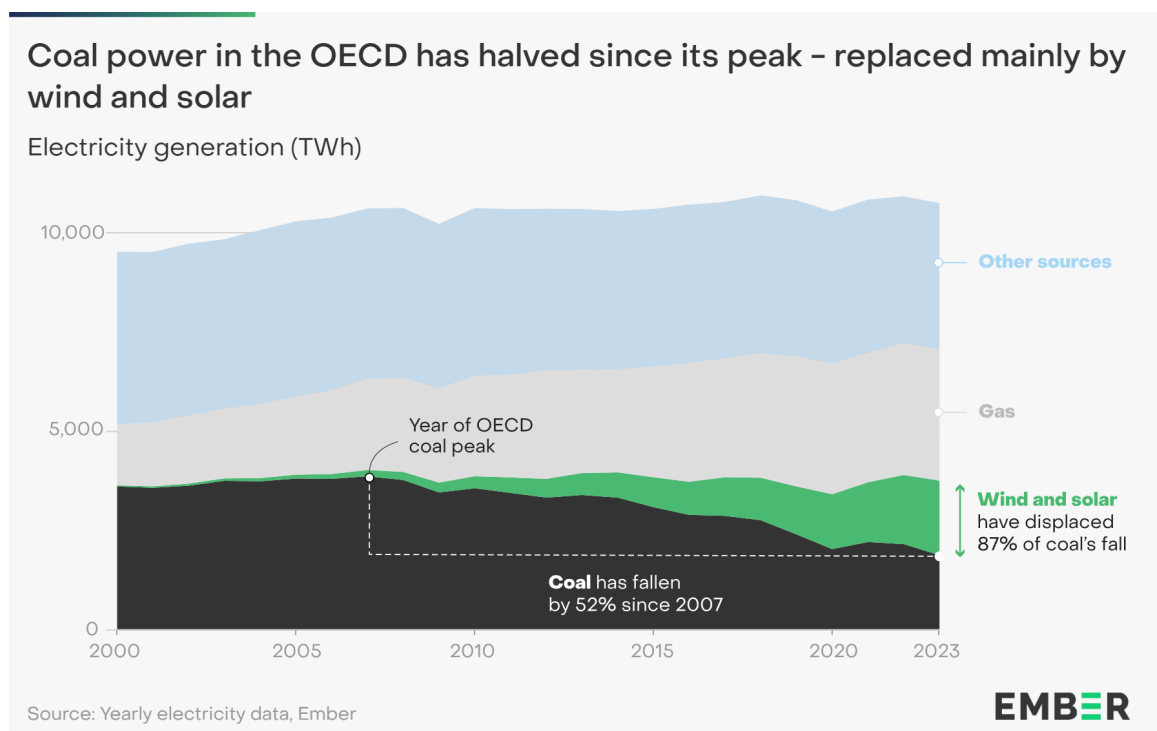
Wind and solar have made a substantial impact on making electricity cleaner, as coal generation in OECD countries falls below half of its peak.

Coal generation in the OECD peaked in 2007, and in 2023, it fell to less than half that peak for the first time. OECD coal generation fell by 52% (-1,989 TWh), from 3,854 TWh in 2007 to 1,865 TWh in 2023. Consequently, coal generation was just 17% of the OECD total electricity production in 2023, compared to 36% in 2007.

The vast majority of coal was replaced by wind and solar, which rose elevenfold (+1,723 TWh) from 2007 to 2023. This equals 87% of the fall in coal generation.

The switch from coal to renewables made electricity cleaner: the carbon intensity of electricity fell from 479 gCO₂ per kWh in 2007 to 341 in 2023.

