EMBER

Global Electricity Review 2026

Solar surge halts fossil generation rise as clean power meets all demand growth and renewables overtake coal

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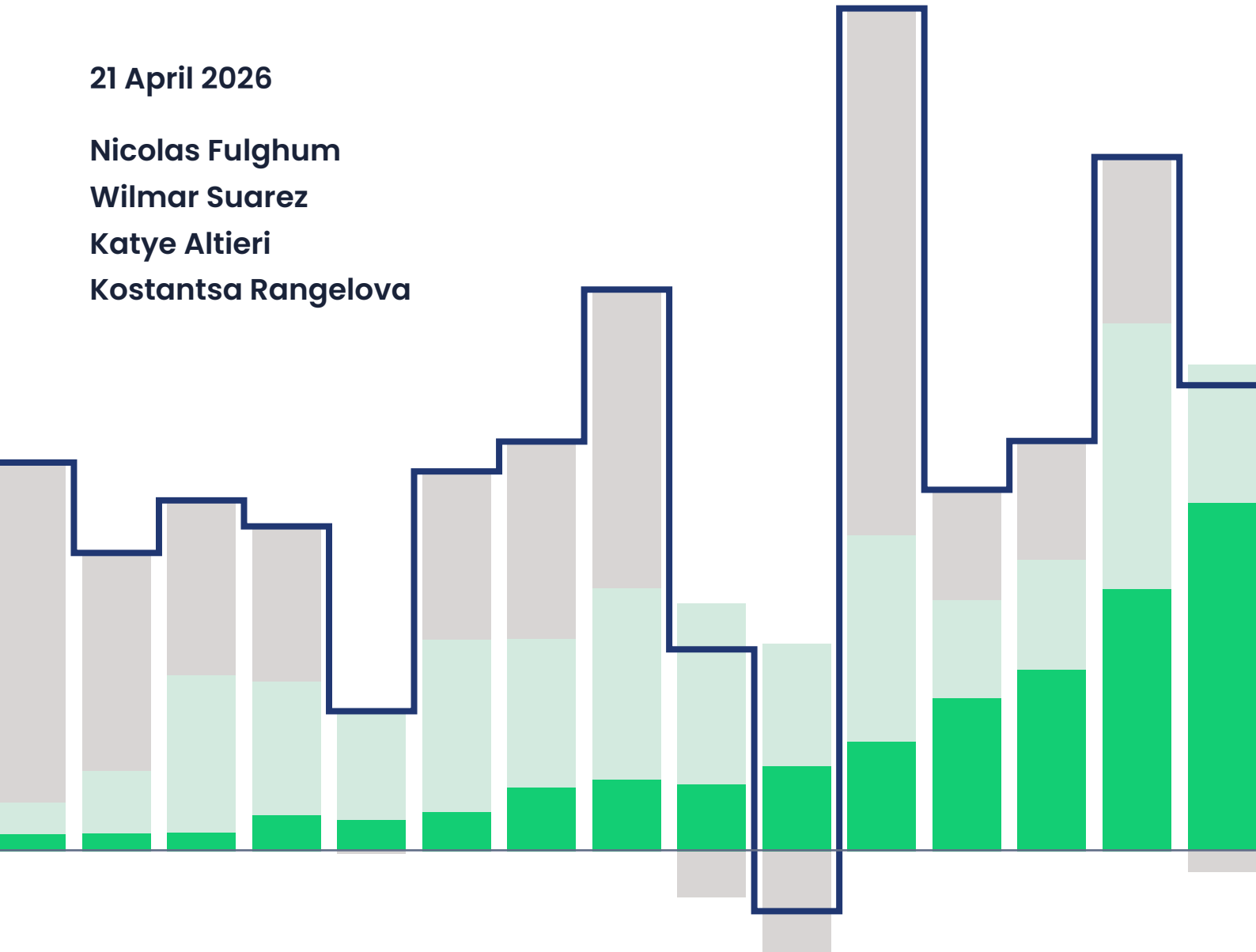

About

Ember's seventh annual Global Electricity Review provides the first comprehensive overview of changes in global and country-level electricity generation in 2025, based on reported data. It presents current trends and implications for electricity sources and power sector emissions in the near future. With the report, Ember is also releasing the first comprehensive, free dataset of global electricity generation in 2025.

The report analyses electricity data from 215 countries, including the latest 2025 data for 91 countries representing 93% of global electricity demand. The analysis also includes data for 13 geographic and economic groupings, such as Africa, Asia, Latin America, the EU and the G7. It also dives deeper into the seven countries and regions with the highest electricity demand, which account for 72% of global electricity demand. In addition to electricity generation data, the report uses weather and capacity data to uncover the underlying trends shaping the global power sector.

We make all of the data freely accessible to empower others to do their own analysis and help speed up the switch to clean electricity.

This report is the first in a sequence of annual global flagship reports from Ember, including the China Energy Transition Review, Electrotech Revolution, and our partnership in the Energy Institute Statistical Review of World Energy.

Read the report online at:
https://ember-energy.org/latest-insights/global-electricity-review-2026/

Highlights

75%

Share of global electricity demand growth met by solar power in 2025.

33.8%

Share of renewables in global power generation in 2025 – above a third for the first time, overtaking coal.

-0.2 %

Year-on-year change in fossil generation.

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Foreword

The global energy system is under increasing strain. Recent years, and indeed recent months, have highlighted the inherent vulnerabilities of a system built around fossil fuels — exposure to price volatility, geopolitical risk and supply disruption.

These pressures are not temporary; they reflect structural characteristics of how the system operates today.

This year's Global Electricity Review shows that an alternative is not only emerging but scaling quickly, with clean power meeting all growth in global electricity demand.

Solar has become the leading source of new generation, supported by battery storage that is beginning to provide system flexibility at scale. In major economies including China and India, fossil generation declined last year even as demand continued to grow.

These developments point to a shift in the underlying dynamics of the power system: clean electricity is increasingly meeting demand growth.

This transition remains uneven and incomplete. Fossil fuels continue to play a significant role, and progress varies across regions.

But the direction of travel is becoming clearer, and the technologies driving change are scaling rapidly.

As Ember works with the Energy Institute on the forthcoming Statistical Review of World Energy, there is an opportunity to build on this perspective across the wider energy system — combining a robust global energy dataset with deeper insight into the structural changes now underway.

Baroness Bryony Worthington
Founder and Chair of the Board, Ember

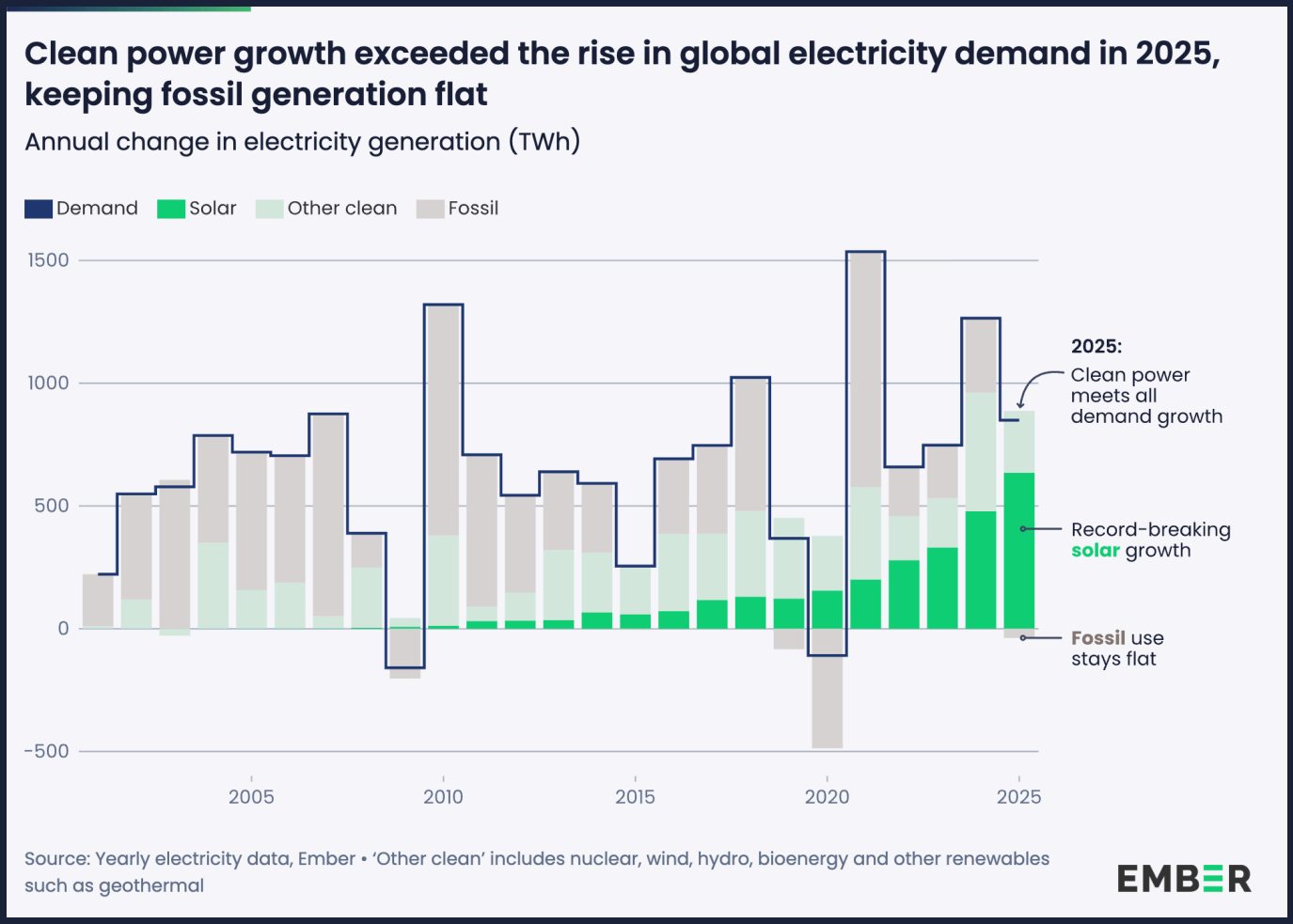
Solar surge halts fossil generation rise as renewables overtake coal

Record solar growth meant clean power sources grew fast enough to meet all new electricity demand in 2025, thereby preventing an increase in fossil generation. This was the first year since 2020 without an increase in electricity generation from fossil fuels and only the fifth year without a rise this century.

China and India, historically the largest contributors to the global rise in fossil power, both recorded a fall in fossil generation in 2025. In both countries, record clean power additions outpaced demand growth. This brought global net growth in fossil generation to a halt.

Solar power cemented its role as the dominant driver of change in the global power sector, with its record growth meeting three-quarters of the net rise in electricity demand in 2025. Solar's rise was 18 times larger than that of gas, the only fossil fuel that increased in 2025. Global solar generation is now the same size as the total electricity demand of the EU.

China once again led solar build-out, recording more than half of the global increase in both solar capacity and solar generation in 2025. This pushed the share of solar and wind in China's generation mix to 22%, surpassing the OECD average (20%). India also ramped up clean power deployment. Renewable generation growth doubled its previous record, and India installed more new solar capacity than the United States for the first time.



In another global milestone, renewables overtook coal power in 2025. Solar, wind, hydropower and other renewable sources together contributed more than a third of global electricity generation for the first time in the modern power system. Conversely, the share of coal power fell below a third for the first time in history.

The accelerating build-out of solar power is increasingly taking place alongside battery storage deployment, enabling the next paradigm shift – from daytime solar to anytime solar. Battery costs fell sharply for the second consecutive year. In 2024, battery costs dropped 20%. In 2025, they fell a further 45%, while deployment grew 46% to an estimated 250 GWh. As a result, the world installed enough battery capacity to shift 14% of the new solar generation in 2025 from midday to other hours of the day.

Front-runners such as Chile and Australia installed enough grid-level storage to shift over 50% of new solar generation in 2025 and are already seeing benefits in lower power prices and reduced curtailment.

Key takeaways

01 Clean power met all new electricity demand, halting fossil generation growth

Driven by record solar growth, low-carbon power generation increased by 887 TWh in 2025, outpacing electricity demand growth of 849 TWh. Solar power alone met 75% of the net increase in electricity demand. Together with wind, the two sources met almost all (99%) demand growth. For the first time since the Covid-19 pandemic in 2020, and only the fifth time this century, fossil generation did not rise, recording a small fall of 38 TWh (-0.2%).

02 Solar grows at highest rate in eight years as exponential rise continues

Solar power increased by a record 636 TWh to reach 2,778 TWh in 2025, a 30% increase from 2024. This new solar generation would be sufficient to displace gas-fired electricity equivalent to all LNG exports through the Strait of Hormuz last year, estimated at 550 TWh. Despite the much larger absolute additions, this was the highest percentage growth solar has recorded in eight years, continuing its exponential rise. Solar has been doubling roughly every three years, rising from 1,333 TWh in 2022. It has grown more than tenfold in the decade since 2015, when global solar generation was just 256 TWh. Solar overtook wind power for the first time globally in 2025 and drew close to nuclear power. Both solar and wind are expected to overtake nuclear in 2026.

03 Fossil generation falls in China and India in historic reversal

The global fall in fossil generation was driven by a historic reversal in fossil trends in China and India, the largest and third-largest fossil power countries globally. 2025 was the first year this century when fossil generation fell in both countries. In China, it fell by 56 TWh (-0.9%), marking the first decline since 2015. Record clean power additions, predominantly from solar, pushed growth in low-carbon sources above demand growth. In India, a record increase in both solar and wind generation, combined with strong hydro output and lower-than-average demand growth, led to a decline in fossil generation of 52 TWh (-3.3%). This came after four years of strong fossil increases following the economic rebound from the Covid-19 pandemic.

04 Renewables overtake coal for the first time in modern era

For the first time in 100 years, renewables (33.8%, 10,730 TWh) overtook coal power (33.0%, 10,476 TWh) in the global electricity mix as continued rapid growth in solar and wind pushed the share of renewables above a third of global generation. Coal power dropped 63 TWh (-0.6%) in 2025, marking the first fall since the Covid-19 pandemic in 2020. Combined with continued electricity demand growth, this meant coal fell below a third of global generation for the first time in history.

The world is entering an era of clean growth and exiting the era of fossil growth in the power sector. Abundant clean electricity is enabling the electrification of other sectors such as transport, accelerating the reduction of fossil fuel dependence across the economy.

This structural shift is happening at a key juncture in the global energy system as the world reels from two major fossil shocks in just four years. First, Russia's invasion of Ukraine, and more recently, the US-Israel war with Iran, have laid bare the vulnerability of a global energy system dependent on volatile fossil fuel markets.

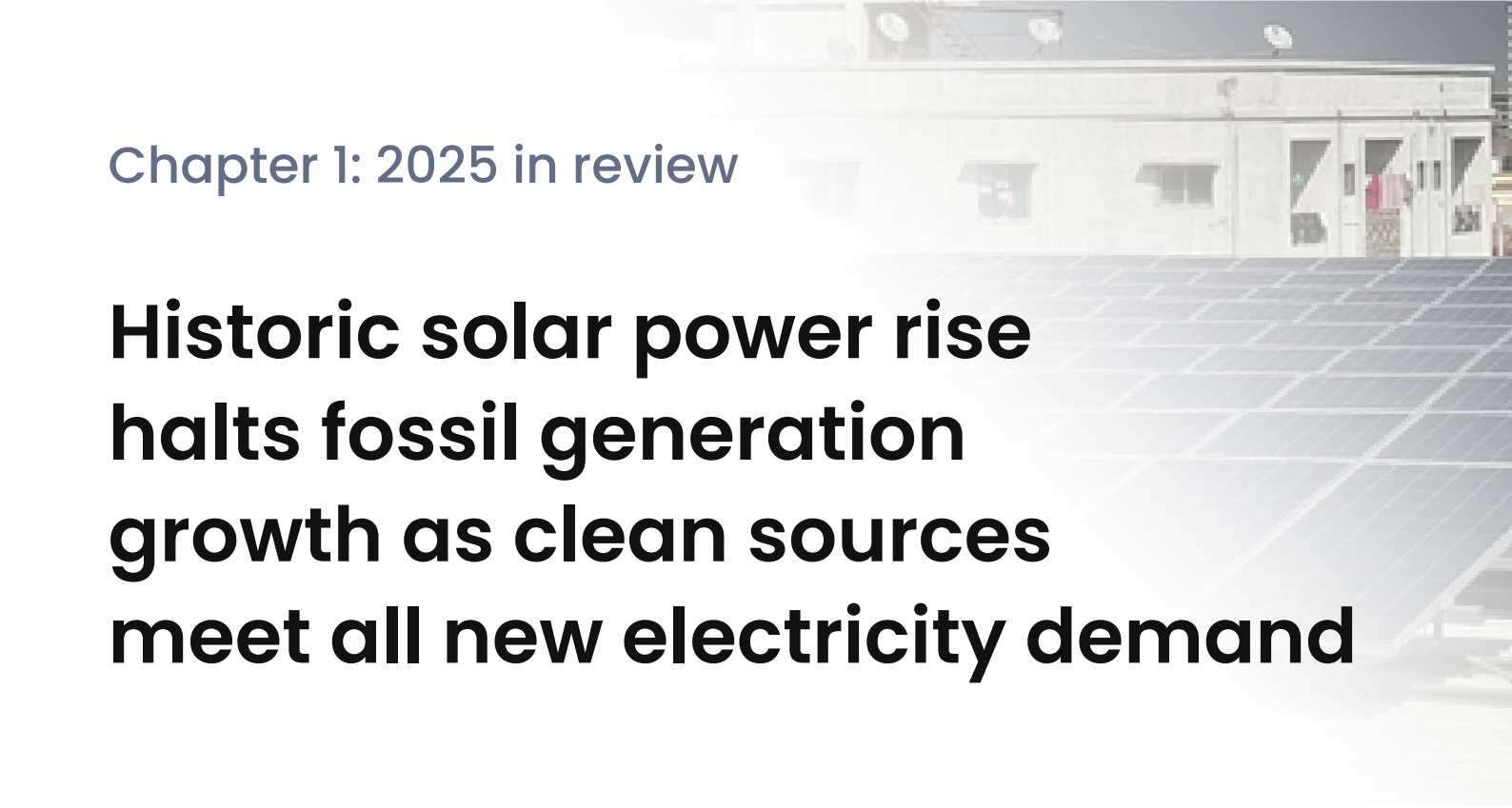
For emerging and mature economies alike, this moment makes the case for anchoring economic growth on a secure, domestic energy base. Those scaling clean power the fastest will be best placed to reduce fossil fuel dependence in the short term and support economic growth in the long term. With solar, wind and battery storage now cost-competitive, multiple technological developments have converged at scale to fundamentally transform the global energy system and offer a permanent route to energy security.

"We have firmly entered the era of clean growth. Clean energy is now scaling fast enough to absorb rising global electricity demand, keeping fossil generation flat before its inevitable decline. The momentum we are seeing is no longer just an ambition, it is becoming a structural reality.

Solar has been the dominant driver of change in the global power system, and along with battery storage, it is opening a path to fast-scaling, round-the-clock clean power.

Clean energy is rapidly redefining the foundation of energy security in a volatile world. It is already helping countries reduce exposure to fossil fuel imports and costs while meeting rising electricity demand. The next step is to modernise grids and regulatory frameworks so power systems are ready to handle this new reality."

Aditya Lolla
Interim Managing Director, Ember



Historic solar power rise halts fossil generation growth as clean sources meet all new electricity demand

A record increase in solar power generation met 75% of the increase in global electricity demand. Combined, low-carbon power sources – renewables and nuclear – grew faster than demand, resulting in a small fall in fossil generation. Renewables surpassed one-third of global electricity generation, overtaking coal power for the first time in 100 years.

1.1 Led by solar power, clean electricity sources met all demand growth in 2025

A record increase in solar power meant clean electricity growth was large enough to meet all additional electricity demand globally in 2025. This resulted in a slight decline in fossil generation. Solar power led both globally and across major economies, cementing its place as the fastest-growing electricity source of all time.

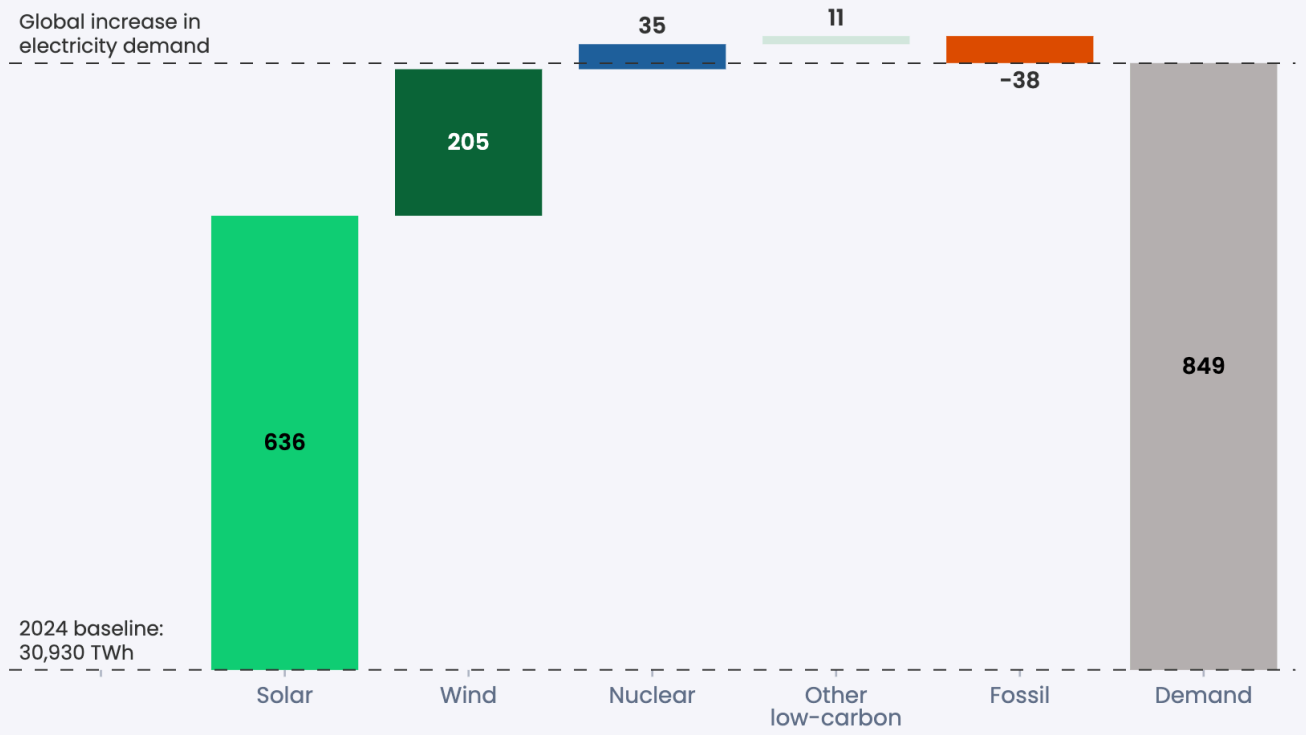
Solar met three-quarters of global electricity demand growth as fossil fuels stagnated
In 2025, solar generation increased by a record 636 TWh (+30%), double the total annual electricity demand of the United Kingdom. Solar alone met 75% of the increase in electricity demand of 849 TWh (+2.8%). China (+336 TWh) contributed more than half of the increase in solar generation, with the US (+85 TWh) and EU (+60 TWh) also adding substantial solar output.

