



Half of the world is past a peak in fossil power

Half of the world's economies are already at least five years past a peak in power generation from fossil fuels, with emissions from these 107 power sectors falling by almost 20% in the last decade.

Published date: 20th October 2023

Lead author: Chelsea Bruce-Lockhart

Other authors: Nicolas Fulghum, Dave Jones

Contents

[Executive summary](#)

[Analysis](#)

[Supporting materials](#)

About

This analysis reviews trends in fossil power generation from 2000 to 2022 from Ember's dataset of global electricity data from 215 countries.

Executive Summary

Half of the world has passed peak fossil power

There is growing evidence that the world is close to a global peak in power sector emissions.

01 107 economies past 'peak' fossil power

Half of the world's economies are already at least five years past a peak in electricity generation from fossil fuels. Emissions from these 107 power sectors have fallen by almost 20% in the last decade. Collectively, they represent 38% of global electricity demand. Economies which are at least one year past a peak in fossil power represent 50% of global demand, setting the stage for a peak and subsequent decline in global power sector emissions.

02 78 post-peak economies have displaced fossil power with clean energy

The vast majority (78) of the economies already five years past a peak in fossil power have displaced fossil generation through the expansion of clean power in the years since. 45 of these economies achieved this even as overall generation increased, in most cases driven by an increase in electricity demand.

03 Fossil power peaks are happening in every corner of the globe

The EU, Oceania and North America are already well into a period of fossil power decline, with fossil generation dropping by 30%, 20% and 15%, respectively, from their regional peaks. Fossil power appears to have plateaued in Africa at a continent-wide level; a similar flattening is true for Latin America and the Caribbean, which has been the case for over a decade. The only regions yet to reach a peak are Asia and the Middle East. But there are success stories in these regions too: Viet Nam has reduced its fossil generation by 16% in just three years while Jordan and the UAE have almost reached five years since their peak in fossil generation.

Earlier this year, [Ember's analysis](#) showed that 2023 may be the first year with structurally falling global emissions from the power sector if clean power growth continues. However, Ember's [mid-year analysis](#) showed that adverse hydro conditions in the first half of 2023 meant that power sector emissions plateaued rather than fell. It still remains too close to call whether power sector emissions will fall across the full year in 2023; if they do not, then the new era of falling power sector emissions would still likely start in 2024.

Reaching 'peak' fossil generation, and therefore emissions, in the power sector is a crucial milestone in the global transition to a clean, electrified economy. But the most critical part is what happens next. To achieve the rapid declines in emissions required this decade, there needs to be a fast acceleration in the deployment of wind and solar power as they need to provide about 40% of global power by 2030, according to the IEA's [latest net zero scenario](#). Tripling global renewable capacity by 2030 is the single biggest action that governments can take to put the world on course for a 1.5C aligned pathway.

Not many people realise just how many countries' power sectors are already well into a phase of fossil decline. For many countries, this was done simultaneously to rising electricity demand. Such is the success of solar and wind, the peak is close even in many key emerging economies. We are on the cusp of a new era of fossil decline in the global power sector.

Dave Jones

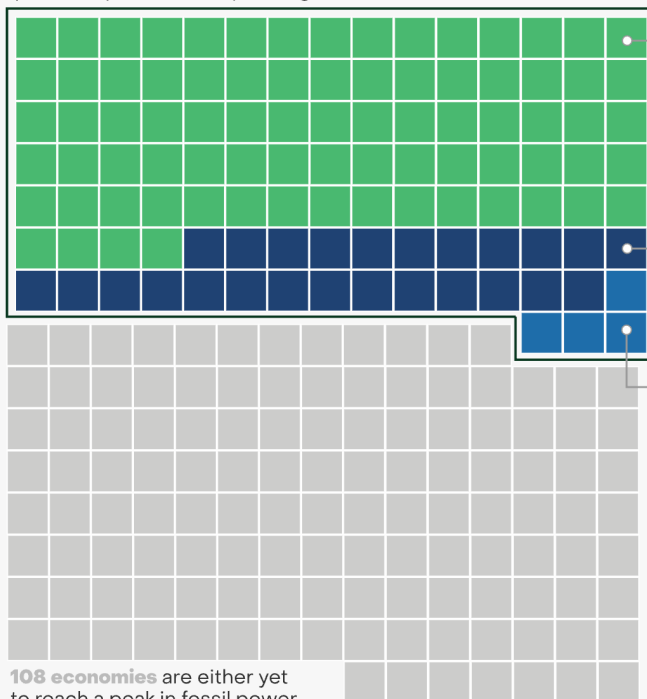
Global Insights Lead, Ember



Half the world's economies are past peak fossil power

A country is considered to have passed a fossil power peak if electricity generation from fossil fuels reached a maximum at least 5 years ago

107 economies are at least five years passed a peak in fossil power generation = 1 economy



78 economies have displaced fossil power with clean energy in the years since a post-2000 peak; 49 did so despite rising electricity generation.