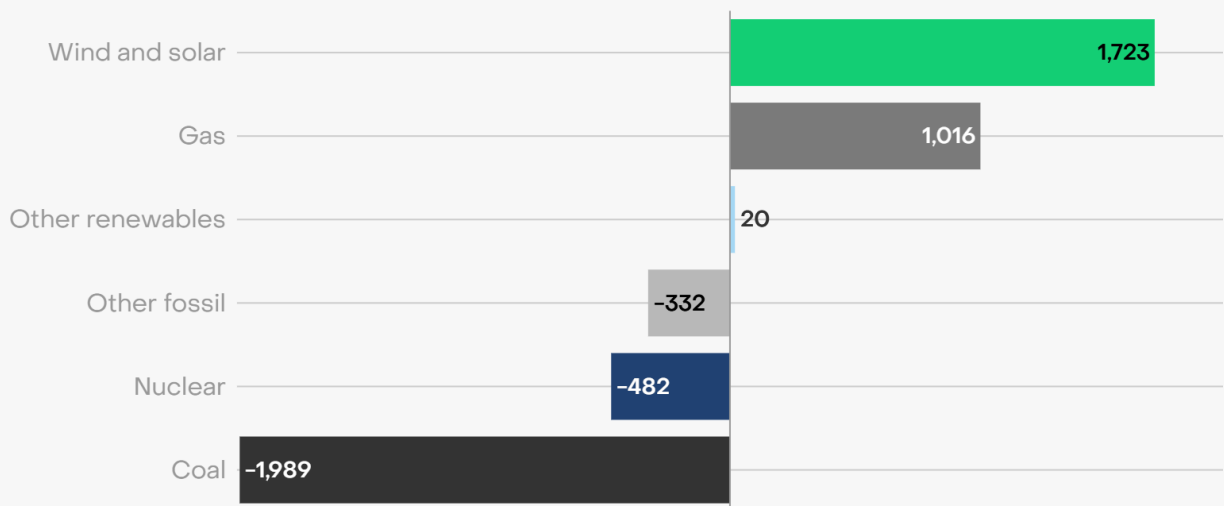
As a result of the fall in coal generation, total OECD power sector emissions fell by 28% from 2007 to 2023.



In addition to solar and wind, three other key factors enabled the decline in coal generation: modest growth in other renewables, stable electricity demand and some growth in gas, particularly in the US. Solar and wind accounted for 90% of the rise in renewables generation, but modest growth in bioenergy, hydro and other renewables also played a role in replacing coal. Nuclear generation fell by 21% as nuclear power plants were closed, especially across Japan and Germany. Gas and oil generation rose in aggregate by 24%. 89% of the rise in gas generation happened in the US, which has seen a significant switch from coal to gas generation. The OECD's halving of coal generation was also helped by stable electricity demand in the OECD, which rose by only 1%, meaning that renewables growth was able to replace fossil fuels rather than just meeting new demand.

OECD countries have displaced coal usage with wind and solar

Change in electricity mix from 2007 to 2023 (TWh)



Source: Annual electricity data, Ember

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Coal in decline across the OECD

The majority of OECD countries are progressing towards a phase-out of coal power. Of the 38 countries in the OECD, over a third are already coal-free: three never had coal power plants, and a further 11 have closed all their coal power plants. In the remaining 24 OECD countries that still have coal-fired electricity: 19 have seen coal power generation fall by at least 30% from its peak, four saw a lesser fall in coal generation, and only one country – Türkiye – set a [new record](#) for coal generation in 2023.

Third of the OECD now coal-free

14 OECD countries – more than a third of the 38 countries in the OECD – no longer generate electricity from coal.

Three never had coal power plants: Costa Rica, Estonia, and Lithuania.

There are a further 11 OECD countries that once used coal, but have since [closed](#) their last coal power plant: Iceland in 1951, Switzerland in 1960, Luxembourg in 1998, Latvia in 2010, Belgium in 2016, Sweden and Austria in 2020, Portugal in 2021, Norway in [2023](#), and Slovakia in 2024. Each of these countries had more wind and solar generation in 2023 than they had coal at the peak.

The UK has now also joined the list; its last power plant closed at midnight on the 30th of September this year, although its shift from coal to wind and solar was mostly already complete half a decade ago. Coal power made up almost 40% of UK generation in 2012, shrinking to 2% by 2019, and finally falling to zero by October 2024. Ember's report [The UK's journey to a coal power phase-out](#) analyses how the UK achieved this transition.

Coal power in rapid decline in the majority of the OECD

Among the remaining 24 OECD countries that still have coal-fired electricity, 19 OECD countries have seen coal generation fall by at least 30% from its peak. In the vast majority, solar and wind have been the driving factors replacing coal.