Wind saw the second-largest increase, growing 205 TWh (+8.2%). This was similar to growth in 2024 (+190 TWh, +8.2%). Although below the record increase of 265 TWh in 2021, it was still equivalent to more than Poland's total electricity demand. As with solar, China also made up the majority of the global rise in wind, with an increase of 138 TWh (+14%), ahead of India at 22 TWh (+28%). Combined, wind and solar grew by 841 TWh, meeting 99% of global electricity demand growth.

With nuclear and other low-carbon sources increasing by an additional 46 TWh, all clean power sources together exceeded the growth in global electricity demand, leading to a small fall in fossil generation of 38 TWh (-0.2%).

Led by solar, clean power sources met all new electricity demand in 2025

Change in electricity generation in 2025 vs. 2024 (TWh)



Source: Yearly electricity data, Ember
'Other low-carbon' includes hydro, bioenergy and other renewables such as geothermal
Value labels show net change

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Nuclear power rose moderately by 35 TWh (+1.3%), largely driven by new reactors coming online in China (+37 TWh), as well as increased output in France (+12 TWh) and Japan (+9 TWh). Conversely, reactor closures in Belgium reduced output by 7 TWh.

Hydropower remained similar to 2024, increasing by 3 TWh (+0.1%). Hydro output increased most in China (+45 TWh), while strong monsoon rainfall improved output in India (+21 TWh). This was balanced out by large declines in Brazil (-25 TWh), Türkiye (-17 TWh) and in the EU (-43 TWh), where alpine regions of Italy, France and Switzerland were particularly affected by lower precipitation following good hydro conditions in 2024.

Electricity demand grew in line with the recent average

Global electricity demand grew by a moderate 2.8% (+849 TWh) in 2025, significantly below the 4.3% growth in 2024, but broadly in line with the ten-year average annual increase of 2.7% (2015 to 2024). The increase in 2025 still represents the sixth-largest absolute annual rise ever recorded.

In 2024, exceptionally high temperatures compared to 2023 had pushed demand growth well above structural trends. However, because conditions in 2025 remained similar to those in 2024, weather was not a factor driving demand growth at the global level this year.

A slowdown in industrial activity, particularly in countries with large industrial demand such as China, also contributed to lower growth in 2025. In contrast, the electrification of other sectors such as transport, as well as rising data centre demand are driving higher electricity needs (see more analysis on factors affecting demand growth in 2025 in Chapter 3).

1.2 Record solar power growth in 2025

The record increase in solar power of 636 TWh was 33% higher than the previous record set in 2024 (+479 TWh) and four times larger than the increase five years ago in 2020 (+155 TWh). Solar generation growth in 2025 represents the largest annual increase of any individual electricity source on record, with the exception of the rebound in coal generation (+719 TWh) after the Covid-19 pandemic in 2021.

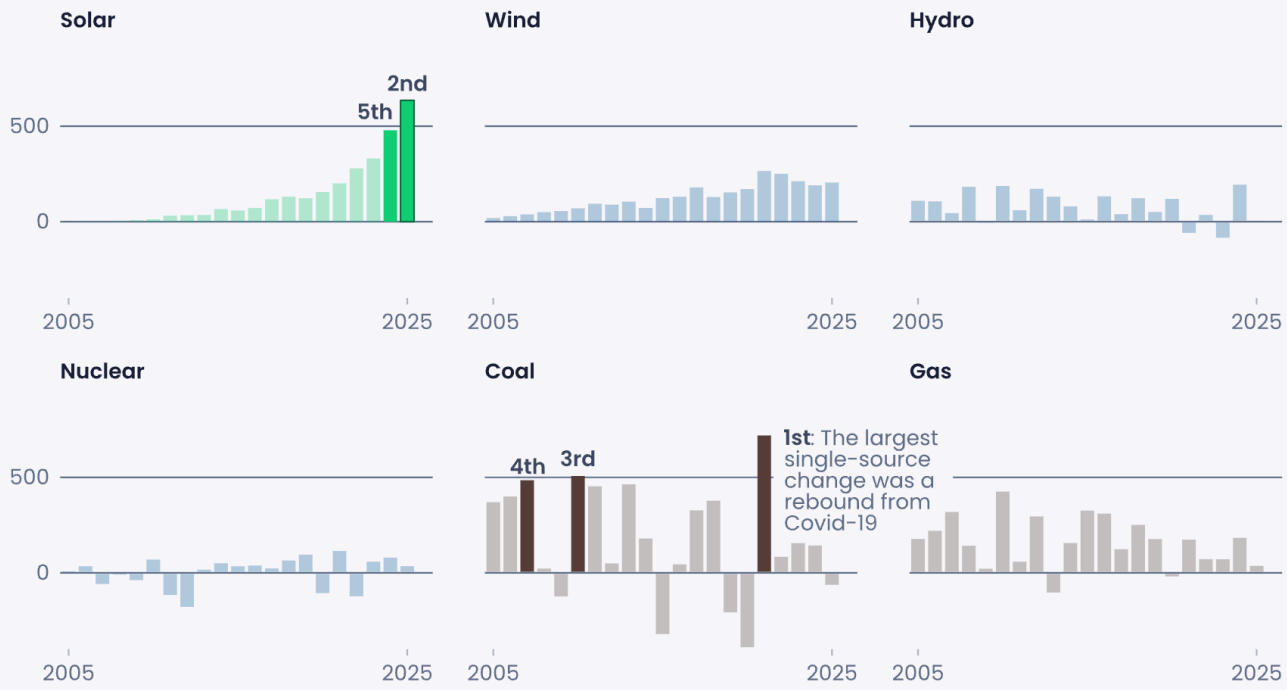
Solar records the largest structural rise of any electricity source ever

Unlike coal's increase in 2021, solar additions reflect structural capacity expansion rather than fluctuations in demand. It was only the third time ever that a source increased by more than 500 TWh in generation in a single year. For the fourth year running, solar recorded the largest absolute growth of any electricity source.

Solar power's 2025 growth was the largest annual increase of any electricity source ever, outside of coal's post-Covid rebound

Year-on-year change in electricity generation, 2005-2025 (TWh)

Highlighted bars = top 5 years of growth (with ranking labelled above)



Source: Yearly electricity data, Ember

Changes before 2005 were smaller than in this period due to the smaller size of the overall power system

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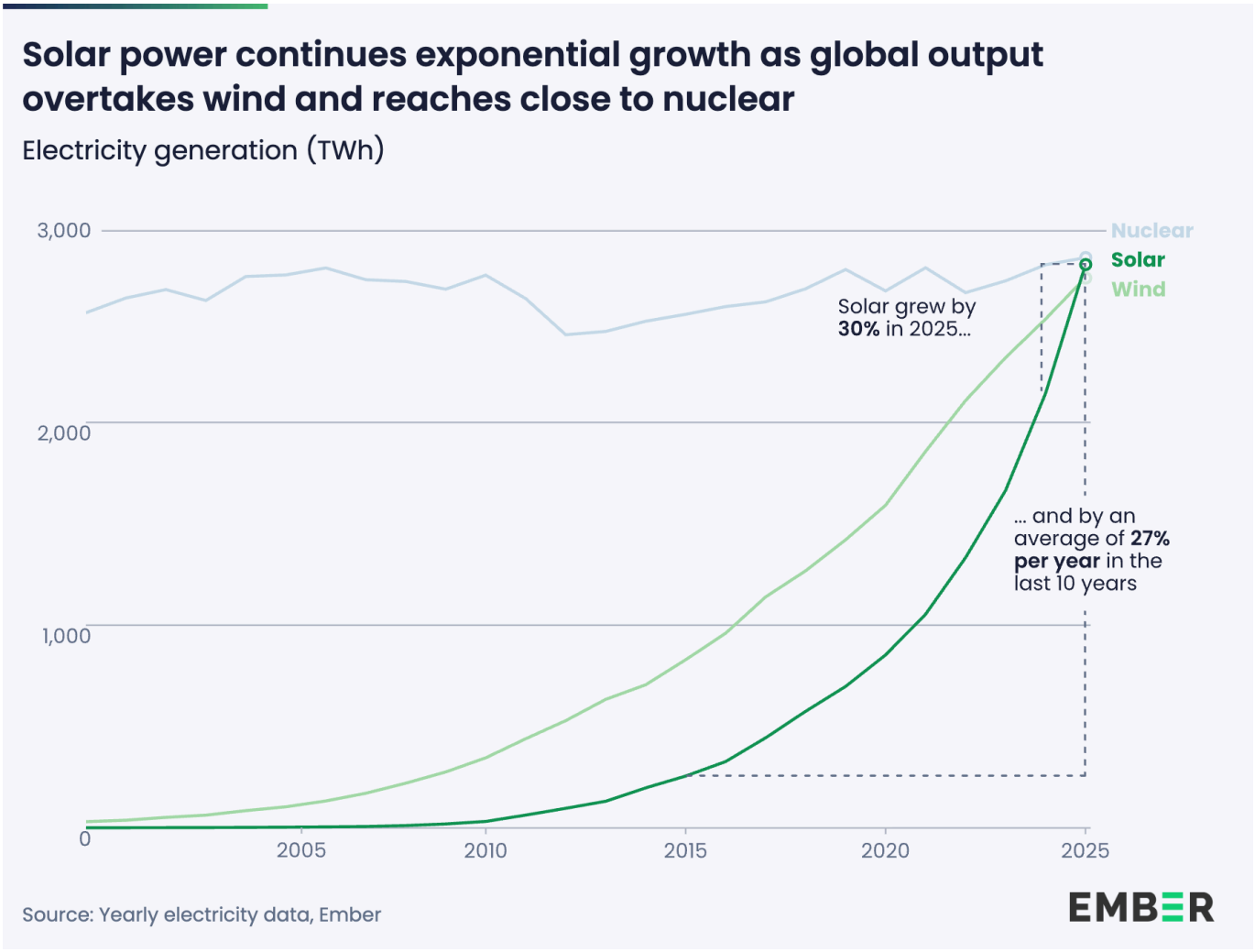
The continued growth in solar generation was supported by a new record for capacity additions of 647 GW in 2025. Global solar capacity installations increased by 11% compared to 2024 (+582 GW), which will support sustained generation growth well into 2026.

Solar's exponential rise continues as it overtakes wind

Solar power increased from 2,143 TWh in 2024 to 2,778 TWh in 2025, a 30% increase and the highest growth rate in eight years despite a much higher base. This shows that solar's exponential growth trajectory remains intact even at scale. Global solar output is now the same size as the total electricity demand of the EU-27.

Over the last ten years, solar grew at an average rate of 27% per year, with the annual growth rate never dropping below 21%.



Ten years ago, in 2015, solar power generated 256 TWh globally. At the time, nuclear power was ten times larger than solar, and wind power was three times larger. Since then, global solar generation has grown more than tenfold, overtaking wind power for the first time ever in 2025 and nearly drawing level with nuclear power. During the summer in the northern

hemisphere of 2025 – from April to September - solar generated more electricity globally than nuclear power. Both solar and wind are expected to overtake nuclear power in 2026.

Half of the increase in solar generation in the last decade was achieved in just the last three years, with output doubling from 1,333 TWh in 2022. Over that period, solar's increase in annual generation of 1,445 TWh met half of the global increase in electricity demand of 2,862 TWh. Solar has now been the fastest-growing source globally (in percentage terms) for 21 consecutive years.

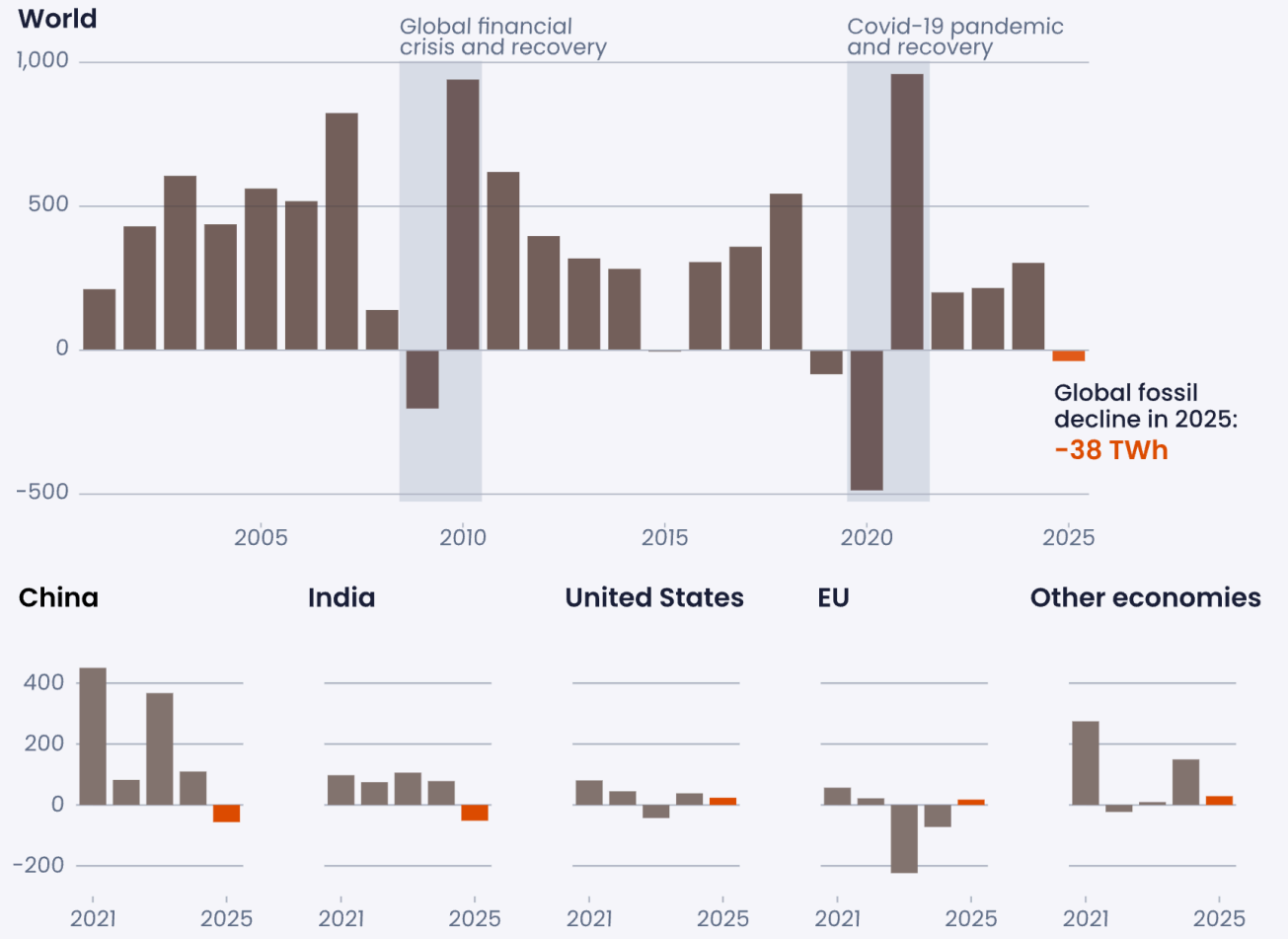
1.3 Global fossil generation stagnates, driven by falls in China and India

2025 marked the first year since the Covid-19 pandemic in 2020 without an increase in electricity generation from fossil fuels and only the fifth year this has happened since the turn of the century. Previous falls in global fossil generation occurred only during global recessions or exceptionally mild years. In contrast, the IMF expects global economic growth in 2025 of 3.2%, in line with the ten-year average (2015-2024) of 3.1%. Equally, changes in weather conditions had no significant influence on electricity demand growth at a global level.

In a stark departure from historical trends, fossil generation fell in both China (-56 TWh, -0.9%) and India (-52 TWh, -3.3%), driven by continued rapid clean power deployment and moderate demand growth. Combined, China and India made up 42% of global fossil generation in 2025. Their falls offset small increases in the US, EU and other economies, leading to a minor fall in fossil generation at a global level of 38 TWh (-0.2%). The net change in global fossil generation was the result of a combination of a fall in coal generation of 63 TWh (-0.6%) and other fossil generation (-12 TWh, -1.4%), mostly from oil, and a rise in gas generation of 36 TWh (+0.5%).

Fossil electricity generation falls in China and India causing the global figure to flatline

Annual change in electricity generation from fossil sources (TWh)



Source: Yearly electricity data, Ember

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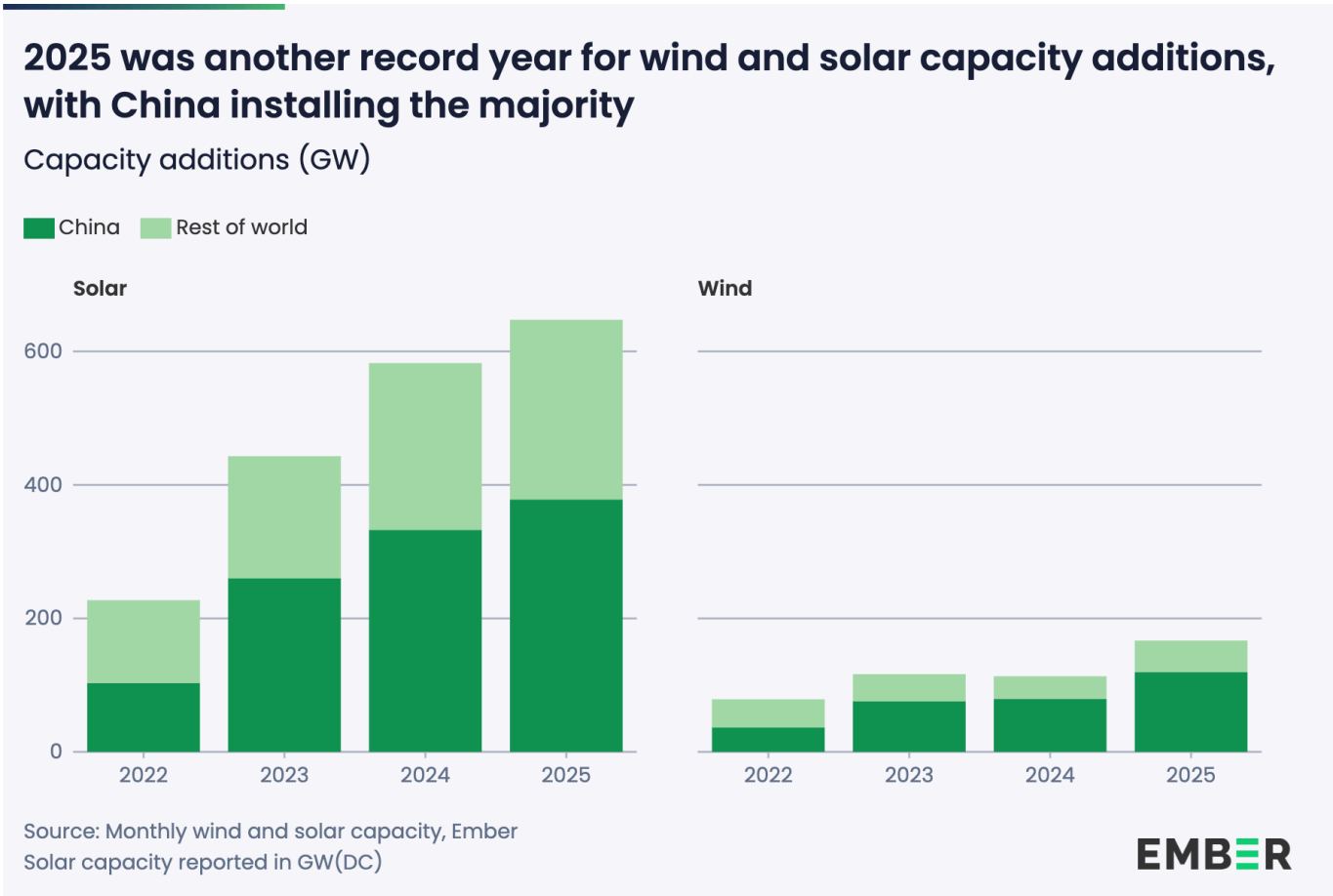
This was the first year this century that fossil generation declined simultaneously in both China and India, two of the world's three largest power sector emitters (read more about the role of China and India in Chapter 2). As a result, their combined power sector emissions fell by 79 MtCO2e compared to 2024 – equivalent to the annual power sector emissions of Brazil – with China down 37 MtCO2e (-0.7%) and India down 42 MtCO2e (-2.9%).