In these countries a future fossil peak is least likely since displaced fossil power is already being generated by cleaner means.

For **25 economies**, any declines in fossil generation have mostly been caused by demand falls, or have been replaced by imports.

A further **4 economies** increased generation without ramping up fossil power, meaning additional demand was met with clean energy alone.

108 economies are either yet to reach a peak in fossil power generation or less than 5 years beyond a peak

Source: Ember calculations; Annual electricity data, Ember
 The breakdown of how fossil generation has been displaced or suppressed since a fossil power peak, refers to changes since peaks recorded in the period 2000 to latest year. An individual country's fossil generation may have peaked even earlier than the year 2000

Analysis

Half of the world has passed peak fossil power

107 of 215 economies passed peak fossil generation at least five years ago, setting the stage for a global peak and subsequent decline in power sector emissions.

Nearing a global peak in fossil power

Half of the world's economies are already five years past a peak in power generation from fossil fuels. In these 107 power sectors, emissions have fallen by almost 20% in the last decade. Together, they represent 38% of global electricity demand. Economies at least one year past a peak in fossil power, according to the latest year of available data, represent 50% of electricity demand.

In 2022, global fossil generation increased by only 1.2% year-on-year compared to a historical average annual growth rate of 1.6% between 2011 and 2021. So far this year, global power sector emissions arising from fossil power generation are already plateauing, with [Ember analysis](#) showing that emissions only increased by 0.2% in the first half of 2023.

The stage seems set for a global peak in power generation from fossil fuels. As this trend of falling fossil power continues to manifest in more and more countries, the global power sector will move into a new era of structurally falling power sector emissions.

The slowdown in power sector emissions has been driven by a rapid expansion in renewable electricity, mainly from wind and solar. Global electricity generation from wind and solar more than tripled from 2015 to 2022, limiting growth in fossil generation even as global power demand continued to grow. Without wind and solar rising in the global power mix, emissions from the power sector today would be 20% higher.

Only when clean electricity growth can meet and exceed rising demand will we see a displacement of fossil fuels in the power sector and a subsequent fall in global power sector emissions.

As many as 78 of the 107 economies already at least five years past a peak in fossil power have managed to displace fossil fuels in the years since a post-2000 fossil power high through the expansion of clean energy. 45 of these economies achieved this even as overall generation increased, in most cases driven by an increase in electricity demand. In these economies it is unlikely another peak in fossil power will occur in the future since the fossil power generation displaced is already being generated by cleaner means.

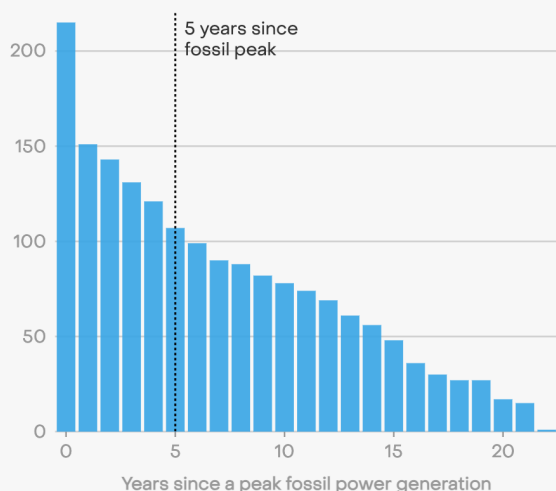
An additional four economies managed to increase generation without ramping up fossil power, meaning additional demand was met with clean energy alone.

For the remaining 25 economies considered to be at least five years past a peak in fossil generation, subsequent fossil declines have largely been due to drops in demand, either through efficiency gains or external factors such as recession, civil unrest or conflict, or due to an increase in electricity imports. In these economies where clean power growth was not responsible for a fall in fossil generation, it is possible another peak in fossil power could occur in the future to meet increasing demand.