Among these, there are ten countries where solar and wind replaced coal (i.e. solar and wind generation rose by more than the decline in coal since its peak). This includes many of the countries that have seen the biggest falls in coal, including Spain where coal declined 95% from its peak in 2002, as well as France (-92% since 2005), Ireland (-85% since 2001), the Netherlands (-79% since 2015) and Hungary (-71% since 2000).

The US was the only OECD country that saw a large uptick in gas as coal phased down. Its rise in wind and solar generation was just under half (47%) of the fall of coal generation, while gas met much of the rest. So whilst coal generation fell by an impressive two-thirds (-66%) by 2023 from its peak in 2007, power sector emissions fell by a more modest 34%.

There are only two countries – Slovenia and Czechia – which achieved a significant fall in coal but where wind and solar generation did not rise to cover at least a third of the fall in coal generation. The fall in coal was instead driven by lower electricity demand and fewer electricity exports.

The rapid declines in coal generation achieved among the majority of OECD countries have been impressive. But for some, there is still a significant way to go to achieve a full coal phase-out. Among the 19 OECD countries seeing rapid declines in coal, there are still four countries that rely on coal for more than a quarter of their electricity: Poland (61%), Australia (46%), Czechia (40%) and Germany (27%).

Five OECD countries are around the peak of coal power

Four of the 38 OECD countries saw coal generation in 2023 fall by less than 30% from its peak: Japan, South Korea, Colombia and Mexico. Only one OECD country – Türkiye – has not yet passed the peak of coal power, setting a new record for coal generation in 2023.

Türkiye set a new coal generation [record](#) in 2023, overtaking Poland to become the second largest coal generator in Europe after Germany, with coal accounting for 37% of its electricity supply (118 TWh). However, coal is not booming in Türkiye: it was only 5% higher in 2023 than five years before in 2018. At that time, Türkiye was planning the world's third-largest increase in coal power plants, but these have since been cancelled, avoiding a major increase in coal. Unlocking [Türkiye's untapped solar potential](#) can help meet growing demand and replace coal power.

Japan's coal generation in 2023 was only 9% below its peak in 2017. There has not been a large build-out of clean power despite its nuclear closures of 2012. Its wind and solar share of electricity was 12% in 2023, below the US at 16% and the EU at 27%. Japan still relied on coal for 32% of its electricity in 2023, almost double the OECD average of 17%.

South Korea's coal generation in 2023 was only 21% below its 2017 peak. It is one of the few OECD countries that has seen a large rise in electricity demand, which has doubled since 2000. The rise in clean power was not enough to meet this demand growth. As of 2023, coal generation was almost twice as high as in 2000, even though it has fallen from its peak. Gas generation is five times as high.