Globally, power sector emissions in 2025 remained almost equal to 2024 levels (-6 MtCO2e, -0.04%). In 2024, emissions had risen by 1.7% (+237 MtCO2e).

China's fossil generation falls for first time since 2015 as solar power booms

China's fossil generation fell for the first time since 2015, when an economic downturn led to the lowest electricity demand increase in China this century (+19 TWh, +0.3%). In contrast, the fall in 2025 occurred despite continued strong growth in electricity demand of 503 TWh (+5.0%), as clean generation grew by 561 TWh (+15%). Solar and wind were the largest contributors. Solar grew by 336 TWh, an astonishing 40% rise compared to 2024 output, while wind increased by 138 TWh (+14%). Solar alone met two-thirds of the increase in China's electricity demand in 2025. According to China's National Energy Administration, renewable power generation in 2025 exceeded the electricity demand of households and the service sector combined.

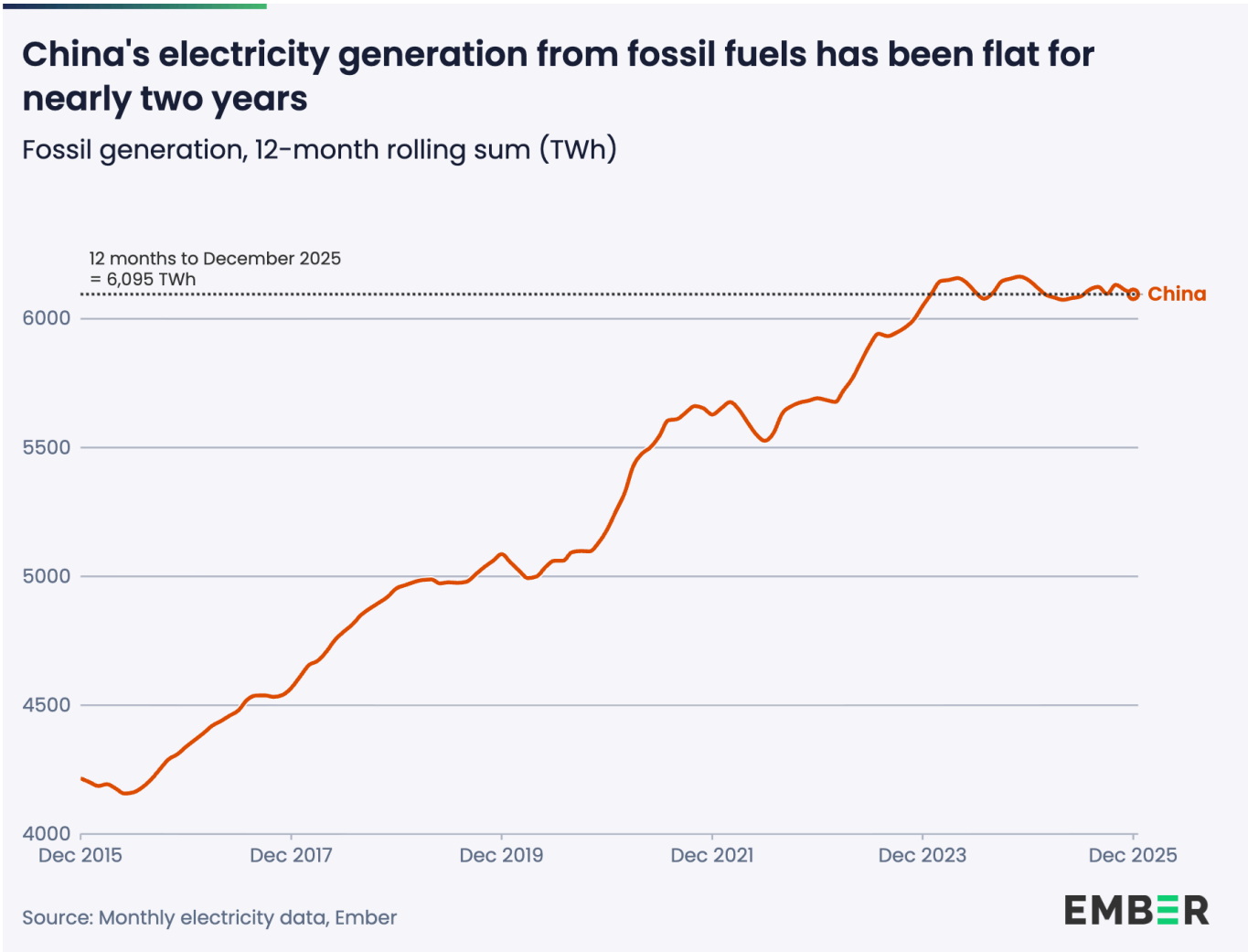
The rapid growth in solar and wind generation reflects China's continued world-leading pace of capacity deployment. As in previous years, China made up more than half of new solar and wind capacity added globally in 2025.



China's solar capacity deployment of 378 GW(DC) in 2025 made up 58% of global solar installations of 647 GW(DC) and exceeded the United States' total solar capacity of 274 GW(DC) (see methodology for DC vs. AC reporting differences). China's wind installations of

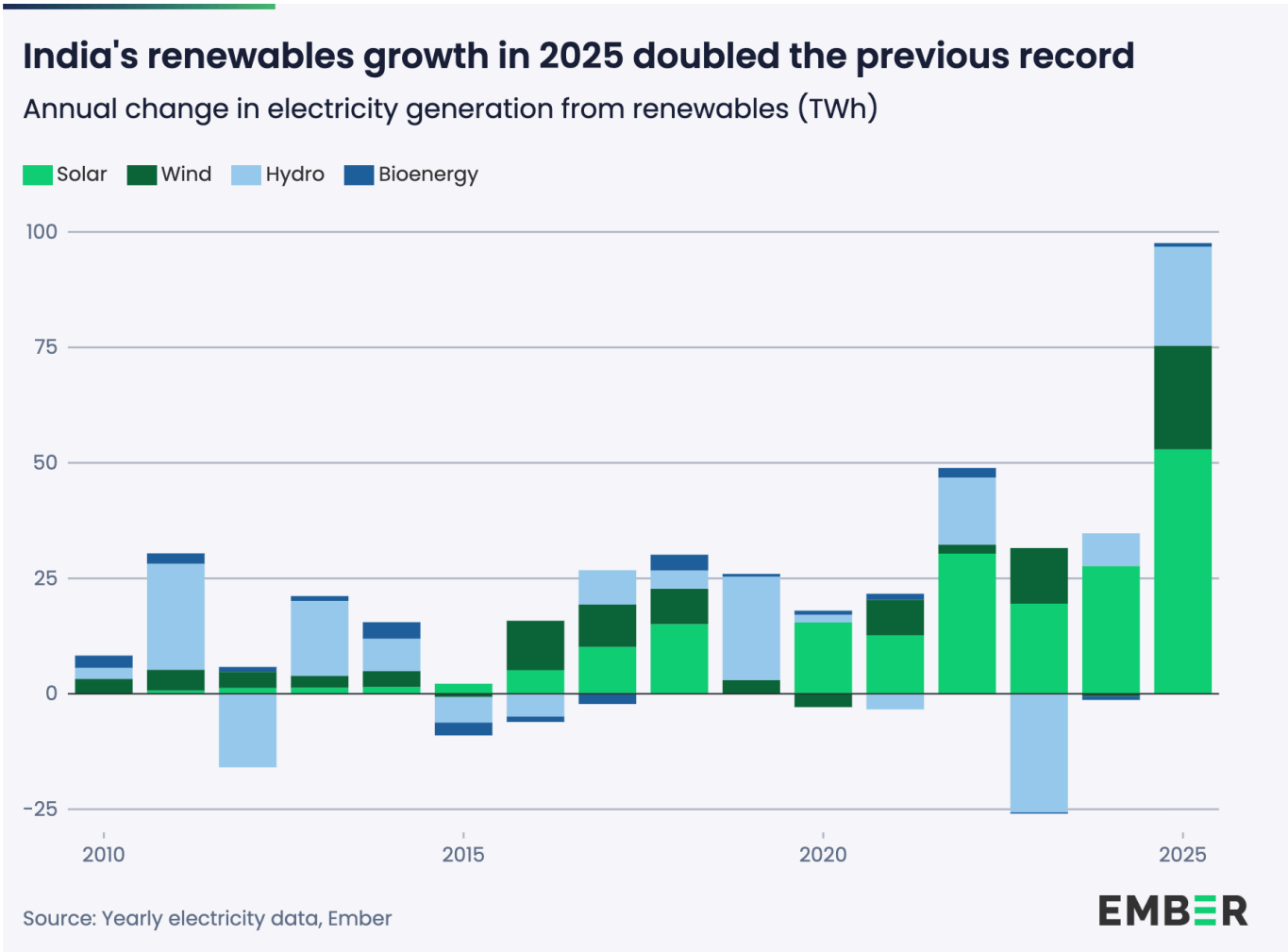
119 GW in 2025 were a 50% increase over deployment in 2024 and accounted for a remarkable 72% of global deployment, which reached a record high of 167 GW in 2025. China's wind capacity additions in 2025 were larger than the total installed wind capacity in Germany, the world's third largest wind power country (78 GW).

As a result of the fast-paced clean power deployment, China's consistent rise in fossil generation has come to a halt. Fossil power output has been flat for nearly two years, with fossil generation in the twelve months to December 2025 remaining at the same level as in January 2024, the longest such streak in recent history.



India's fossil generation declines amid mild weather conditions and a renewable surge
Fossil generation in India recorded an extraordinary fall of 52 TWh (-3.3%) in 2025. Renewable power generation from solar, wind, hydro and bioenergy saw a record increase of 98 TWh (+24%),

twice as large as the previous record set in 2022 (+49 TWh). Solar and wind both set new individual records for year-on-year increases in 2025, rising by 53 TWh (+37%) and 22 TWh (+28%), respectively. Distributed solar, such as rooftop installations, is becoming increasingly important and added an estimated 22 TWh in 2025.



The surge in clean power coincided with the third-lowest increase in electricity demand in the last decade at 49 TWh (+2.4%), leading to a stark departure from the prevailing trend of growing fossil generation in India. In each of the previous four years, demand had grown by more than 100 TWh. Mild weather conditions substantially reduced the need for electricity for cooling and heating. Across the year, milder temperatures avoided an estimated 32 TWh of electricity demand compared to 2024, which had seen the opposite effect, with demand growing above structural trends due to hotter weather.

Additionally, a slowdown in industrial activity meant lower-than-usual demand growth in the manufacturing sector. Economic growth in 2025 remained similar to the previous year, with GDP growing by 6.6% in 2025, compared to 6.5% in 2024, according to the IMF.

Beyond the temporary factors present in 2025, the record additions of renewable generation point to decreasing reliance on fossil generation to meet growing electricity demand.

1.4 Renewables overtake coal for first time in the modern era

In 2025, renewables overtook coal power globally for the first time in the modern power system. Rapid growth in solar and consistent gains in wind generation have driven renewables to new record highs. Coal power continued to lose market share, falling below a third of global electricity generation for the first time in history. Renewables have now overtaken coal power in every world region, except Asia.

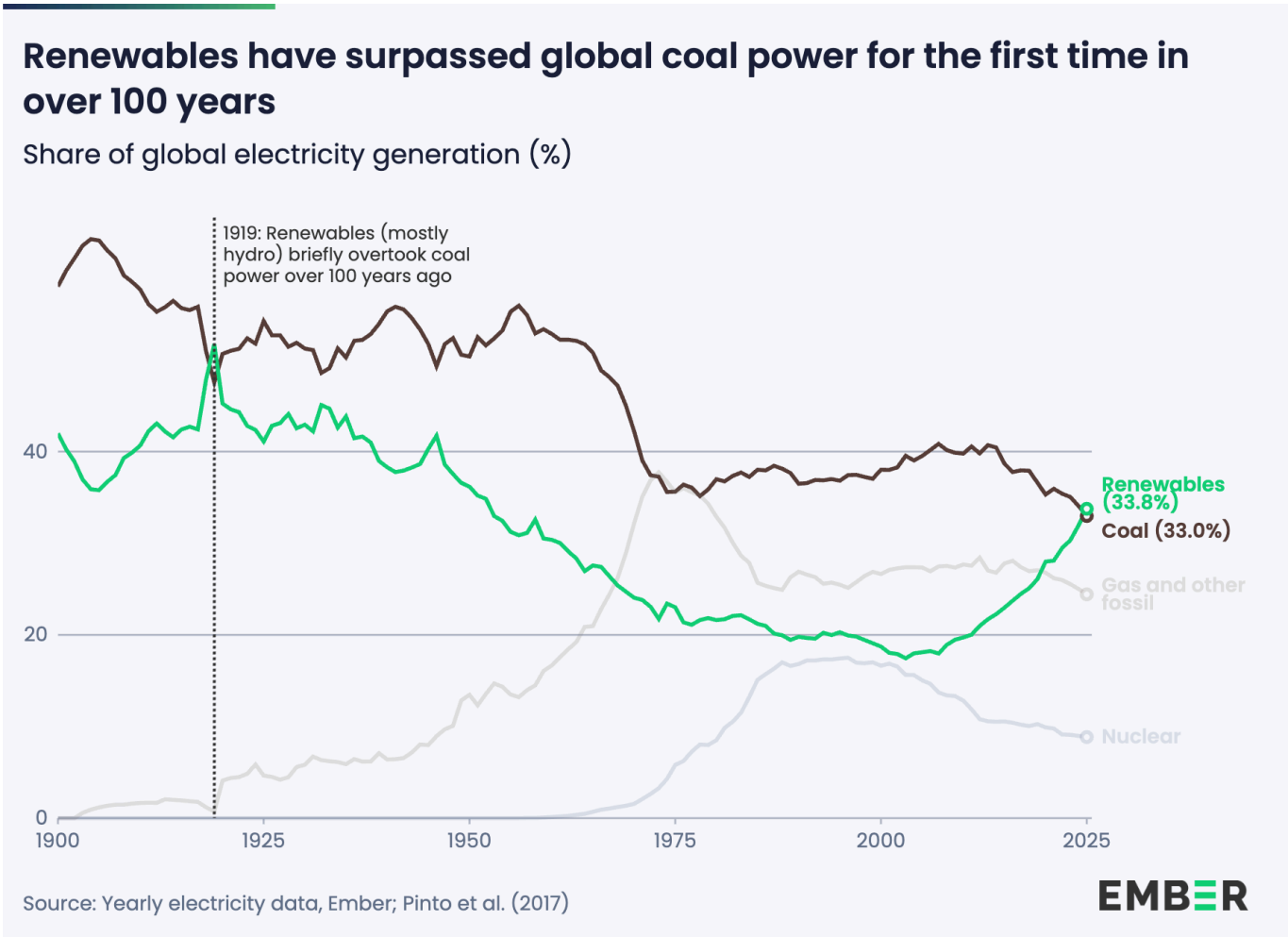
Coal power drops as renewables surpass a third of global electricity generation
For the first time in 100 years, renewables (33.8%, 10,730 TWh) overtook coal power (33.0%, 10,476 TWh). Continued growth in solar and wind pushed the share of renewables above a third of global electricity generation.

At the same time, coal power dropped by 63 TWh (-0.6%) in 2025, marking the first fall since the Covid-19 pandemic in 2020. Combined with steady overall electricity demand growth, this meant that the share of coal fell below a third of global generation for the first time in history.

In 1919, when global electricity demand was nearly 300 times smaller than in 2025, renewables – at the time overwhelmingly hydropower – briefly exceeded coal power. For over 100 years since then, coal power remained the largest source. Its share stayed consistently around or just below 40% of the global power mix from the 1970s to the mid-2010s.

The rise of wind and solar power rapidly increased the contribution from renewables, with their share rising by more than ten percentage points, from 23.0% to 33.8%, in the decade from 2015 to 2025. Wind and solar alone reached 17.3% in 2025, more than tripling over the same period from 4.5% in 2015. In contrast, the share of coal power has declined steadily since 2015, dropping from 38.7% to 33.0% in 2025.

Combined with a fall in the share of gas (down to 21.8% in 2025 from 23.9% in 2020) and other fossil fuels in the global electricity mix, emissions intensity – the amount of greenhouse gas emissions produced per unit of electricity – has also declined. In 2025, the average kilowatt hour produced globally resulted in emissions of 458 gCO2e, 2.7% less than in 2024 (471 gCO2e) and down 16% from two decades ago in 2005 (543 gCO2e).



Coal power's role in the mix is declining across the globe

The declining importance of coal power in the mix is evident across all regions. In every major region, coal has lost market share in the last two decades and renewables have overtaken coal everywhere except Asia.

Renewables have overtaken coal in the power mix in every region but Asia

Share of electricity generation (%)

Source: Yearly electricity data, Ember

In Europe, coal's share fell from 25% in 2005 to 13% in 2025, and to just 9.2% in the EU-27. In 2025, 19 of the EU's 27 countries had coal shares below 5%, and renewables have exceeded coal across Europe since 2013.

In North America, coal's share dropped by two-thirds over the same period, from 45% to 15%, as it was largely replaced by renewables and gas.

Coal's decline has also accelerated in Oceania, falling from 67% in 2005 to 36% in 2025. Renewables overtook coal in 2023 and reached 45% of generation in 2025.

In Africa, coal's share nearly halved, from 45% to 24%, with renewables overtaking coal in 2025.

Coal has never played a major role in Latin America, accounting for just 4% of generation in 2025, while in the Middle East it also remains marginal at 0.3%.

Asia is now the only region where coal still exceeds renewables, with coal at 52% and renewables at 32% in 2025. Asia makes up the majority (82%) of global coal generation. However, renewables have grown rapidly, increasing their share by ten percentage points in just seven years. Conversely, the share of coal power has dropped by 10% since its recent peak of 62% in 2013.

Clean power scale-up moves the global electricity sector past fossil growth

Demand growth in the global power sector no longer relies on growing fossil fuels, as China's fossil slowdown has brought global fossil generation to a plateau. In countries with growing demand, clean power build-out is accelerating while potential remains high. Batteries are unlocking solar beyond daylight hours, accelerating the shift from fossil fuels to flexible, clean power systems.

Section 2.1 examines how the clean power build-out, with China as a central player, has tipped the balance in the global trend from fossil-fuelled growth to clean growth. It demonstrates why India is unlikely to repeat China's coal-heavy power sector development in the coming years and outlines the clean growth opportunity for remaining fossil-growth economies.

Solar power has been the largest contributor in recent years to halting fossil generation growth globally. Section 2.2 explores how batteries are transforming solar from a daytime-only resource into a technology that can displace fossil generation around the clock.

2.1 The era of clean power growth is here

In 2025, clean power met all global demand growth for the first time since the Covid-19 pandemic. China, which accounted for the majority of fossil growth over the past decade, saw its fossil output fall for the first time since 2015 despite demand growing by 5% in 2025. With solar, wind and batteries now mature technologies, the remaining fossil-growth economies, such as India, can follow a fundamentally different path. Globally, expected clean power growth can tip fossil fuel use in the power sector from plateau to decline while aiding decarbonisation in other sectors.

2.1.1 How the world moved from fossil-fuelled growth to clean growth

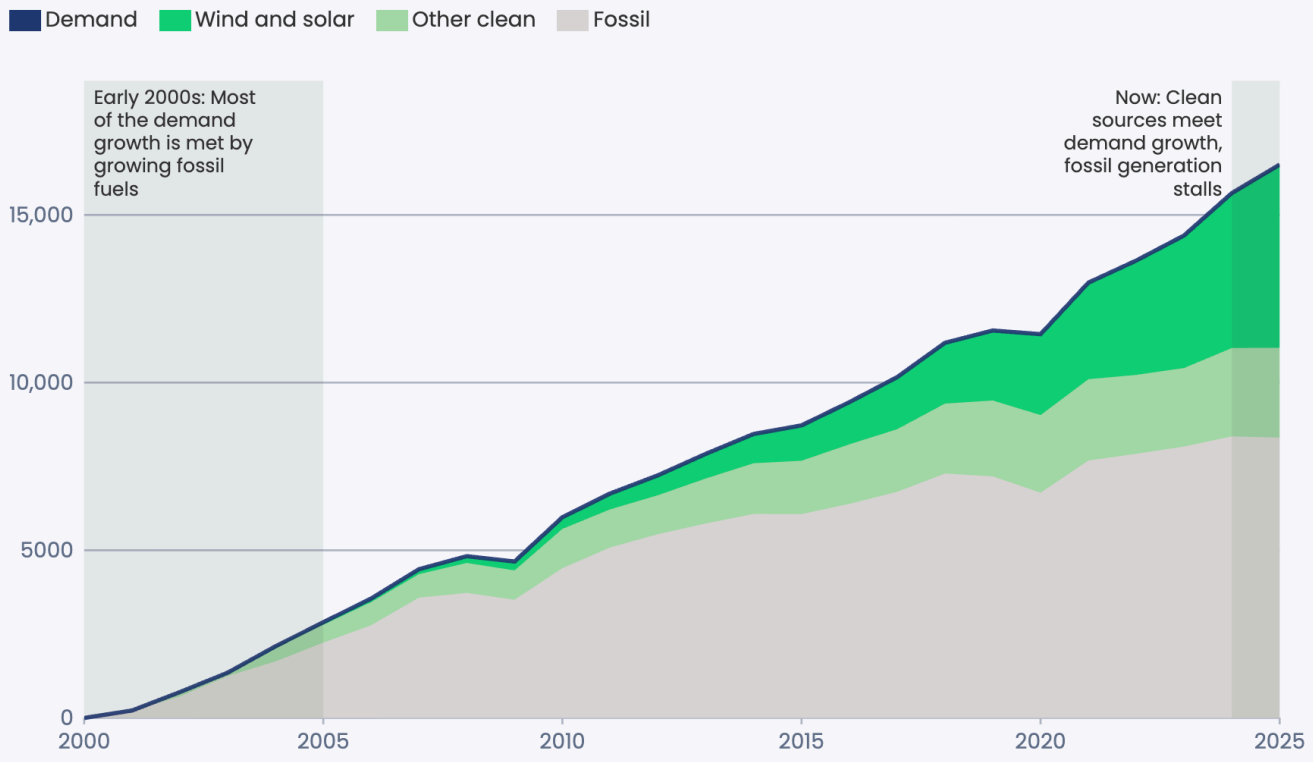
The rapid acceleration of wind and solar power, particularly from 2015 onwards, first weakened and has now decoupled the relationship between electricity demand growth and fossil fuel consumption. Demand continues to grow while fossil generation is plateauing.