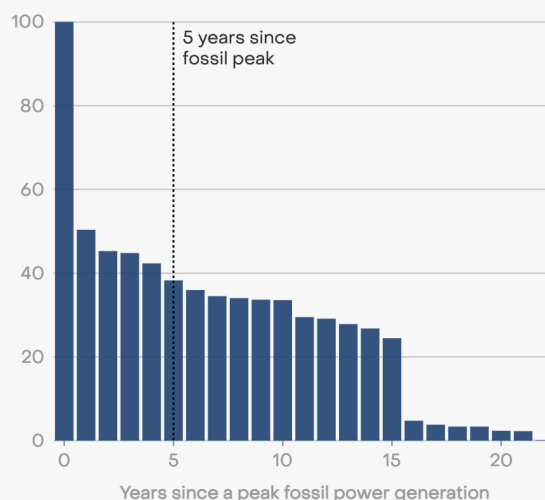
Fossil power peaked more than five years ago for more than 107 economies; they account for 38% of global electricity demand

Number of economies and their share of demand, by years since a fossil power peak for the period 2000 to latest year

Number of economies



Share of global demand* (%)



Source: Ember analysis of annual electricity data, Ember
*Based on latest year of available data for each country



107 economies passed peak fossil power more than five years ago

Countries are moving beyond a peak in fossil power in almost every region of the world.

The EU is leading the way in displacing fossil fuels from the power sector, having cut fossil power by more than 30% in the last 15 years. Among EU countries, all but one (Latvia) have passed the milestone of five years since a peak in fossil power this millennium. Of the larger EU member states, Denmark and Finland have recorded the biggest declines this century, with fossil power generation in 2022 more than 80% below levels reached almost two decades ago.

Oceania is also well into a period of fossil power decline having cut fossil generation by 20% in the last 13 years. Its success is largely down to progress made in Australia and New Zealand, which account for the vast majority (96%) of power demand in the region, and have cut fossil power by 20% and 56%, respectively, from their peaks.

In North America, fossil generation is already 15% lower than it was 15 years ago, largely influenced by changes in the US where fossil use in the power sector has dropped by 14% over the same period.

Ember's data also shows that electricity generation from fossil fuels in Africa has plateaued, reducing by 0.5% in the last 3 years. Fossil fuel generation within Latin America and the Caribbean has similarly flattened, a trend that has persisted for over a decade. Peaks are also taking place in some of the largest economies in these regions. Chile's fossil power is down by 20% from a peak six years ago, despite electricity demand increasing. Nigeria's fossil power has dropped by 8% in the last 8 years, again while electricity demand has risen.

The only regions that have yet to reach a peak in fossil power are the Middle East and Asia. However, Asia has some success stories. Nepal has removed fossil fuels from its power sector entirely. Japan's fossil power has dropped by more than a fifth since its peak a decade ago. Viet Nam has reduced its fossil generation by 16% in just three years, largely due to the expansion of wind and solar.

In the Middle East, just two countries with power demand unaffected by major conflicts – Jordan and the UAE – are approaching five years past a peak in fossil power.

Of G20 countries, 10 countries are more than five years past a peak in fossil generation - the UK, Italy, Canada, Germany, Japan, South Africa, Australia, the US, France and Argentina, leaving the other 10 yet to reach this milestone. Yet, even in China, where electricity demand is expanding more rapidly than any other country, President Xi has [pledged](#) that coal use will begin to fall from 2026, as the country leads the world in wind and solar additions.

Supporting Materials

Methodology

Summary

This report analyses annual power generation for 215 countries from 2000 to 2021, with 2022 data included for 78 countries representing 93% of global power demand. Data is collected from multi-country datasets (EIA, Eurostat, BP) as well as national sources (e.g. China data from the National Bureau of Statistics). The latest annual generation data is estimated using monthly generation data. A detailed methodology can be accessed [here](#). All the data can be viewed and downloaded freely from Ember's website.

Caveats

This analysis focuses on domestic electricity generation from 2000 to 2022. An individual country's fossil generation may have peaked earlier than the year 2000, meaning the number of years since its true historical peak is even higher than recorded in this analysis.

If fossil generation is unchanged for at least five years since a country's initial fossil power peak, it is considered to have passed its peak.

Falls in fossil generation for some economies may have been caused by external factors such as war, civil unrest or recession. A few economies reported to be past a peak in fossil power may have replaced domestic fossil generation with electricity imports. Emissions from those imports have not been accounted for.

Acknowledgements

Cover image

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

© Ember, 2023

Published under a Creative Commons ShareAlike Attribution Licence (CC BY-SA 4.0). You are actively encouraged to share and adapt the report, but you must credit the authors and title, and you must share any material you create under the same licence.