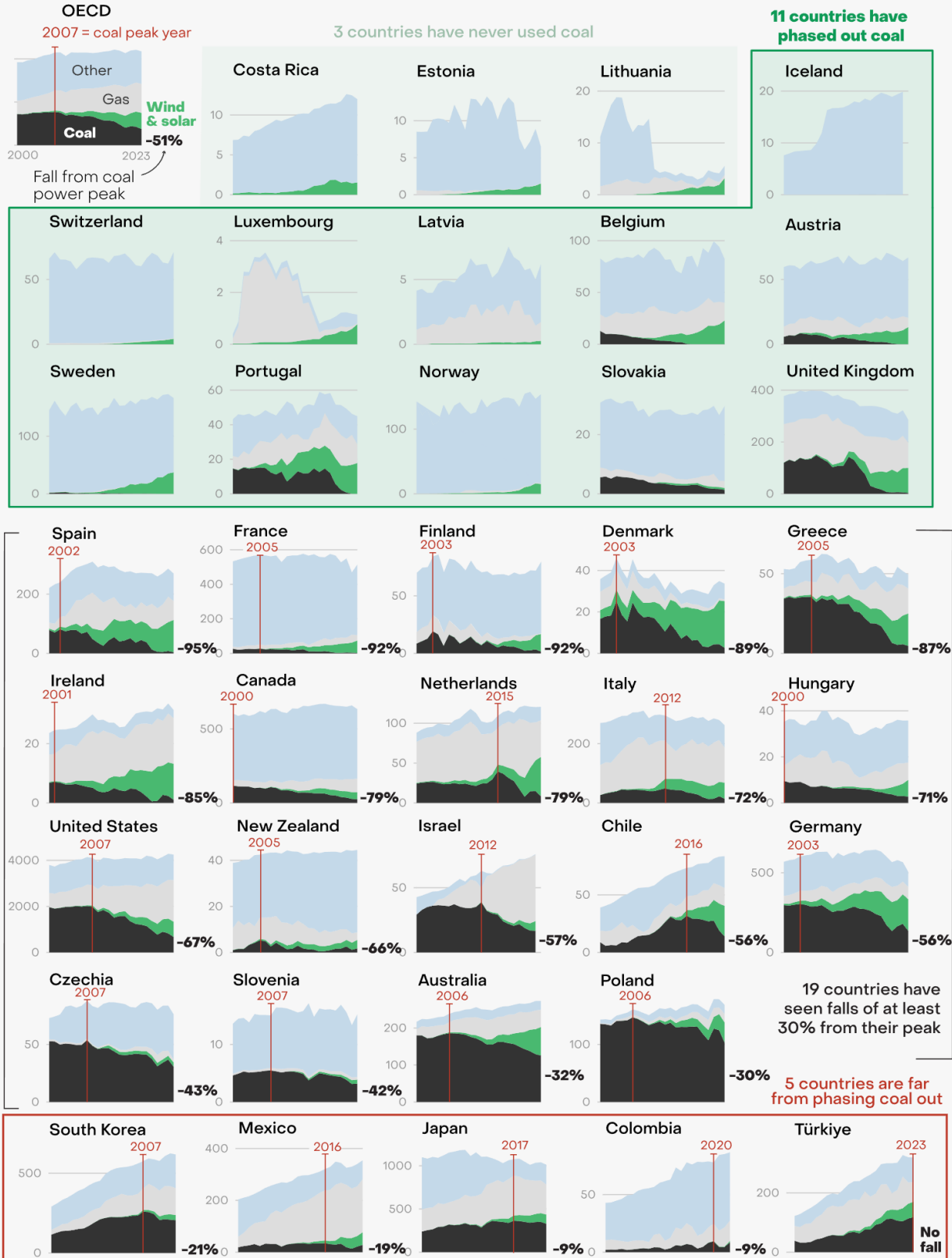
Together, Türkiye, Japan and South Korea represented 35% of remaining coal generation in the OECD in 2023.

Colombia and Mexico's coal generation in 2023 was 9% and 19% respectively below their peaks in 2020 and 2016. Both countries have a relatively small reliance on coal, accounting for just 10% and 8% respectively of their total electricity supply in 2023.

A coal phaseout is well underway in the OECD; a third of its member states are already coal-free

Electricity generation, 2000-2023 (TWh)

Countries ordered by percentage fall in coal generation, since their peak →



Source: Yearly electricity data, Ember · Where coal has already been phased out, countries have been ordered by year of final plant closure; Graphic by Jivan Zhen Thiru and Chelsea Bruce-Lockhart

The final half

Coal generation in the OECD has halved in the last 16 years, but the final half will decline even more rapidly. Almost three-quarters of the OECD is on track for a 2030 coal phase-out, which is required in 1.5C-aligned pathways. The remaining countries are seeing rapid growth in solar and wind, which will ensure that coal power will continue to decline. The next milestone of a fully decarbonised power system by 2035 brings both a coal and gas phase-out into sight.

Science-based targets for the OECD

The science shows that all coal power must be phased out in OECD countries by 2030, to keep global heating to 1.5C. This was the result of the 2019 Climate Analytics [report](#) of IPCC modelling, and was also a key recommendation in the IEA's first Net Zero [report](#) in May 2021.

Furthermore, for a 1.5C aligned pathway, OECD countries would need net zero power sectors by 2035. The IEA's report [Achieving Net Zero Electricity Sectors in G7 Members](#) made this recommendation in 2021. This led the G7 to commit to “predominantly decarbonise their electricity systems by 2035.” The 2035 net zero power sector target was reinforced in the latest IEA [Net Zero Roadmap](#) report, while the coal phase-out language was modified to “in the 2030s”.

Three-quarters of the OECD on track for a 2030 coal phase-out

Almost three-quarters of the OECD is on track for a 2030 coal phase-out. As well as the 14 countries that are already coal-free, a further 13 countries have committed to phase out coal power by 2030. These include many EU countries, as well as Canada, Chile, Israel and New Zealand.