81% of all wind and solar generation growth since 2000 occurred in just the last ten years. In contrast, only 27% of fossil fuel growth since 2000 happened in the last ten years.

Had wind and solar not grown since 2000, fossil generation would have been 30% higher in 2025, and emissions 28% higher. This would have added 4,065 MtCO2e annually, more than the combined emissions from electricity generation in all OECD countries (3,818 MtCO2e).

Clean power growth has disconnected global electricity demand from fossil fuel growth

Cumulative change in electricity generation since 2000 (TWh)



Source: Yearly electricity data, Ember
'Other clean' includes nuclear, hydro, bioenergy and other renewables such as geothermal

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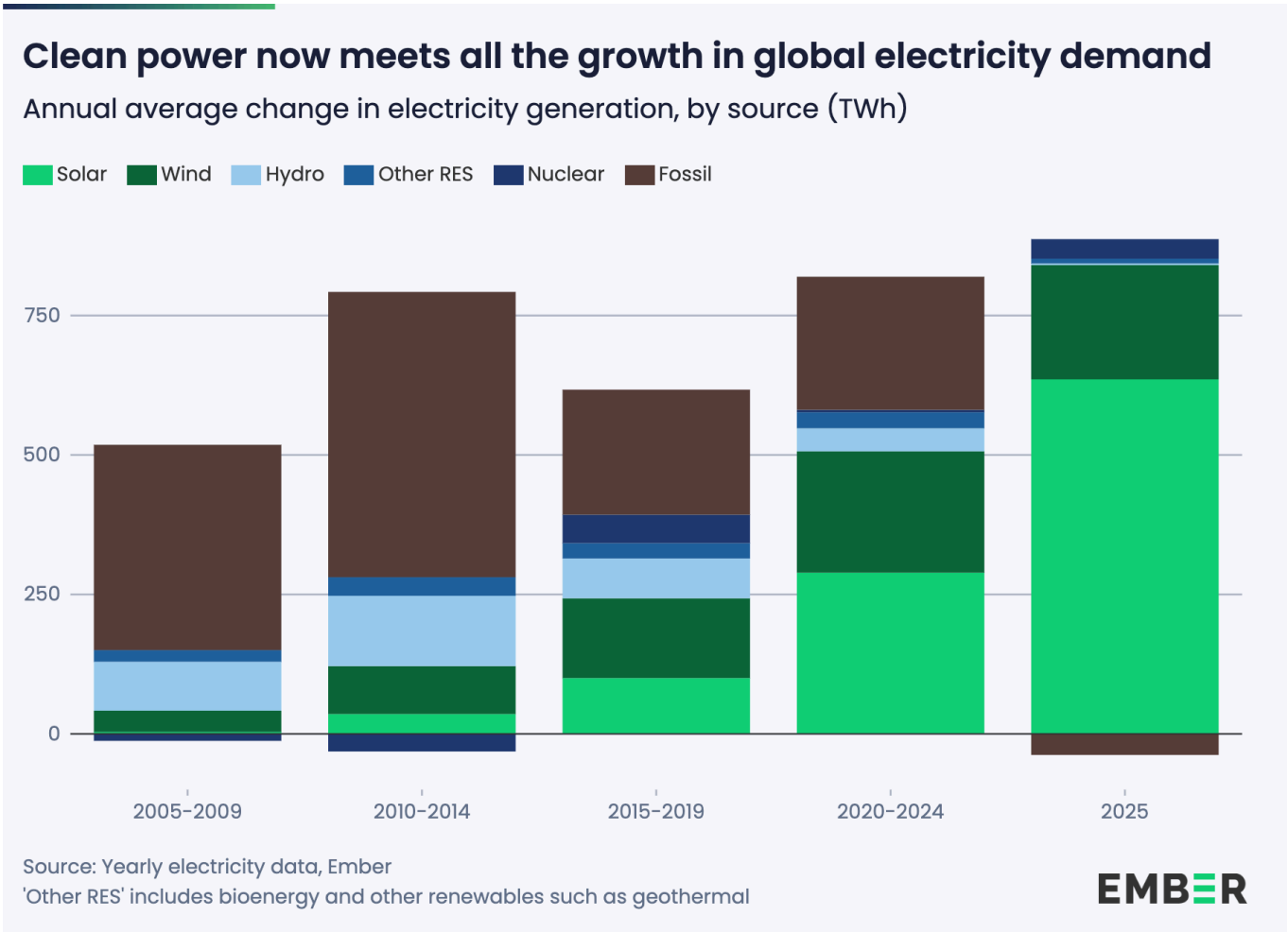
Two decades of a changing landscape

In the late 2000s (2005-2009), fossil fuels still met nearly three-quarters (73%) of average annual electricity demand growth of just over 500 TWh per year, with hydro contributing 17% and wind 8%. By 2010-2014, solar had emerged for the first time at scale, but fossil fuels still dominated at 67% of demand growth.

The turning point came after 2015. Between 2015 and 2019, fossil fuels met just 36% of the increase in demand. This fell further to 29% during 2020-2024, despite average annual demand growth increasing to over 800 TWh.

In 2025, fossil fuel growth ceased entirely. Clean sources met all the growth in electricity demand, with solar alone providing three-quarters (75%) of the rise, a complete reversal of the fossil-dominated growth pattern that defined the global power sector from its inception until the mid-2010s.



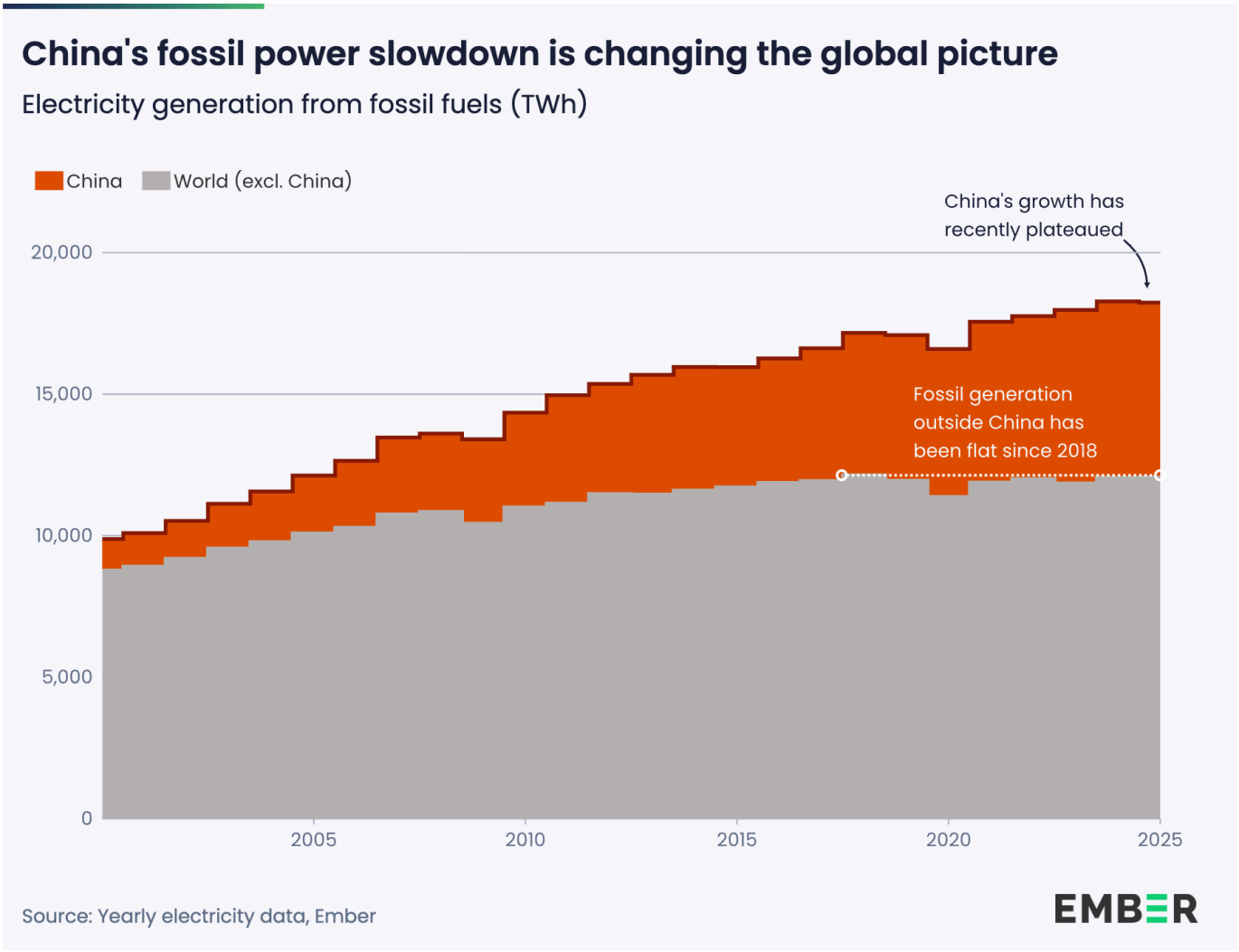
2.1.2 China tips the global balance away from fossil growth – India won't reverse it

China has been the world's largest contributor to global fossil generation growth, but is now meeting all new demand with clean power. India, the country with the third-highest fossil generation overall and the second-highest coal generation, is unlikely to take China's place and will not repeat fossil growth at the same scale.

China's fossil slowdown brings global fossil generation to a plateau

Outside China, fossil generation has not increased in aggregate since 2018, down 0.6% in 2025 relative to 2018. Over the same period, China added 1,145 TWh of fossil generation, over four times larger than India's increase (+250 TWh) and thirteen times larger than Indonesia's (+88 TWh), the third-largest rise.

The fall in China's fossil generation in 2025 therefore removed the world's biggest driver of fossil growth, resulting in no net growth in global fossil generation.



Why India is set to follow a less coal-reliant growth path than China

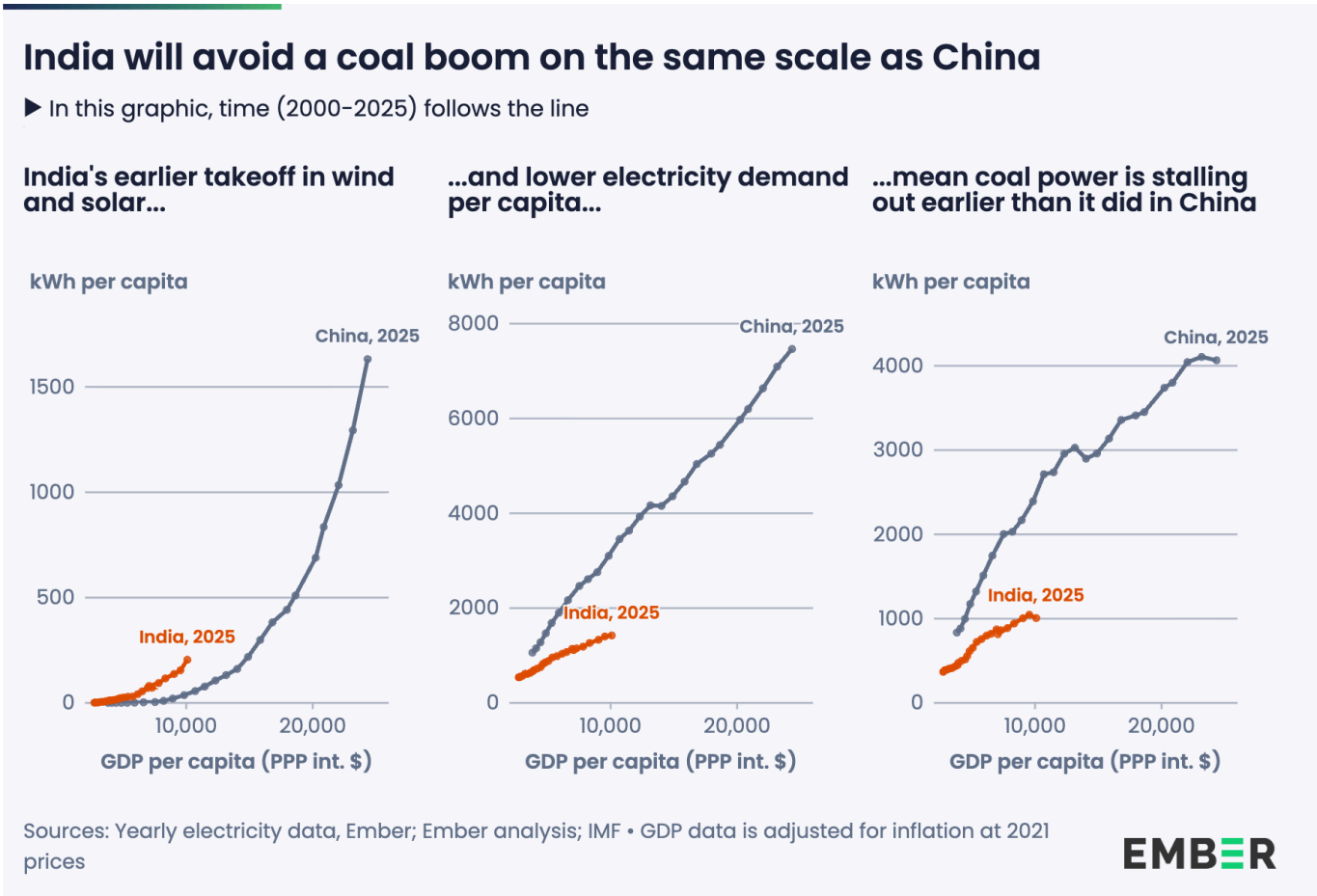
India is already showing signs of divergence from the coal-heavy growth model experienced by China in the first two decades of the 21st century. Today, India is developing in a fundamentally different landscape, benefitting from a cost and technology environment that is far more favourable to clean energy than it was during China's electricity demand boom.

India's GDP per capita crossed over $10,000 (international dollars) in 2025. China reached a similar level 15 years earlier in 2010. China's growth over the following years was fuelled by a surge in electricity demand met largely by coal power. Similarly, India's electricity demand is expected to grow at over 6% annually through the early 2030s. However, two structural trends suggest India will diverge from China's path, keeping coal reliance significantly lower.

First, wind and solar power are now mature and cost-competitive. In 2010, when China was at India's current GDP per capita level, solar power was nearly ten times as expensive as it is today. Providing firm power with solar and battery storage is now already cheaper than new coal power in India. The deployment level of wind and solar power in India stood at 205 kWh per capita in 2025, already more than five times higher than China's (37 kWh) at the same GDP level.

Second, India's growth is less energy-intensive. India's electricity demand per capita is currently less than half China's at the same GDP level, as its economy is more service-sector focused. To move from $5,000 to $10,000 GDP per capita, electricity demand per capita in India increased by about 0.5 MWh. In China, demand rose at three times that rate (around 1.5 MWh) during the same stage of development.

As a result, India is positioned to peak its coal generation much earlier in its development curve, at less than a third of China's recent peak recorded in 2024. Other fossil fuels, such as gas and oil, play only a minor role, accounting for just 2.5% of India's electricity generation.



The shift is already visible on the ground. In 2025, India deployed a record 37.9 GW(AC) of solar and 6.3 GW of wind. This represented a year-on-year increase in capacity additions of 54% for solar and 85% for wind, and translated into record renewable generation growth (see Chapter 1).

The future pipeline is equally robust. Utility-scale projects already under construction in India amount to 101 GW of solar, 24 GW of wind and 23 GW of hybrid wind and solar projects. These projects alone could generate enough electricity to fully meet two years of India's expected demand growth. More projects are expected to be added to the pipeline, and India's government is considering increasing its target of 500 GW of non-fossil fuel power capacity by 2030.

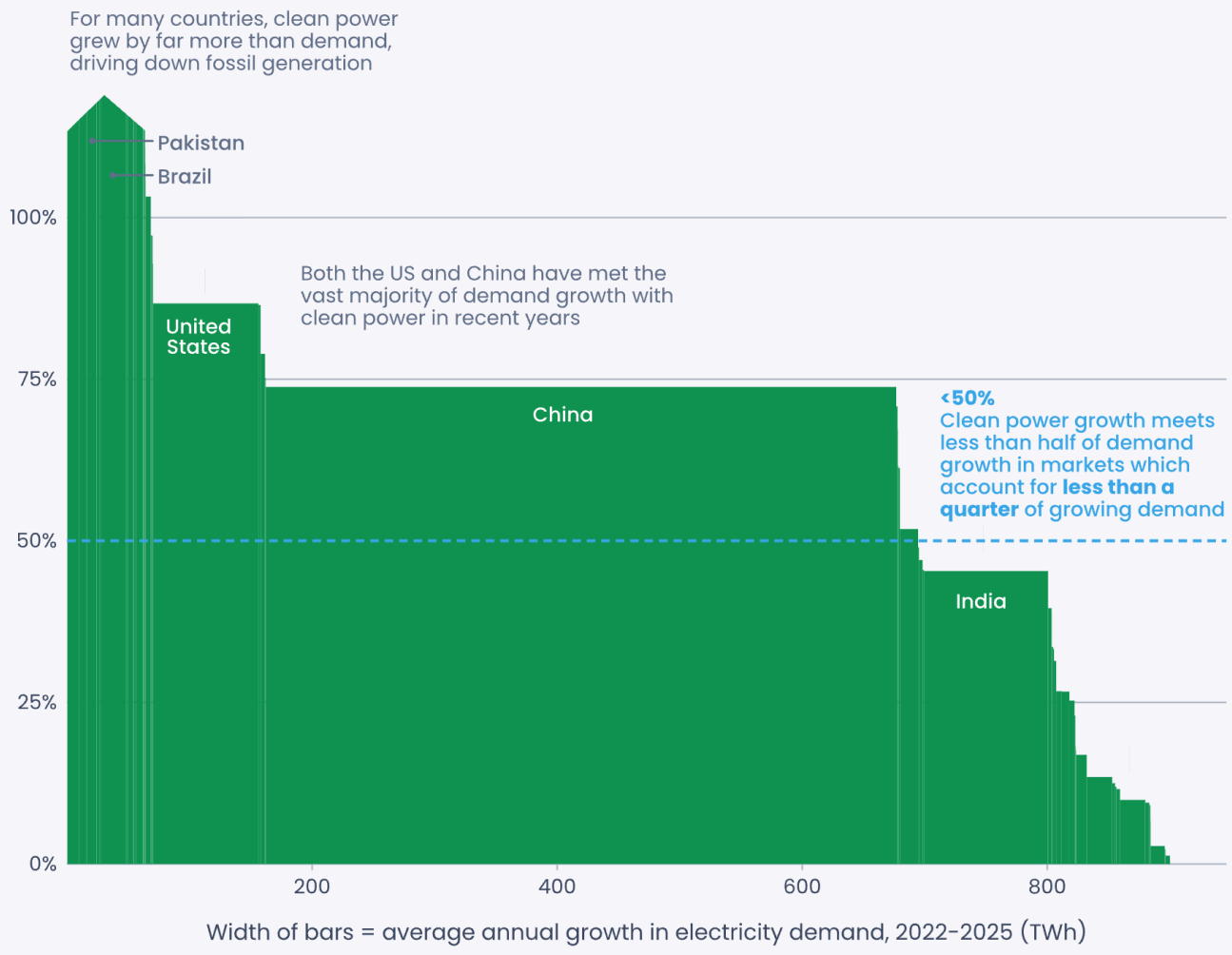
2.1.3 Clean power is closing the door for remaining fossil growth

With China's fossil generation flattening out, power sectors where fossil generation has peaked or is near a peak make up the majority of the world's power generation. Critically, the countries with the fastest-growing fossil generation predominantly sit in sunny regions with vast untapped solar potential. The availability of low-cost solar, batteries, wind and other clean technologies means countries with growing electricity demand now have an array of tools enabling them to transition to a clean growth trajectory.

Where demand is growing, clean power is growing too
A four-year view from 2022 to 2025 reveals that most countries with rising electricity demand already met that growth primarily with clean power.

In countries with growing electricity demand, most growth is met by clean electricity

Height of the bars = share of demand growth met by clean power sources in 2022-2025 (%)



Source: Yearly electricity data, Ember
In some economies clean growth exceeded demand growth; Graphic only includes economies with an increase in electricity demand in 2022-2025 and total electricity demand of 10 TWh or more

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As a collective, advanced economies are already meeting demand with clean power. Clean power growth in OECD members was 1.8 times higher than demand growth from 2022 to 2025.

However, this dynamic is not limited to advanced economies. Several other growth markets, including Brazil and Pakistan, met their entire increase (100%+) in demand with low-carbon sources. In Brazil, the rapid expansion of wind and solar complemented an existing clean

power base supplied by hydro, preventing an increase in gas-powered generation. In Pakistan, distributed solar power, increasingly combined with battery storage, played a pivotal role. This enabled Pakistan to grow demand by an average of 4.5% annually (2022-2025) while reducing fossil generation.

China and the United States drove the largest and third-largest rises in demand over this period. In China, demand rose by an average of 513 TWh annually, with 76% of the increase met by clean sources. In the US, clean power supplied 88% of new demand.

India, with the second-largest demand increase (101 TWh per year), met nearly half (48%) of that increase with clean power, double the 24% share in the decade prior (2012-2021). While this reflects continued reliance on fossil fuels for some of its growth, it marks a significant step-up in clean power deployment.

Other economies, such as Saudi Arabia, Indonesia, Thailand and Malaysia still met most of their rising demand with fossil fuels. Crucially, however, countries that met less than half of their demand growth with clean power accounted for only around a quarter (26%) of growing electricity demand globally between 2022 and 2025.

Unrealised solar potential is highest in countries with growing fossil fuels

While solar has emerged as the global driver of electricity generation growth, deployment in many regions remains low. Most of the remaining economies still relying on fossil power to meet growing demand sit almost exclusively in regions with excellent solar conditions, showing the enormous potential for fossil-dependent regions to shift to clean, affordable power. Falling costs for solar and battery storage further strengthen the case for taking advantage of ample solar resources. In 2024, 90% of globally installed renewable projects were already cheaper than the lowest-cost fossil fuel alternative.

Nearly all power sectors that experienced growth in fossil generation between 2022 and 2025 have above-average solar conditions. The United States and China are among the few countries with significant solar deployment in this group. Among countries with the fastest recorded fossil growth (3% or more per year), almost all have lower solar generation per capita than the world average of 345 kWh, despite this group containing countries with some of the world's highest solar insolation such as Egypt and Saudi Arabia.

Most economies with growing fossil generation have high solar potential – most of it remains untapped

Solar generation per capita in 2025* (y-axis, kWh), and solar insolation (x-axis, W/m²), grouped by fossil growth category

Source: Yearly electricity data, Ember; ERA5
*Or latest available year of data
Annual growth refers to compound annual growth rate for fossil generation in 2022-2025

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In contrast, many countries with low solar insolation have already deployed solar at scale, with the Netherlands reaching 1,553 kWh per capita. Egypt receives more than twice the sunlight of the Netherlands, yet generates just 4% as much solar per capita (67 kWh). Among high-potential countries, Australia (2,080 kWh), the United Arab Emirates (1,379 kWh) and Chile (1,117 kWh) demonstrate high deployment.

Critically, countries like India, Egypt or Indonesia do not need to match deployment rates in Australia, China or Germany to make a significant impact. Their much lower electricity demand per capita means moderate solar deployment can meet substantial shares of total demand. Egypt's total electricity consumption per capita of 2,050 kWh is lower than Australia's solar generation per capita alone. Additionally, because of superior solar conditions, the same capacity can produce around twice as much electricity in Egypt as in countries such as Germany or the Netherlands.

The first signs of a solar surge in sunny regions still reliant on fossil growth are already here. After years of slow progress, Saudi Arabia's solar sector is now scaling rapidly, with some estimates suggesting over 10 GW of installed capacity as of 2025. This is set to continue with Saudi Arabia securing financing for 15 GW of new renewable capacity, including five solar projects, in late 2025 alone.

Many fossil-reliant African economies, such as Egypt, Nigeria or Algeria, are also showing signs of an emerging solar rollout. According to Ember's tracking of solar PV exports from China, panel exports to Africa increased 48% in 2025 compared to 2024, from 12.7 GW to 18.8 GW, indicating strong demand growth for solar. Egypt imported more than twice as many panels in 2025, at 2.3 GW, compared to 1.0 GW in 2024. Algeria's solar panel imports in 2025 (2.1 GW) were six times larger than in 2024 (0.35 GW).

2.1.4 Clean power expansion can shift fossil fuels from plateau to decline

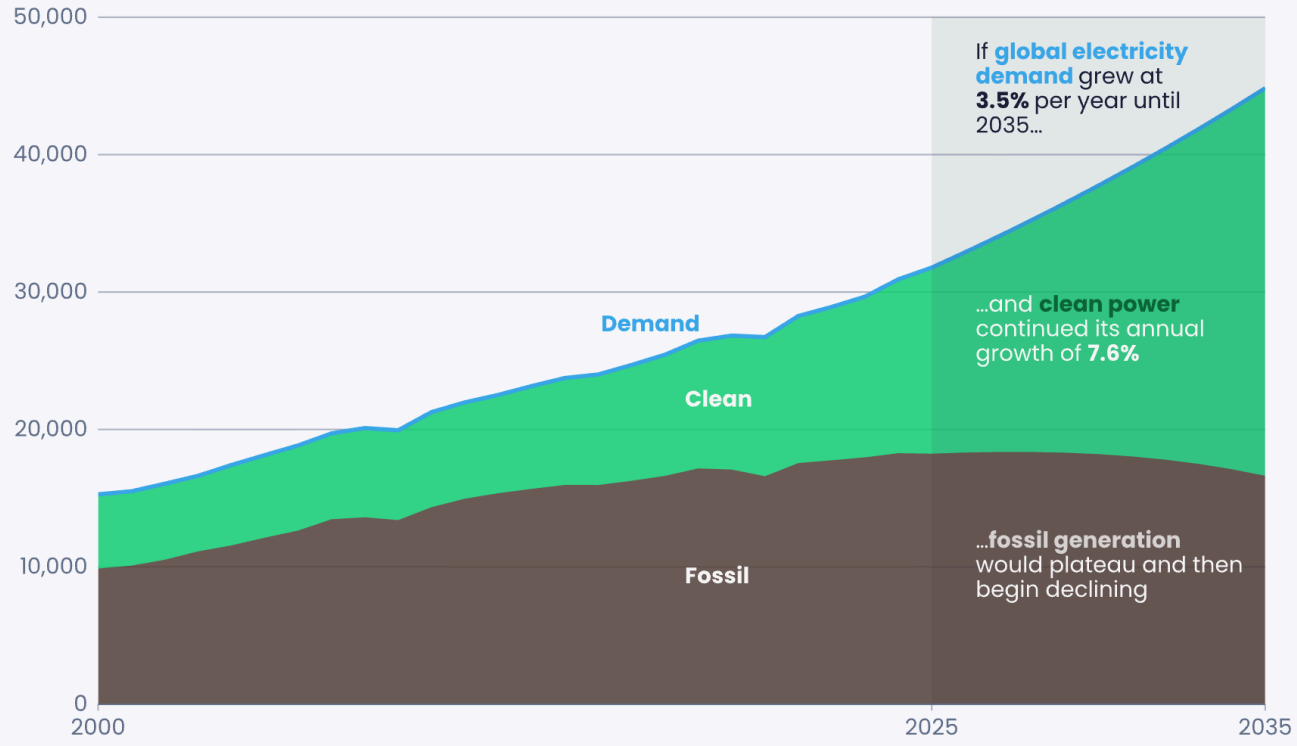
Beyond 2025, major energy outlooks such as the IEA's Stated Policy Scenario (STEPS) and Bloomberg New Energy Finance's (BNEF) Economic Transition Scenario (ETS), as well as the current trajectory of clean power and demand growth, show clean power keeping pace with and likely exceeding electricity demand growth over the next decade. The same clean electricity can simultaneously decarbonise traditionally fossil-dependent sectors such as transport through electrification, resulting in emissions reductions across the entire economy. The scalability of solar, wind and batteries makes this dual transformation achievable.

Fossil generation is entering a plateau

Global electricity demand growth is expected to accelerate in the coming years. While 2025 demand growth (+2.8%) moderated from the high growth in 2024 (+4.3%), the two years averaged 3.5% growth, well above the 2.5% average in the previous decade (2014-2023). Clean electricity expanded by an average of 7.6% per year across 2024 and 2025. Under these trajectories, fossil generation is set to plateau before entering a more consistent decline in the early 2030s.

Under current growth rates, clean power keeps pace with growing electricity demand, leading to a plateau in fossil generation

Global electricity generation (TWh)



Source: Yearly electricity data, Ember; Ember analysis
Current rates refer to average growth for demand and clean power in 2024 and 2025; Projections are illustrative under stated growth rates, but do not show forecasts for specific years between 2026 and 2035

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The pattern is consistent across major outlooks. Under the IEA's STEPS, demand grows by an average of 3.2% annually to 2035, although more recent estimates by the IEA expect higher growth of 3.6% between 2026 and 2030. With clean generation expanding by an average of 7.2% annually under STEPS, fossil generation plateaus before declining in the 2030s to 10% below 2025 levels by 2035. BNEF's ETS scenario expects an even larger fall in fossil generation of around 20%.

Even if demand were to grow 4.0% per year as a result of faster electrification, cooling demand and data centre growth, and clean generation growth were to remain at current rates (7.6% per year), fossil generation would experience an extended plateau with only a small rise through the early 2030s. Clean power would still meet 97% of the increase in electricity demand by 2035.

Clean power growth could yet exceed these projections. Solar and wind now comprise a much larger share of clean electricity than a decade ago, while growing faster than other low-carbon sources such as hydro and nuclear. Maintaining their recent momentum would push overall clean growth higher. In 2024 and 2025, solar and wind grew at a combined 17% per year. An overall clean power growth rate of 7.6% would mean solar and wind growth decelerates to around 13% annually, suggesting that deployment could be higher if current solar and wind growth rates continue.

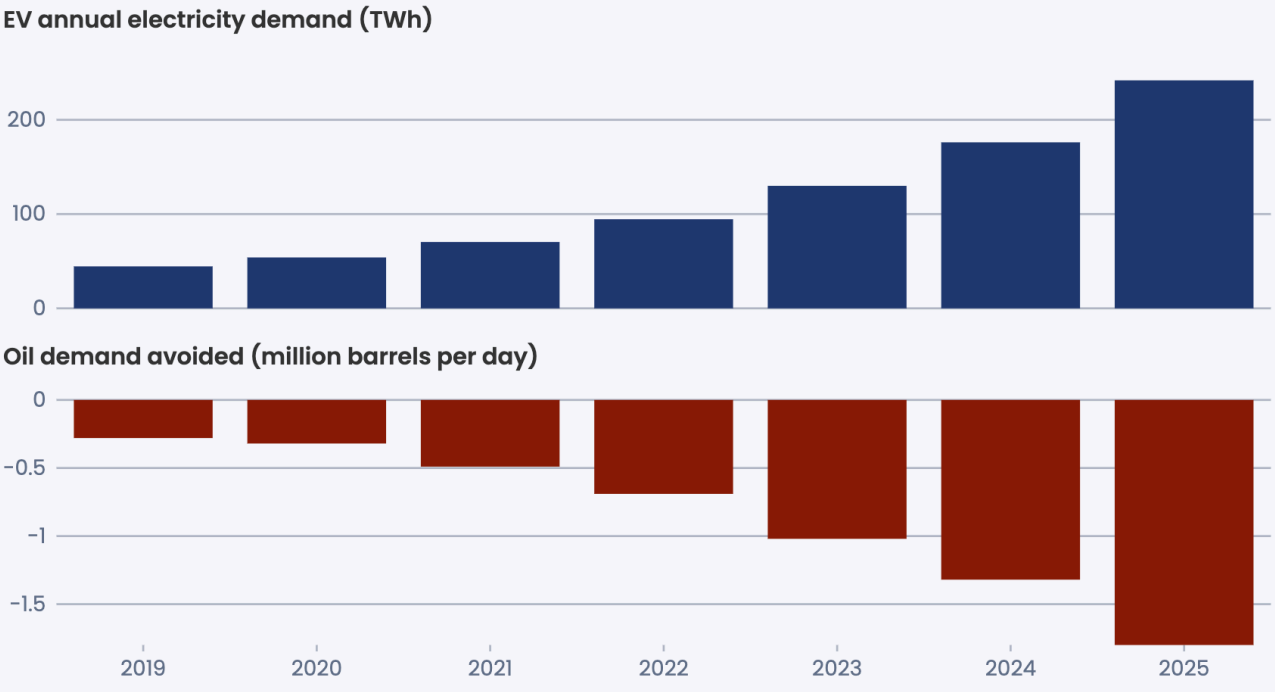
Clean power enables fossil-free growth beyond the power sector

With fossil generation plateauing globally, growing electricity demand from electric vehicles (EVs), heat pumps and industry can now be met predominantly with clean power. This fundamentally changes the dynamics of decarbonisation across the economy.

The transport sector demonstrates this well. In 2025, electrification of the sector continued, with electric vehicle sales reaching over 25% of the global car market and 39 countries now exceeding 10% EV market share.

As a result, EVs are becoming a structural driver of electricity demand growth. In 2025, the expanding EV fleet contributed about 8% (66 TWh) of the 849 TWh rise in global electricity demand. In 2024, EV electricity demand had increased by 46 TWh.

Electricity demand for EVs is growing, but they already avoid 1.8 million barrels per day in oil demand



Source: Ember analysis; IEA Global EV Data Explorer
Includes battery electric vehicles and plug-in hybrid vehicles; Includes data on cars, buses, trucks, vans and 2 and 3 wheelers

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This electrification is directly displacing oil consumption. The total global EV fleet displaced 1.8 million barrels per day (mbpd) of oil demand in 2025, equivalent to around 13% of the United States' crude oil production. New electric vehicles added in 2025 alone displace 0.5 mbpd. While power sector emissions remained flat in 2025, the oil demand displaced through additional transport electrification in 2025 will avoid roughly 80 million tonnes of CO2e emissions annually, more than the annual power sector emissions of the United Kingdom.

The clean electricity expansion halting the rise in fossil generation in the power sector is also decarbonising other sectors of the economy as the world enters a period of clean power growth.

2.2 Batteries are making daytime solar into anytime solar and are ready to unlock the next stage of solar power growth

Solar power has become the dominant driver of change in global power systems. It is meeting a large share of electricity demand growth and displacing fossil fuels, but primarily during daylight hours.

As solar penetration rises, especially in mature markets, flexibility is becoming the main constraint on further expansion. With falling costs and accelerating deployment, batteries are emerging as a key flexibility technology, shifting cheap daytime solar into non-sunny hours. They complement other clean flexibility tools like grid expansion and flexible demand that maximise daytime solar use but cannot bring solar to the dark hours. Batteries will play a key role in unlocking the next stage of solar growth.

With cheap batteries, solar's potential to grow and meet an even greater share of global electricity demand is larger than ever, meaning it can remain the dominant driver of change in global power.

2.2.1 Cheap daytime solar is already transforming power systems globally

As of 2025, the rise of solar is, first and foremost, a daytime story. While annual averages show rapid growth in solar's share of electricity, its impact is far greater when viewed by hour of the day.

In May 2025, solar peaked at around a quarter of global midday electricity demand

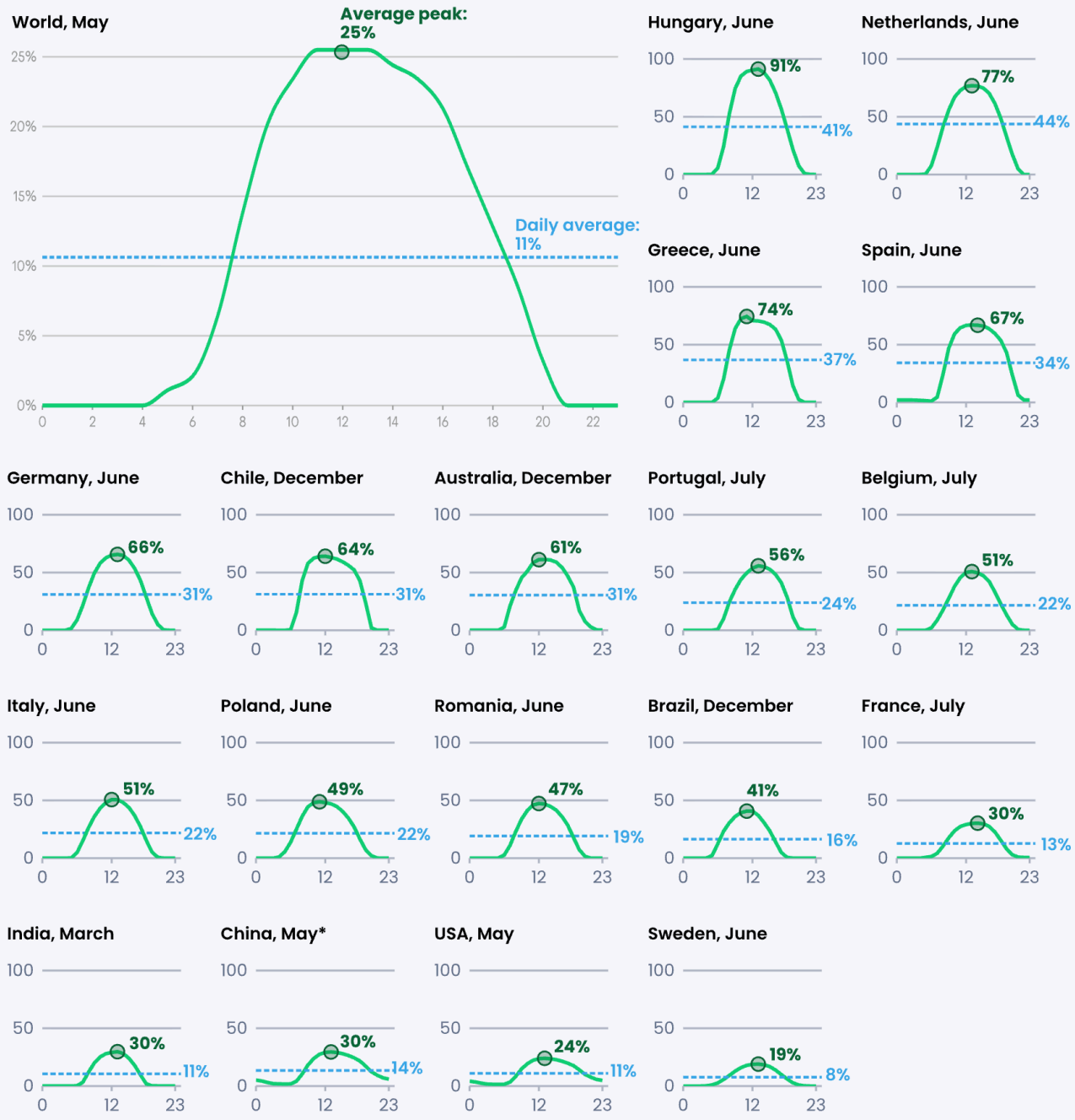
In May 2025, solar reached a new monthly record share of global electricity at 11% compared to 9% on average for 2025. This was not delivered equally by hour. On average, at midday when solar peaks, solar met around a quarter of global electricity demand in May, based on Ember estimates using hourly load curves from representative markets (see Methodology).

Many countries reached new record high midday solar shares well above 50%. In Hungary, the country with the highest annual average solar share, solar came close to meeting total midday demand on the average day in June. It reached 91% of generation at 1 pm on average, up 24 percentage points from the previous maximum of 67% at noon in June 2024.

Larger systems such as Germany, Spain and the Netherlands saw solar cover around two-thirds of demand on the average day during peak months, showing that it has become the dominant source of electricity during peak daylight hours in many power systems.

Solar reached over a quarter of global midday demand in May 2025, and over half in some countries during peak months

Average solar share of electricity demand by hour of day during the peak month*, %



Source: Ember analysis and estimates based on hourly generation and demand data from ENTSO-e, ESIOS, Energy-Charts (Agora), Terna, EIA, MERIT, ONS, Open Electricity • Peak month is the month with the highest solar share in 2025

* World and China hourly data is estimated based on representative load curves, scaled to the monthly average share

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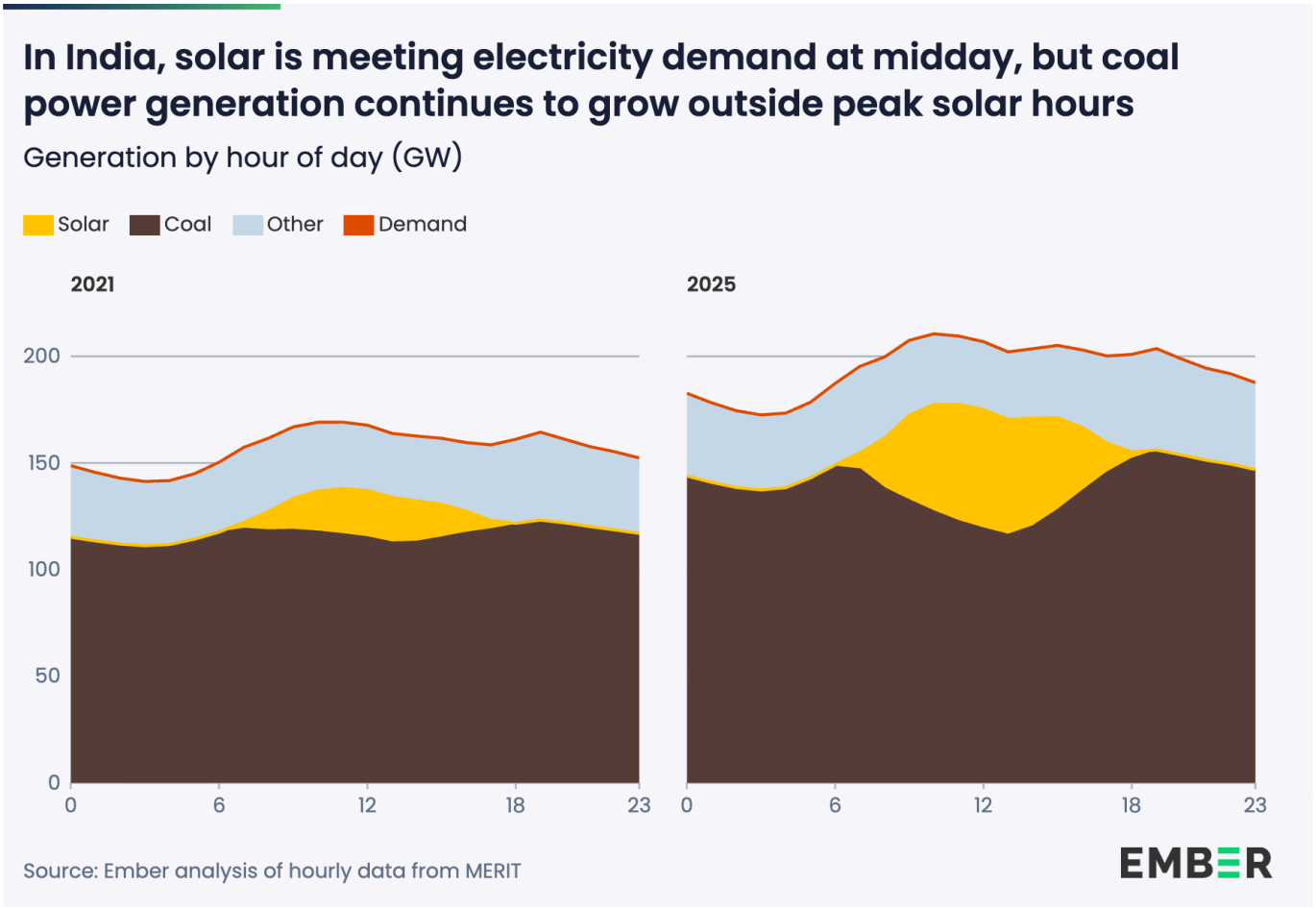
Rising daytime solar shares are sharply improving the business case for battery storage, as evidenced by the surge of negative prices across Europe and record curtailment in Chile. To incorporate ever more solar, especially in mature markets where midday shares are already high, further solar growth will be difficult without batteries: solar needs to be stored in the day and released at night.