There are still 11 countries that have not yet committed to a 2030 coal phase-out, though coal is certain to continue to fall rapidly.

This is primarily because some of these countries do have near-2030 commitments. Slovenia and Czechia have committed to close all coal plants by 2033. The US has [committed](#) to a carbon-free power sector by 2035, and the NREL [projected](#) that the Inflation Reduction Act – implemented to help step up clean electricity – will bring unabated coal power to very low levels by 2030.

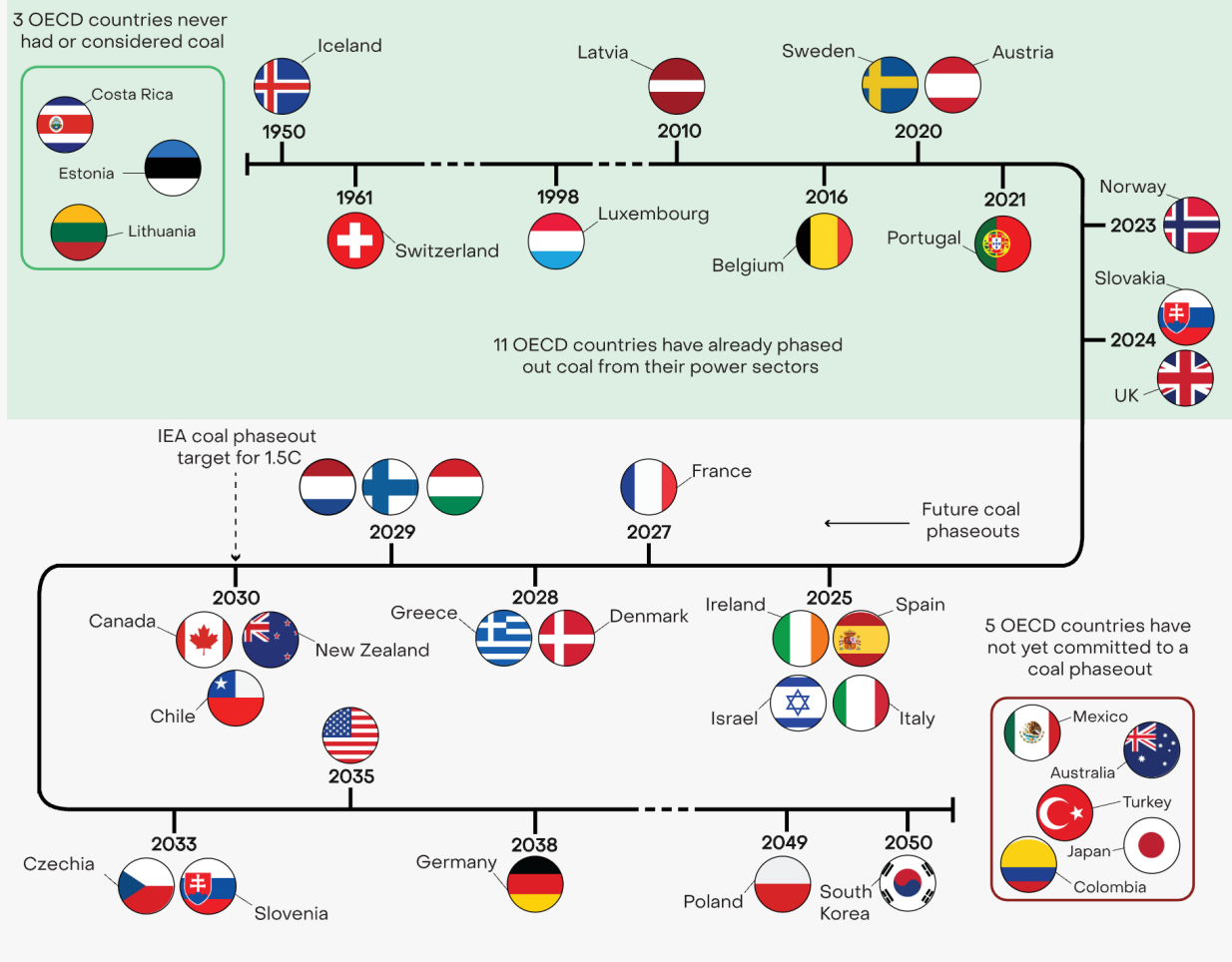
Secondly, some of these 11 countries have big plans for renewables, which should guarantee that coal continues to fall rapidly in these countries. Germany and Poland – the EU's largest coal generators – have committed to huge increases in the share of renewables from 2023 to 2030; Germany [from](#) 32% to 80%, and Poland [from](#) 27% to 51%. Australia has not yet committed to phase out coal, but it has [committed](#) to increase renewables from 36% of its electricity in 2023 to 81% in 2030.