While solar meets daytime demand, fossil generation keeps growing in the dark hours

In most countries, demand rose across all hours, so even when solar met the majority or all demand growth on an annual basis, fossil generation often continued to rise outside daylight hours, as evident in countries like India and the US.

In India, solar peaked at over 50 GW at midday during the average day in 2025 - doubling from 2021 and for the first time meeting a quarter of national demand during these hours. Meanwhile, coal power remained around its 2021 levels during those peak solar hours, its share falling below 60% for the first time in 2025.

However, outside daylight hours, India's coal generation has been growing steadily alongside electricity demand and still met well over three-quarters of demand growth from 6 pm to 6 am in 2025. The need to keep coal online to meet evening demand even contributed to significant solar curtailment at midday in H2-2025 due to the inability of the coal fleet to reduce generation below technical limits.



In the United States, solar met all of the increase in daytime electricity demand in 2025 between 10:00 and 18:00, while overnight demand growth continued to be met largely by coal and gas.

Together, these cases show that expanding flexibility and, in particular, batteries are essential to meet demand growth with cheap solar electricity outside daylight hours and reduce the need for more coal power. Batteries can also respond to variations in solar generation much faster than fossil plants that have limitations to how fast they can ramp up and down, and to the minimum operational load factor beyond which they need to shut down completely, which is often costly. That makes batteries significantly more efficient providers of flexibility. In 2025, some coal power plants in India even invited bids to build batteries to enhance their flexibility, with a coal plant in China also deploying a similar solution.

2.2.2 Batteries are ready to bring a paradigm shift and unlock the second stage of global solar growth

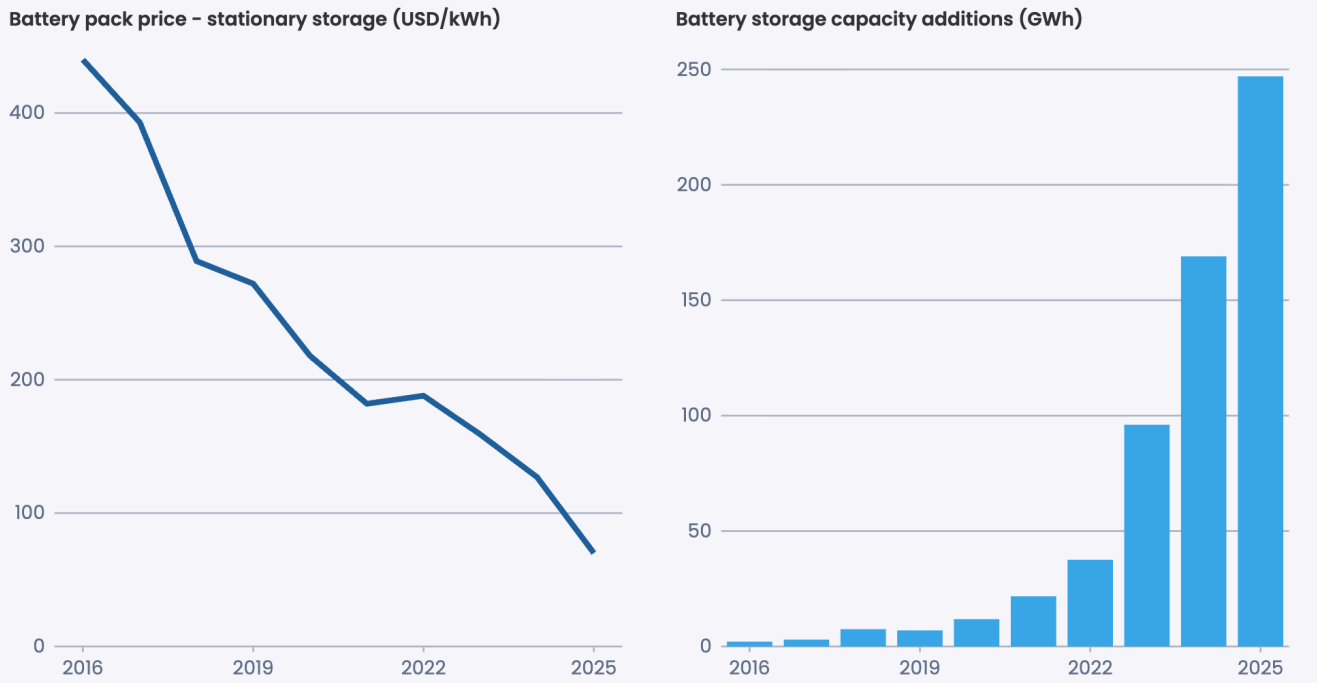
In 2025, batteries are finally moving into the mainstream to move solar beyond daylight hours and unlock the next phase of solar expansion.

Batteries are scaling up fast as their prices drop to a new record low in 2025
Falling battery prices are driving a rapid scale-up in deployments. Battery pack prices for stationary storage applications fell to a record low of USD 70/kWh in 2025, a 45% drop from 2024. Meanwhile, global battery storage capacity additions reached an estimated 250 GWh, up 46% year-on-year. This expansion is further supported by maturing business cases that enable revenue stacking. Batteries have outgrown their initial niche role as a grid stability service and are now core infrastructure designed to store excess daytime electricity and release it in the evening and at night.

Battery economics reached a turning point in 2025. Based on Ember's latest analysis of recent auction results in Saudi Arabia, India and Italy, alongside in-depth interviews with project developers, suppliers and analysts across global markets, dispatchable solar with batteries can now be delivered for around $76/MWh as of October 2025.

This makes it cheaper and faster to build than a new gas power plant, particularly in countries reliant on expensive LNG imports. In India, solar and battery costs to supply round-the-clock clean power at over 95% availability are now comparable to or lower than the tariffs for new coal power plants.

Battery prices continued their free fall in 2025 while installations are surging



Source: BloombergNEF • Volume-weighted average prices in 2025 real USD
2025 capacity additions are projected

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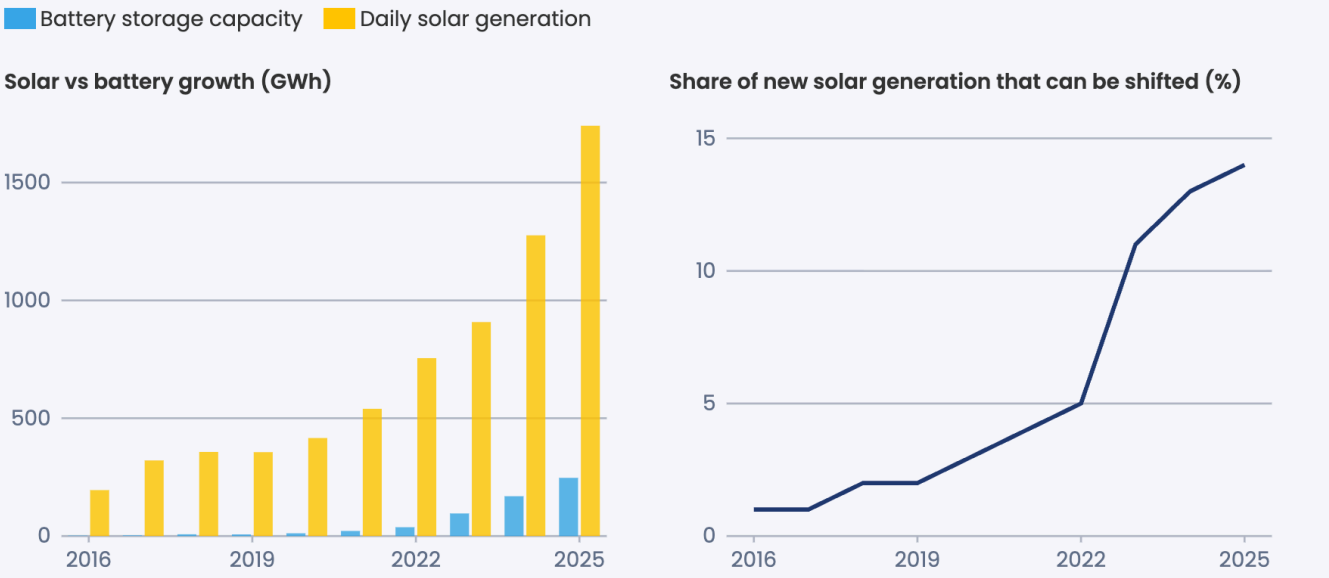
The world added enough new battery capacity in 2025 to shift 14% of new solar generation

This is only the beginning, as battery additions are still catching up with the pace of solar growth. In 2025, global solar generation increased by 636 TWh, equivalent to around 1,700 GWh of additional solar output on the average day. The 247 GWh of battery capacity added globally in 2025 would be enough to shift around 14% of this new daily solar generation from daytime to other hours, up from 13% in 2024 and just 5% in 2022.

In practice, batteries are not used only to shift solar. They also support wind integration and provide ancillary services such as regulating frequency and voltage to help maintain power quality and prevent blackouts - meaning only part of this battery capacity is actually dedicated to moving solar generation across the day.

The world could shift 14% of the new solar generation in 2025 using new battery capacity



Source: Yearly electricity data, Ember, Battery capacity additions based on BNEF
Shifting solar refers to the theoretical amount of the average daily solar generation growth (total annual growth divided by number of days in the year) that can be absorbed by the new battery capacity and redistributed to a different time. It is the ratio of battery capacity to the daily solar growth.

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Australia and Chile could shift over 50% of the new solar generation they added in 2025 with new battery capacity

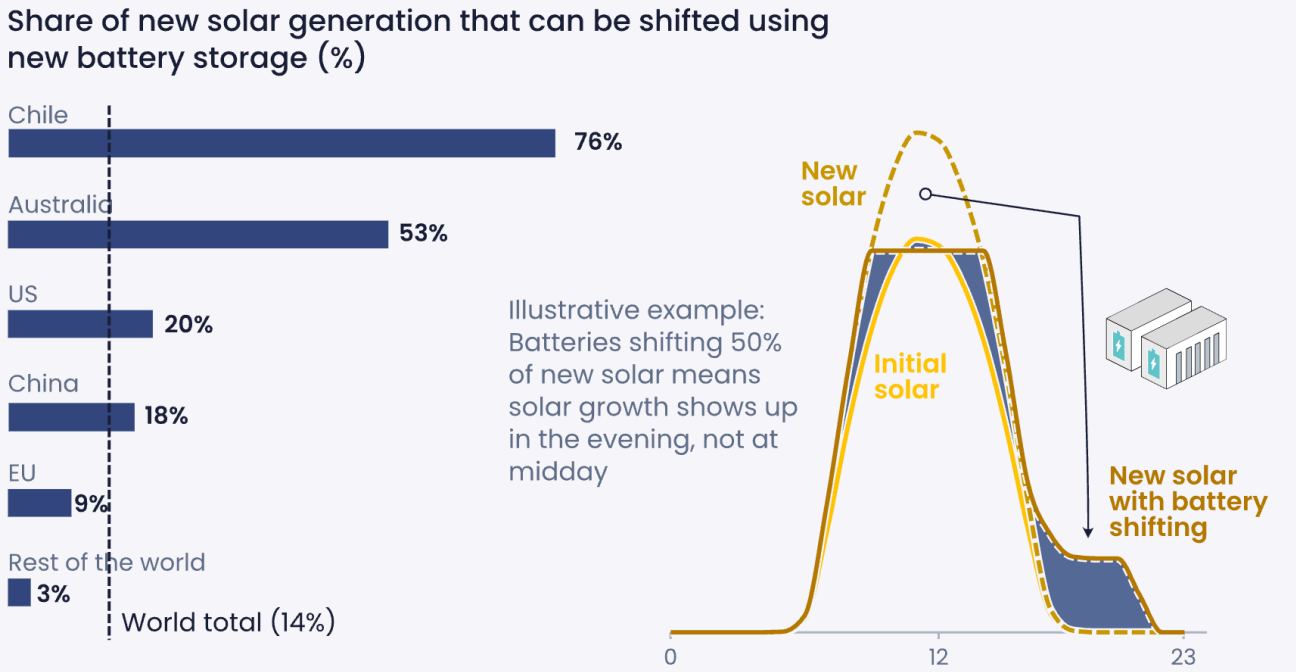
Large-scale solar shifting is emerging first in markets where solar already dominates the generation mix. Markets like California, Australia and Chile are leading the way.

Among these markets, Australia and Chile stand out for adding relatively small amounts of battery capacity in absolute terms, 9 GWh and 4 GWh respectively, but large enough relative to their solar growth to make a material difference. Chile added enough battery capacity in 2025 to theoretically shift 76% of the new solar generation it added in that year, while Australia added enough to shift 53%.

In the US, battery additions in 2025 were sufficient to shift around 20% of new solar generation, reflecting rapid battery build-out in several markets, including California and Texas. California stands out because it has already moved from potential to reality. The state has been adding more battery capacity than solar since 2021, with most of the 2025 increase in solar generation being delivered in the evening.

In 2025, the EU added around 15 GWh of utility-scale battery capacity, enough to shift 9% of the new solar generation added in that year, and it has a record pipeline of projects that could quadruple battery capacity.

Australia and Chile added enough new battery capacity to move more than 50% of the solar they added in 2025



Source: Ember • Battery capacity additions based on BNEF, AEMO, ACERA, SolarPower Europe, Benchmark Mineral Intelligence
Shifting solar refers to the theoretical amount of the average daily solar generation added in 2025 that can be absorbed by battery capacity and redistributed to a different time

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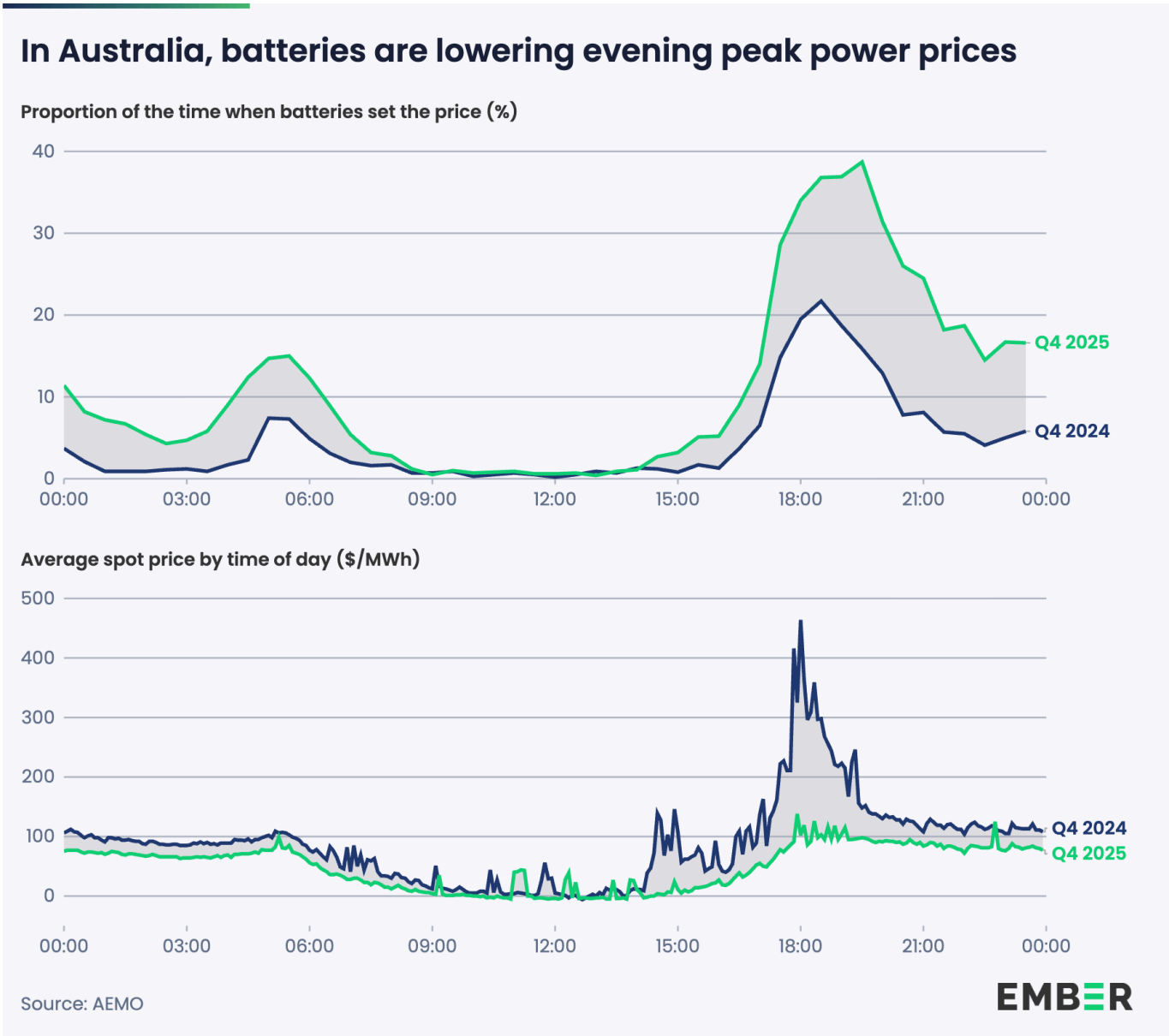
In Australia, batteries are setting peak evening power prices lower

Australia shows how batteries can quickly reshape power markets once deployed at scale. In Q4-2025, during the high-value evening peak hours (18:00-20:00) in the National Electricity Market, batteries set prices 36% of the time - doubling from 18% in Q4-2024, displacing gas and hydro as price setters.

This led to significantly lower price volatility compared with Q4-2024, with average spot prices of around $100 per MWh during 18:00-20:00, less than half of the Q4-2024 average spot prices during these hours. This helped bring overall prices lower, with wholesale prices averaging $50/MWh, a $39/MWh (-44%) reduction from Q4 2024.

These dynamics, with similar trends also in Q3-2025, show that batteries are already delivering tangible system benefits by reducing reliance on expensive fossil generation and stabilising prices at the most critical times of day.



In Chile, batteries are helping to curb curtailment growth

In 2025, Chile's growing battery capacity helped curb the rise in renewables curtailment. Installed battery capacity doubled, reaching 7.6 GWh in 2025, up from 3.5 GWh in 2024, mainly from battery capacity installed at already operating solar power plants.

Without batteries, wind and solar curtailment would have increased by 43% to 8 TWh from 2024 compared to the 8% actual curtailment increase registered in 2025. The 2 TWh of potential curtailment avoided by batteries is the equivalent of 2.2% of Chile's total electricity demand in 2025.

Batteries are ready to unlock the next stage of solar growth

With falling costs, rising deployment and clear system benefits, batteries are becoming a core enabler of the next stage of solar growth. As more power systems reach high daytime solar shares, storage will be critical to shifting clean electricity into non-sunny hours, reducing fossil generation and sustaining solar expansion.

According to the IEA's latest World Energy Outlook, 80% of global energy demand growth is expected to come from "regions with high-quality solar irradiation". Lower seasonal variability means solar combined with storage is no longer just a daytime solution — it can now be a nearly round-the-clock resource and the most affordable pathway to meet rapidly rising electricity demand there.

Chapter 3

Global Electricity Demand and Supply Trends

Analysis of global electricity demand and supply, highlighting changes in 2025 and longer-term trends over the last two decades.

This chapter provides an in-depth analysis of global electricity demand and supply, covering the largest sources of electricity that comprise 94% of global electricity generation, ordered by their growth in 2025: solar, wind, gas, nuclear, hydro and coal.

Changes in global electricity generation in 2025

	2024 Electricity generation (TWh) **Share of generation (%)**	2025 Electricity generation (TWh) **Share of generation (%)**	Change Generation (TWh) **Percentage change (%)**	5-Year Trend CAGR 2020-2024 (%)
Electricity demand	30,930 TWh	31,779 TWh	849 TWh **2.8%** ▲	2.9%
Total clean	12,655 TWh **40.9%**	13,542 TWh **42.6%**	887 TWh **7.0%** ▲	5.4%
Total renewables	9,878 TWh **31.9%**	10,730 TWh **33.8%**	852 TWh **8.6%** ▲	7.1%
Solar	2,143 TWh **6.9%**	2,778 TWh **8.7%**	636 TWh **29.7%** ▲	25.1%
Wind	2,510 TWh **8.1%**	2,715 TWh **8.5%**	205 TWh **8.2%** ▲	12.0%
Hydro	4,434 TWh **14.3%**	4,437 TWh **14.0%**	3 TWh **0.1%** ▲	1.0%
Other renewables*	792 TWh **2.6%**	800 TWh **2.5%**	9 TWh **1.1%** ▲	4.1%
Nuclear	2,777 TWh **9.0%**	2,812 TWh **8.9%**	35 TWh **1.3%** ▲	0.2%
Total fossil	18,276 TWh **59.1%**	18,238 TWh **57.4%**	-38 TWh **-0.2%** ▼	1.4%
Coal	10,539 TWh **34.1%**	10,476 TWh **33.0%**	-63 TWh **-0.6%** ▼	1.4%
Gas	6,883 TWh **22.2%**	6,919 TWh **21.8%**	36 TWh **0.5%** ▲	1.5%
Other fossil**	854 TWh **2.8%**	842 TWh **2.6%**	-12 TWh **-1.4%** ▼	0%

Source: Yearly electricity data, Ember
*Other renewables generation includes bioenergy, geothermal, tidal and wave generation. **Other fossil generation includes generation from oil and petroleum products, as well as manufactured gases and waste.

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3.1 Global electricity demand

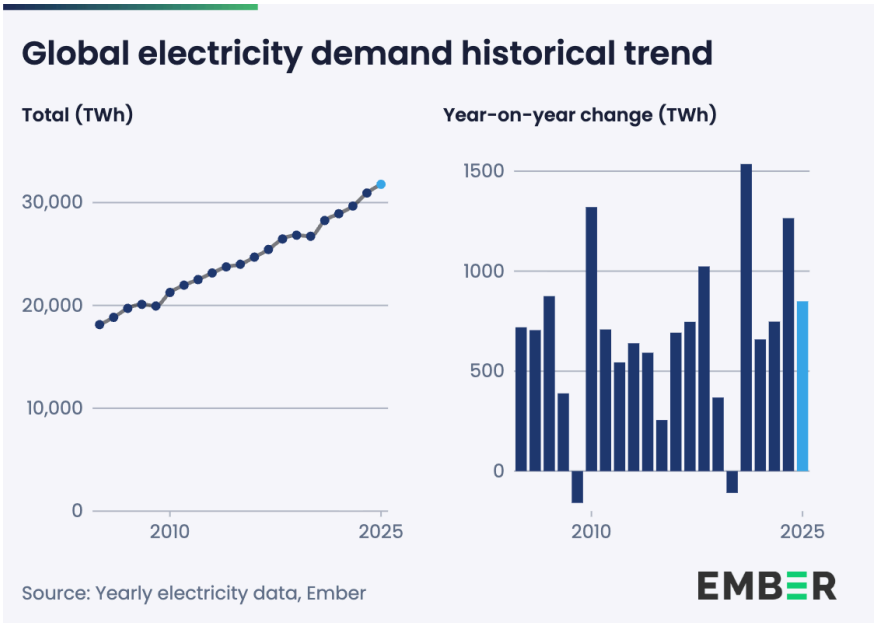
Key highlights

01 **Global electricity demand grew moderately at 2.8% in 2025, in line with the ten-year average of 2.7%**

02 **China's electricity demand reached a third of the global total for the first time and accounted for more than half of global growth in 2025**

03 **India's electricity demand grew at the third-lowest annual rate in two decades in 2025 amid milder weather conditions**

Global electricity demand increased by 2.8% (+849 TWh) in 2025, to a new record high of 31,779 TWh. This marked a notable slowdown from the 4.3% (+1,265 TWh) surge in 2024 but aligns closely with the ten-year average annual demand increase of 2.7% from 2015 to 2024.



Despite lower growth than in 2024, last year still ranks as the sixth-largest absolute increase in global electricity demand in the past two decades. The record was set in 2021 (+1,536 TWh) as demand rebounded from a global recession caused by the Covid-19 pandemic in 2020.

Three key factors led to lower demand growth in 2025 than in 2024:

Firstly, there were no temperature-related demand changes. In 2024, heatwaves drove a sharp rise in electricity demand globally. In 2025, temperatures remained similarly high to 2024 levels. Consequently, they had no net impact on demand growth.

Secondly, there was a slowdown in electricity demand growth from manufacturing and industrial sectors, particularly in China.

Thirdly, there was a calendar effect unrelated to the power sector. Because 2024 was a leap year, it had one more day than 2023, boosting 2024's year-on-year growth by roughly 0.3 percentage points. Conversely, 2025 had one fewer day than 2024, reducing demand growth in 2025 by around 0.3 percentage points.

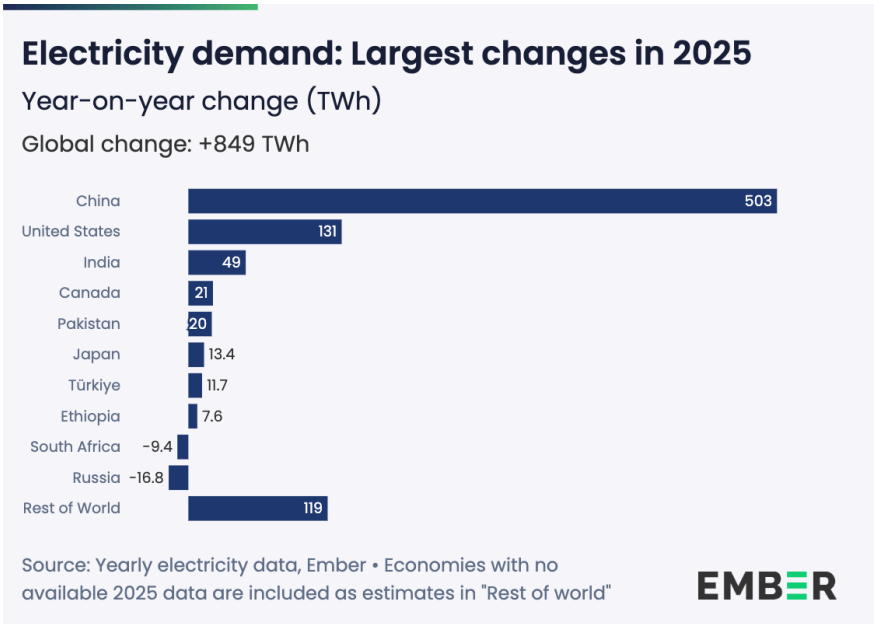
When both years are adjusted for temperatures and calendar effects, underlying demand growth was similar at around 3.3% in 2024 and 3% in 2025.

Electricity demand is expected to accelerate in the coming years with increasing electrification of sectors like transport. However, the relative efficiency of electrified technologies means even major

shifts only have a moderate impact on electricity demand. In 2025, record growth in electric vehicle sales and usage contributed roughly 8% (+66 TWh) of the global increase in demand – up from 46 TWh in 2024.

Data centres are also expected to become a significant contributor to global electricity demand growth in the coming years. International Energy Agency (IEA) projections suggest data centres likely added around 60 TWh, or 7% of the global increase in demand in 2025, though uncertainty around this estimate remains high. The IEA's forecast expects data centre demand to grow four times faster than overall electricity demand, from around 500 TWh in 2025 to around 950 TWh in 2030. However, even at this rapid pace, data centres would account for less than 3% of global electricity demand by 2030, though regional impacts will differ significantly.

China led global demand growth in 2025, for the tenth year running, adding 503 TWh (+5.0%). This accounted for 59% of the global net increase in electricity demand (+849 TWh). However, it marked a slowdown from China's growth in 2024 (+6.7%, +631 TWh). This deceleration of China's electricity demand was caused by reduced temperature-related changes and slower expansion in the industrial sector, where demand growth slowed from 5.1% in 2024 to 3.7% in 2025.



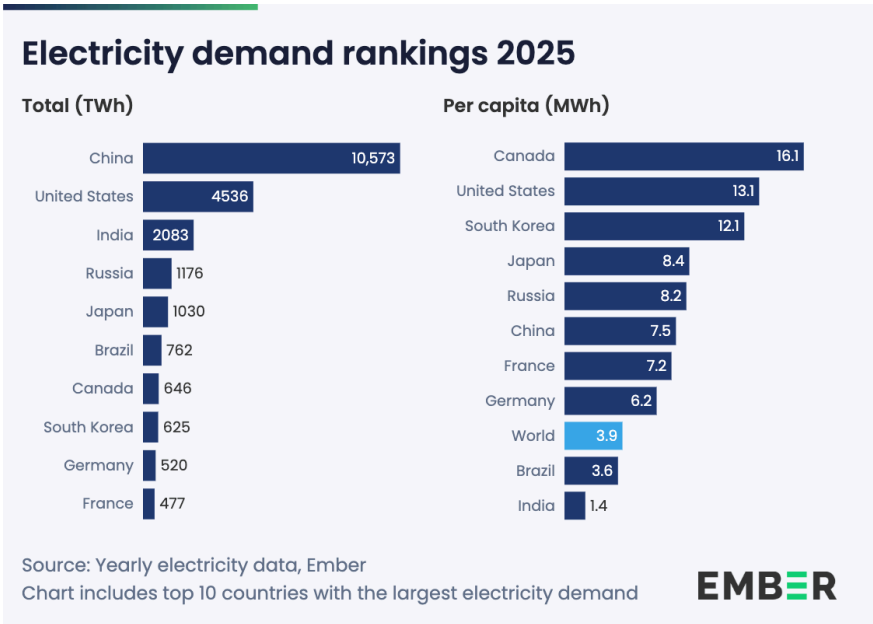
Still, China's electricity demand rise was nearly four times larger than that of the United States (+131 TWh, +3.0%) and ten times larger than India's (+49 TWh, +2.4%).

In the United States, electricity demand growth remained at similarly high levels as in 2024. Lower demand from cooling systems during a milder summer was more than offset by a spike in heating demand during colder-than-average winter conditions.

India recorded its third-lowest rate of electricity demand growth in the last 20 years at 2.4% (+49 TWh). On average, India's electricity demand grew by 5.6% annually over the period from 2006 to 2025. Mild temperatures significantly reduced cooling demand in India in 2025, compared with 2024, while a slowdown in industrial activity dampened growth in electricity demand.

Russia recorded the largest decline in electricity demand of any country in 2025 (-17 TWh), primarily driven by significantly milder temperatures than in 2024.

China remains by far the world's largest power sector, reaching 10,573 TWh of electricity demand in 2025. This is more than double the power demand of the United States (4,536 TWh) and five times that of India (2,083 TWh). In 2025, China accounted for a third of global electricity demand (33.3%) for the first time – up from less than 10% at the beginning of the 21st century.



China's electricity demand has grown by 6.2% per year on average in the last decade, even as its population trend has tipped from growth to decline. Electricity demand per capita has surged, reaching 7.5 MWh in 2025 – nearly double the global average of 3.9 MWh. As recently as 2008, China's demand per capita was still below the global average.

Among the ten largest power sectors globally, Canada (16.1 MWh) and the United States (13.1 MWh) have the highest per capita demand. Even though China's per capita demand has been rising, the United States' remains 75% higher.

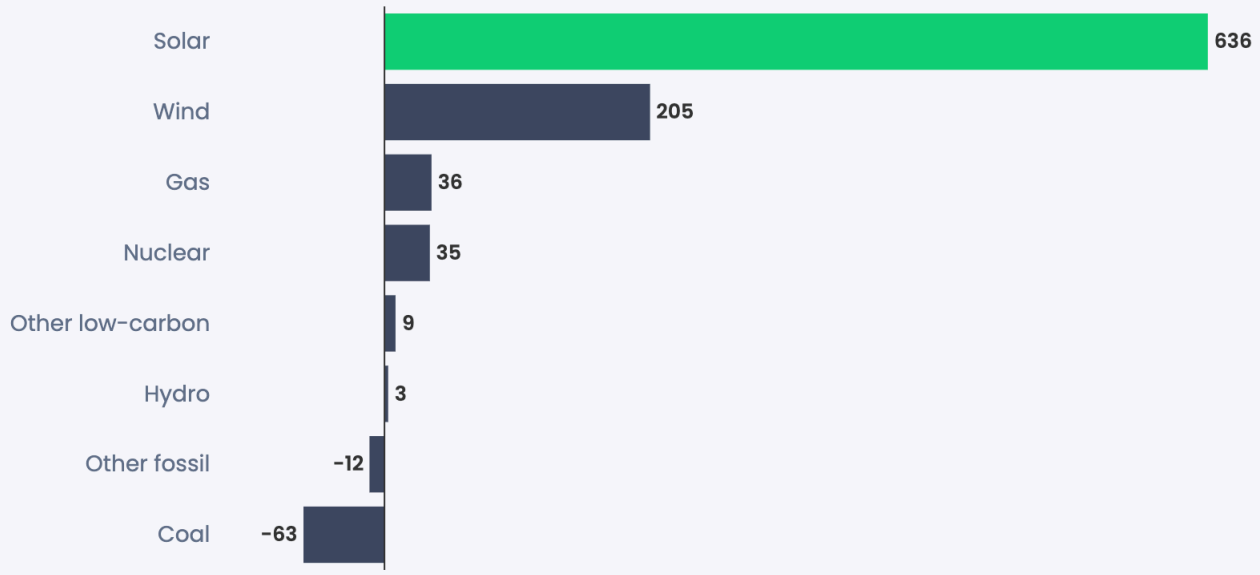
India's per capita demand remains the lowest among the top ten power markets at just 1.4 MWh. This is roughly a third of the global average and roughly one-tenth of the US.

3.2 Global electricity supply overview

Solar was the largest source of new electricity in 2025, growing by 636 TWh. Its increase was 18 times as large as that of gas (+36 TWh), which was the only fossil power source that grew in 2025. Electricity generation from coal and other fossil fuels declined in 2025.

Solar dominated changes in global electricity generation in 2025

Change in 2025 vs. 2024 (TWh)



Source: Yearly electricity data, Ember
'Other low-carbon' includes bioenergy and other renewables such as geothermal; 'Other fossil' includes oil, other petroleum products and fossil waste

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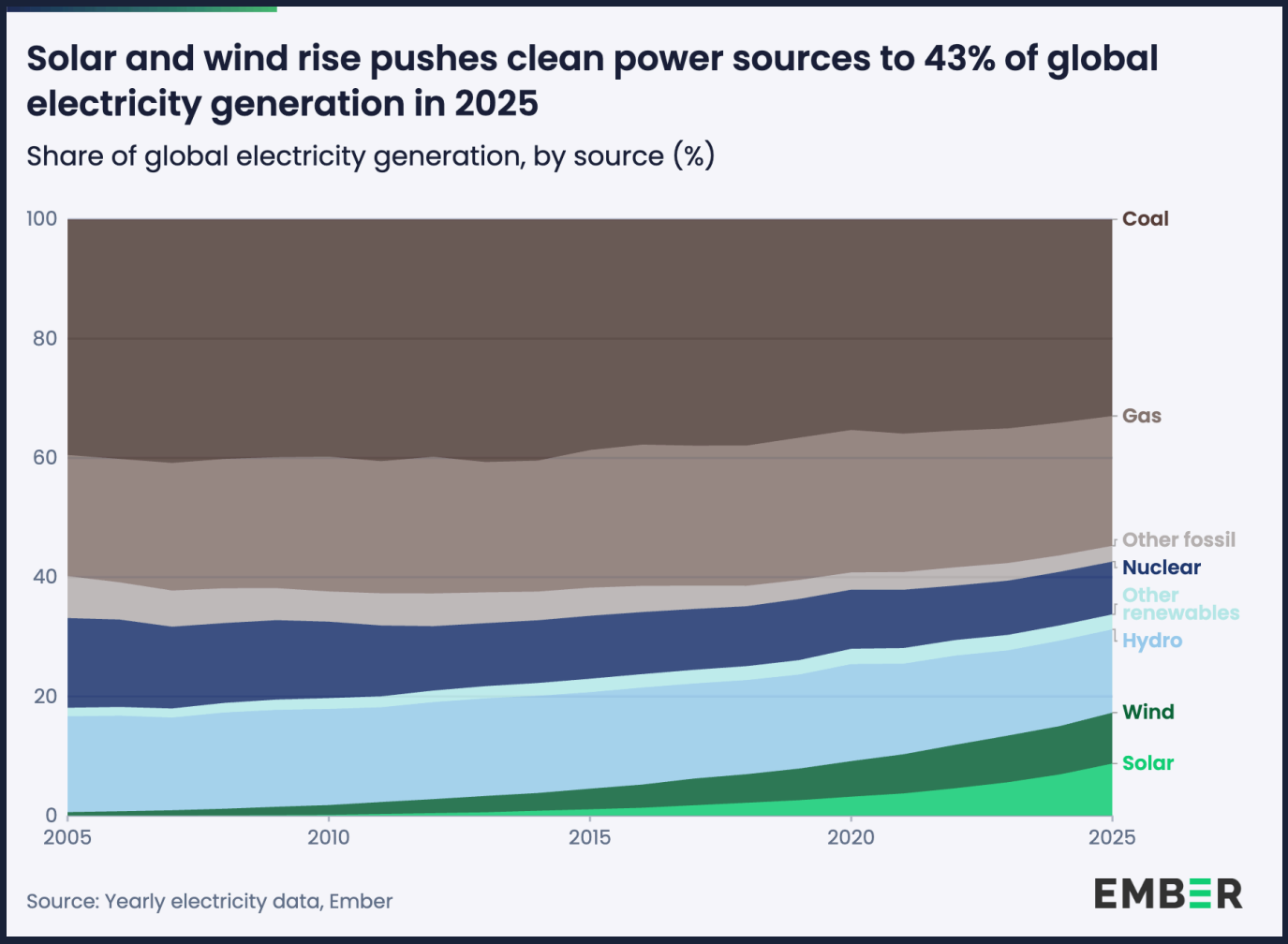
Over the last decade, wind and solar power have rapidly become major contributors to global power generation, reaching 17.3% of total electricity generation in 2025, nearly four times the share in 2015 (4.5%). Wind and solar power now contribute more than half of all renewable generation, which was historically dominated by hydropower. Combined with nuclear (8.9%), low-carbon sources reached 42.6% of total electricity generation in 2025, up 9.1 percentage points from 33.5% in 2015. Conversely, the share of fossil generation fell to 57.4%, down from 66.5% in 2015.



Electricity, on average, is getting cleaner. The emissions intensity of electricity has dropped 14% over the last decade, from 533 grams of CO2 equivalent per kWh (gCO2e/kWh) in 2015 to 458 gCO2e/kWh in 2025. In 2025 alone, the global emissions intensity of electricity declined by 2.7% – the largest annual percentage decline of the past two decades and similar to the decline observed during the Covid-19 pandemic year of 2020.

3.3 Solar

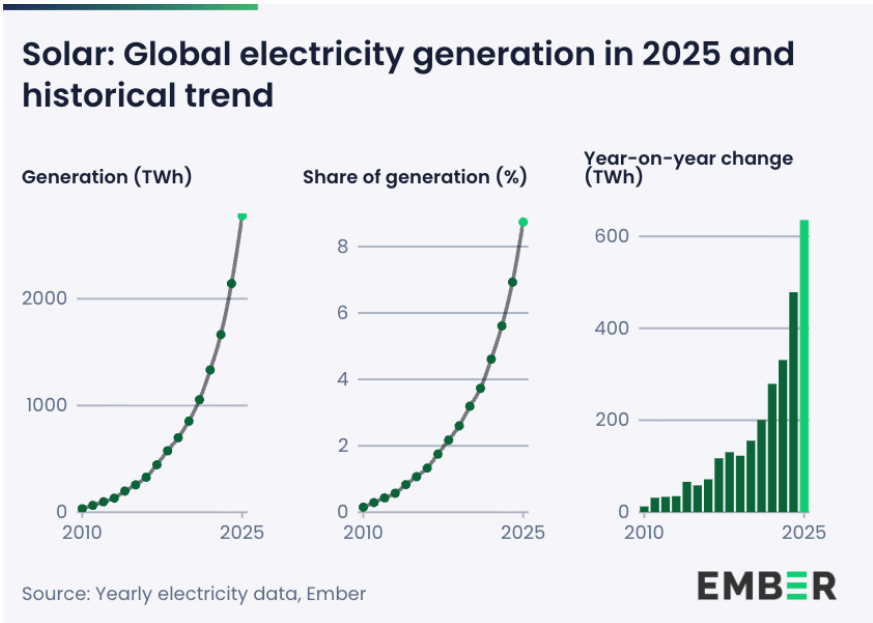
Key highlights

01 **Solar met 75% of global electricity demand growth in 2025**

02 **The rise in solar generation in 2025 was the largest increase of any electricity source ever, apart from coal's Covid-19 rebound in 2021**

03 **As of 2025, 50 countries generate more than a tenth of their electricity from solar, up from just 15 in 2020**

2025 was another record year for global solar growth, with generation rising by 636 TWh, equivalent to twice the total electricity demand of the United Kingdom. Global solar growth in 2025 alone exceeded the electricity that could be generated from all LNG exports through the Strait of Hormuz that year (81 million tonnes, or around 550 TWh of gas-fired electricity). The solar increase in 2025 was 33% higher than in 2024 (+479 TWh) and almost double that of 2023 (+331 TWh).



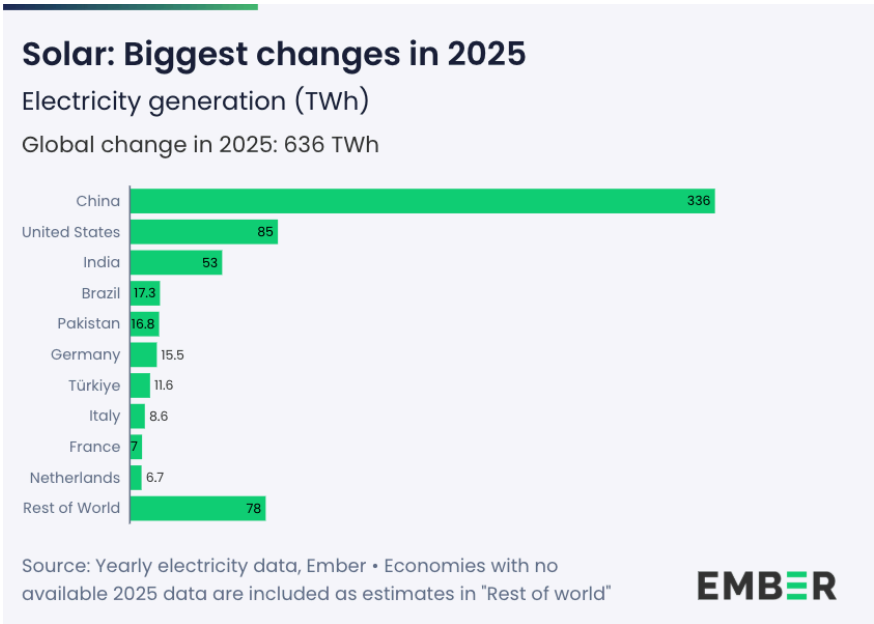
Solar's growth of 636 TWh was more than three times as large as wind's, the next largest increase in 2025, at 205 TWh. Solar generation growth in 2025 was nearly 18 times that of gas (+36 TWh). Other than coal's post-Covid rebound in 2021, the 2025 rise in solar generation was the largest of any electricity source ever.