Thirdly, even the countries with the slowest progress are still planning a decline in coal. In Japan, the 2021 Sixth Strategic Energy Plan for 2030 [proposes](#) to cut coal generation from 32% of Japan's electricity in 2023 to 19% by 2030. Korea's [new energy plan](#) targets to halve coal from 33% in 2023 to 17% in 2030.

Although Türkiye currently has no commitment to phase out coal, it does plan to increase the share of solar and wind in electricity generation from 16% in 2023 to over 23% by 2030 and 34% by 2035.

A third of OECD countries are now coal-free

Coal phaseout dates for the power sector, past and committed



Source: E3G Coal Transition Progress Tracker: OECD & EU Countries



Conclusion

Closing the chapter on coal

The rapid displacement of coal power by solar and wind in the OECD gives confidence that coal will soon be consigned to history.

In 2021, at COP26 in Glasgow, the UK presidency consigned to commit coal to history. In the OECD countries, this is happening. Coal power in the OECD has already halved since its peak, and will continue to collapse this decade. It won't be completely phased out by 2030 in every OECD country, but it will be a shadow of its former self.

This matters, because coal, [more than any other fossil fuel](#), has added to climate change. And the world's richest countries bear the largest historical responsibility for this. Many OECD countries began to industrialise over a century ago, with coal as a key source of energy. But a new era has arrived, as the world upgrades to cleaner and cheaper sources of electricity like solar and wind.

And countries in the OECD are not just targeting coal power. A focus towards a net zero power sector in many OECD countries means gas power will also begin to fall rapidly in the years ahead. This is critical since OECD countries now produce more electricity from gas than coal. Over half (52%) of OECD electricity in 2023 still came from fossil fuels, so achieving net zero power by 2035 would mean decarbonising half the OECD's electricity supply in just 13 years.

Many OECD countries have committed to keeping to a 1.5C aligned pathway; the [IEA](#) shows this would require an 80% fall in OECD economy-wide emissions by 2035. The upcoming submission of new Nationally Determined Contributions (NDCs) to 2035 will reveal the level of ambition in these countries. But the direction of travel is clear – OECD nations will be the first to decarbonise their power systems, setting a precedent for what can be achieved worldwide.

As OECD coal power has been falling, it has risen rapidly in emerging economies in Asia. Globally coal power hit a new record last year, producing 30% of all global energy-related CO₂ emissions according to the [IEA](#).

In the 16 years since OECD coal generation peaked, China's coal power has doubled, India's has tripled and Southeast Asia's has quadrupled. Between them, they accounted for three-quarters of the world's coal generation in 2023 – 55%, 14% and 5% respectively. Rapid demand growth in emerging economies requires an even more ambitious plan to scale renewables than required in OECD countries.

But the era of rising global coal use, too, is coming to an end. China is building renewables so quickly that coal power might have already [peaked](#), and India's [renewables plans](#) mean that coal power will not grow too aggressively this decade. It is not just the OECD that has been on the journey of switching focus from coal to renewables.

For so long, coal power was synonymous with industrial growth. The tables have now turned, and policymakers throughout the world are instead [basing](#) industrial strategy around clean energy.

Supporting Materials

Methodology

The data and the methodology can be accessed [here](#).

Acknowledgements

Contributors

This lead author was Dave Jones, with data visualisation from Jivan Zhen Thiru and Chelsea Bruce-Lockhart. There was drafting support from Hannah Broadbent, Euan Graham and Kostantsa Rangelova.

Cover photo

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Ember

The Fisheries,
1 Mentmore Terrace,
London Fields,
E8 3PN

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info@ember-climate.org

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