Global solar generation overtook wind for the first time in 2025, reaching a new record high of 2,778 TWh. Solar's output in 2025 was almost 11 times higher than in 2015 (256 TWh). In the same period, its share rose from 1.1% to 8.7%. Over the past decade, solar generation has doubled roughly every three years. In the last three years (2023-2025), solar met 50% of global demand growth.

Solar accounted for 68% of all renewable capacity additions from 2019 to 2024. This is partly due to the sharp drop in solar panel prices, which fell by 90% between 2015 and 2024. 2025 was once again a record year for solar capacity additions with 647 GW added globally.

China continues to record the world's largest annual increases in solar generation, adding 336 TWh in 2025, despite the end of some incentives and a shift to a market-driven pricing model in June 2025. In 2025, China accounted for more than half of the global rise in solar generation, for the second year in a row. Solar generation in China rose 40% year-on-year in 2025, following 44% growth in 2024.

The United States recorded the second-largest increase in solar generation globally in 2025 (+85 TWh, +28%), which met 65% of the country's growth in electricity demand. The largest solar rises occurred in states where electricity demand increased the most. Solar's surge in the US was driven by continued expansion of utility-scale projects, with smaller contributions from behind-the-meter systems.



India recorded the third-largest increase in solar generation globally in 2025, adding 53 TWh, a 37% increase from the previous year. This was driven by record capacity additions of 38 GW(AC) in 2025, a 54% increase on 2024 deployment, with policy support for both utility-scale and rooftop-PV solar.

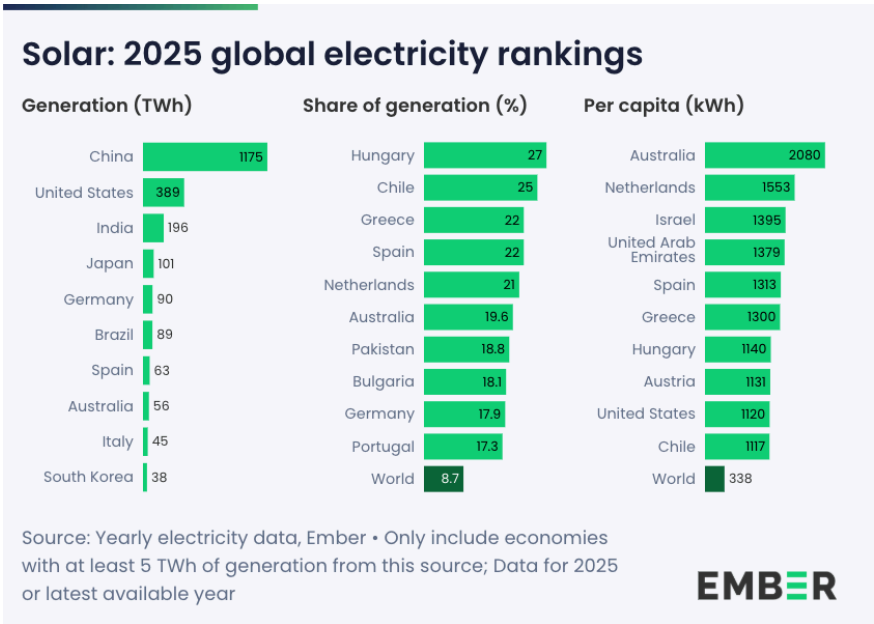
Pakistan added a record 17 TWh of solar generation in 2025, roughly the same as Brazil. This was an 85% increase from 2024, which was already 75% higher than in 2023. Rapid expansion of solar installations in Pakistan has almost tripled solar's share in just three years - rising from 6.6% in 2022 to 18.8% in 2025. Pakistan is one of the world's fastest-growing solar markets, with strong growth in distributed solar, including through off-grid systems.

Solar generation was the fastest-growing power source for at least 23 countries in 2025.

China remains the global leader in solar generation. China's total solar generation in 2025 (1,175 TWh) was greater than that of the OECD combined (1,078 TWh) and three times that of the next largest country, the United States (389 TWh).

Hungary and Chile now generate more than a quarter of their electricity from solar; in 2020, both countries had solar shares below 10%. Hungary continues to be a global solar leader, increasing its share from 24% in 2024 to 27% in 2025, due in part to government support and subsidies. Chile saw an increase from 23% to 25% over the same period and now ranks second globally.

To rank among the top ten countries by solar share, a country needed to reach 17% in 2025, compared with just 13.5% in 2024.



Based on the latest available data, 50 countries generated more than a tenth of their electricity from solar in 2025, up from 15 in 2020. No country had yet passed that threshold in 2015. Among larger electricity markets, defined as those with more than 5 TWh of total solar generation, 19 countries exceeded a 10% solar share in 2025, up from 15 in 2024 and none in 2020.

In per capita terms, global solar generation reached 338 kWh in 2025, a 29% increase from 2024. Australia remains the world leader for solar generation on a per capita basis, driven by high residential uptake. 43% of Australian households now have their own solar panels installed.

3.4 Wind

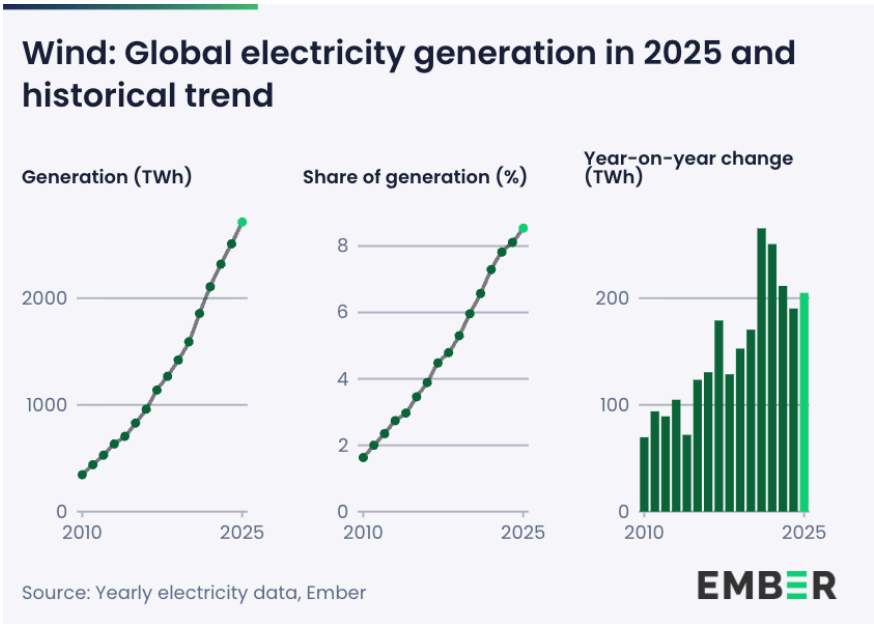
Key highlights

01 **Wind saw the second-largest increase of any electricity source in 2025**

02 **China accounted for more than two-thirds of global wind generation growth in 2025**

03 **India overtook the UK to become the fifth-largest wind generator globally**

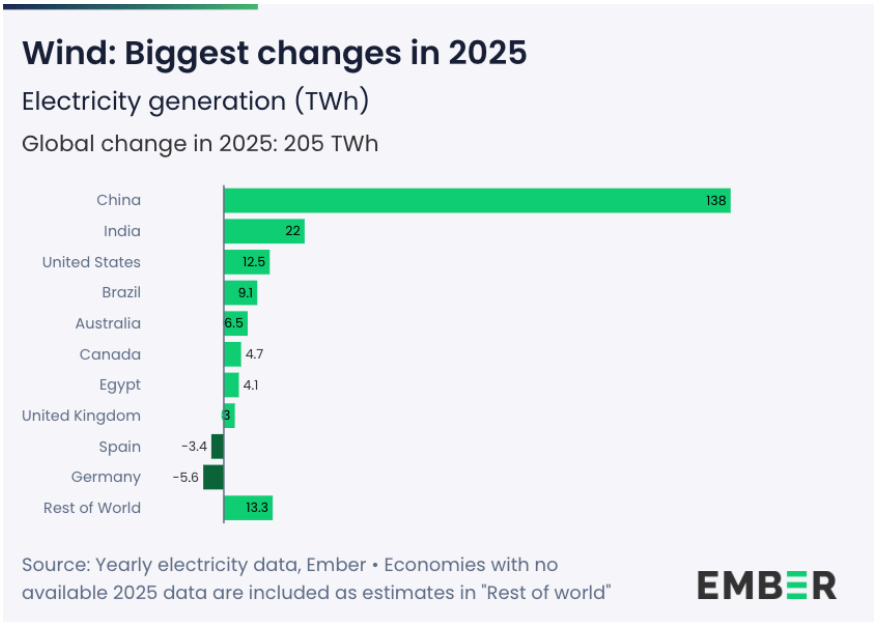
Global wind generation reached a new high of 2,715 TWh in 2025, up 205 TWh (+8.2%) from 2024. The increase was the second-largest of any source of electricity in 2025, behind only solar. Wind generation has roughly doubled in the past seven years, up from 1,268 TWh in 2018.



Global wind capacity additions reached a record 167 GW in 2025. However, this growth remained concentrated in the top four markets: China, India, the United States and Germany. Together, these markets accounted for 82% of global wind installations in 2025.

The share of wind power in the global electricity mix continued to rise in 2025, reaching an all-time high of 8.5%.

China accounted for just over two-thirds (68%) of the global increase in wind generation in 2025. Its wind generation grew by 138 TWh in 2025, a 14% increase from 2024. The country also accounted for more than half of global wind capacity additions for the third year in a row, adding 119 GW in 2025, 72% of the global total.



India registered the second-highest increase in wind generation in 2025 (+22 TWh). This was the country's largest single-year increase to date. Wind now accounts for 5% of India's electricity generation, double the share reached in 2015.

In the United States, growth in wind generation slowed to 12.5 TWh in 2025, 59% lower than the increase in 2024 (+31 TWh). This was partially the result of a slowdown in wind deployment. The United States' annual wind installations in 2024 (+5.1 GW) and 2025 (+5.6 GW) dropped to the lowest levels in a decade.

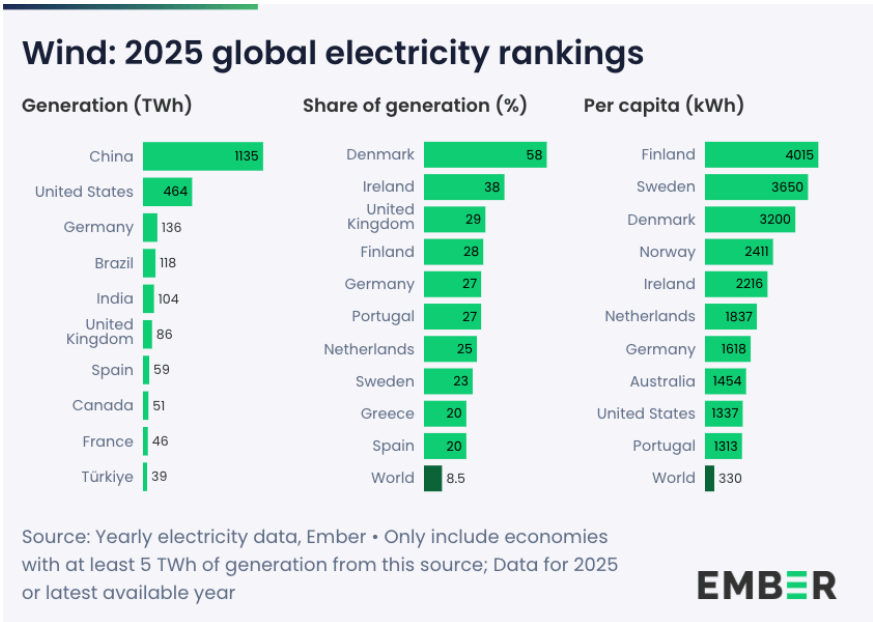
Brazil recorded the fourth-largest increase in wind generation, with output rising by 9.1 TWh in 2025. This raised wind's generation share by one percentage point to 16%.

Australia recorded a significant increase in wind generation in 2025 of 6.5 TWh (+20%) due to stronger wind conditions and major new wind farms coming online, such as the 412 MW Goyder South wind farm and the 923 MW MacIntyre Wind Farm, Australia's largest-ever wind farm project. In 2024, temporary wind conditions in Australia's late autumn and winter reduced the output of wind farms. However, conditions improved in 2025.

By contrast, wind generation fell in the EU in 2025 (-12 TWh) owing to unusually low wind speeds in some major markets, particularly in the first half of 2025. Weaker wind conditions led to Germany's wind generation falling (-5.6 TWh), as well as Spain's (-3.4 TWh). Sweden, Poland and Denmark also recorded declines above 1 TWh in 2025. However, wind still accounted for 17% of the EU's electricity mix in 2025, double the global average.

China remained the largest wind power producer in 2025, generating 1,135 TWh – more than the G7 combined (819 TWh). China accounted for 42% of global wind generation in 2025.

India overtook the UK to become the fifth-largest wind generator globally in 2025, reaching a total of 104 TWh. It is the second-largest generator of wind power in Asia, behind China.



Among countries with at least 5 TWh of wind generation, the top ten by wind share in 2025 were all in Europe. By this metric, Denmark leads the world by far, with wind generating 58% of the country's electricity.

The latest available data shows 15 countries generated more than a fifth of their electricity from wind in 2025, up from nine countries in 2020.

On a per capita basis, Nordic countries generated the most wind power in 2025, led by Finland at 4,015 kWh per capita.

3.5 Gas

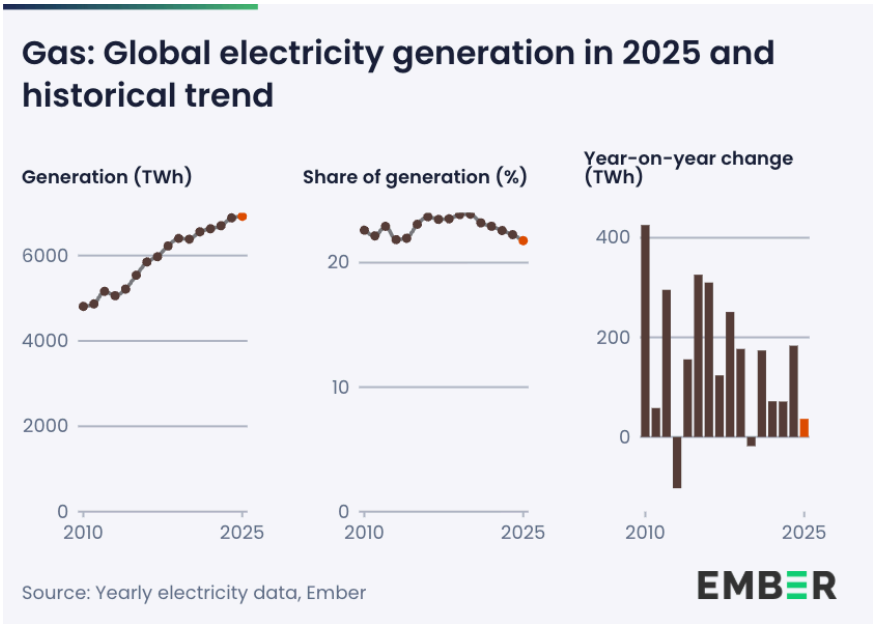
Key highlights

01 **The global share of gas generation declined for the fifth consecutive year in 2025**

02 **Growth in global gas generation fell to a five-year low in 2025**

03 **The United States recorded the largest decline in gas generation in 2025 due to high prices**

Global gas generation rose by 0.5% in 2025, increasing by just 36 TWh, the lowest increase since 2020, and only a fifth of the 183 TWh (+2.7%) increase in 2024. Solar growth was 18 times greater than gas generation growth in 2025.



Despite modest growth, global gas generation reached a record high of 6,919 TWh in 2025, 8% higher than pre-pandemic levels recorded in 2019. However, in recent years, gas generation has grown more slowly than electricity demand. As a result, the share of gas in the global electricity mix has declined every year since a peak of 23.9% in 2020 – falling to 21.8% in 2025.

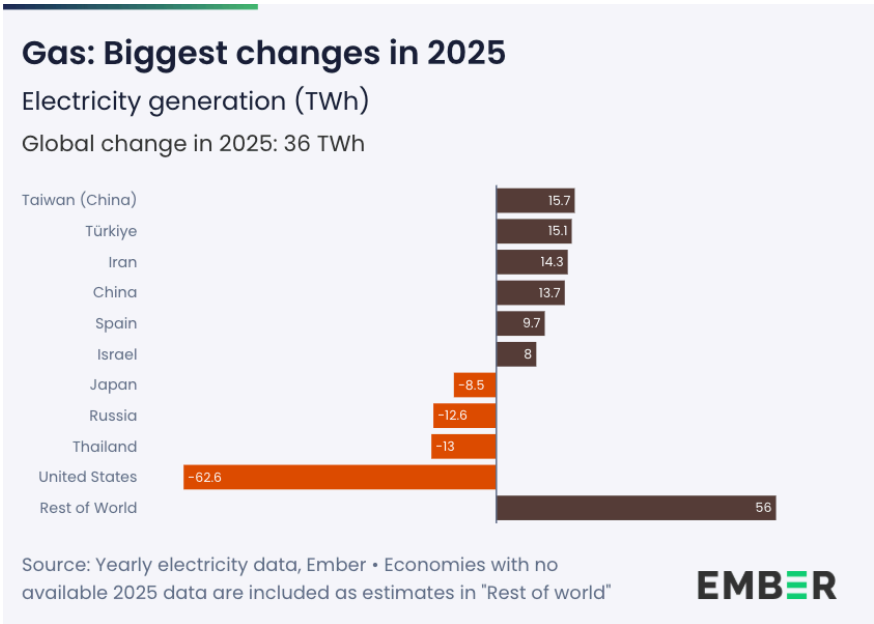
Four countries have shifted a fifth — or more — of their generation away from gas since 2019 due to renewables growth and new nuclear power plants. Belarus saw the share of gas fall from 97% in 2019 to 55% in 2025, as a nuclear power plant came online. In the United Arab Emirates, gas fell from 97% in 2019 to 68% in 2024 (2025 data not yet available) as nuclear and solar power expanded rapidly. In Latvia, gas declined from 50% in 2019 to 26% in 2025 due to renewables growth, while in the Netherlands it fell from 59% to 35% as a result of growing solar and wind generation.

The largest increase in gas generation occurred in Taiwan (China), where output rose by 16 TWh (+13%), compensating for the shutdown of its last operating nuclear reactor in the first half of 2025. Türkiye recorded the second-largest gas power rise of 15 TWh (+24%) in 2025. This was partly compensating for a decline in hydropower output as Türkiye experienced its lowest rainfall level in 61 years.

The largest gas power decline in 2025 was in the United States (-63 TWh, -3.4%), as higher gas prices reversed the coal-to-gas-switching seen in the previous three years.

Thailand recorded the second-largest decline in gas generation (-13 TWh, -9.6%) after three consecutive years of increases. Thailand experienced mild weather in 2025, leading to less cooling-related demand, alongside a slowing economy and rising solar generation.

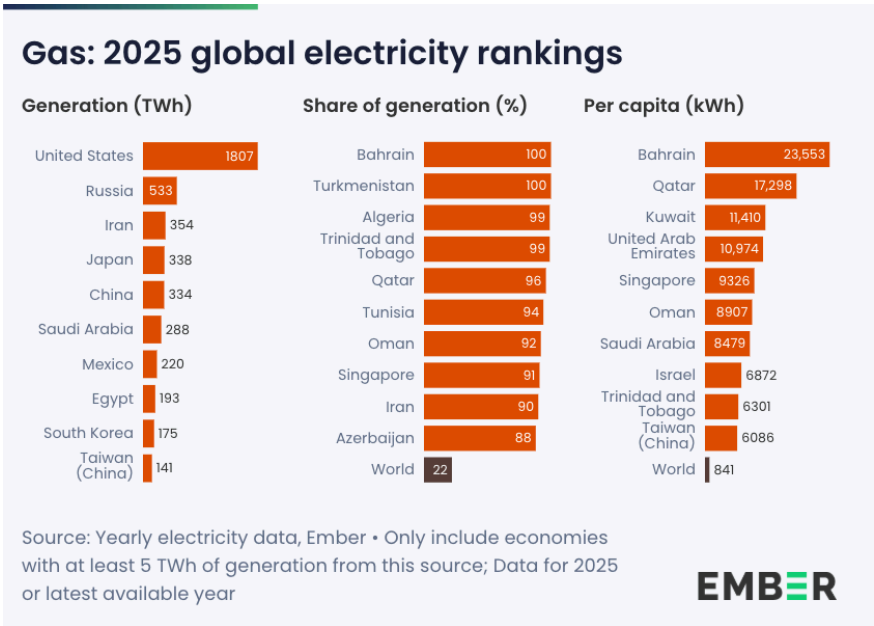
Russia also recorded a decline in gas generation in 2025, falling by 13 TWh (-2.3%), the first decline since 2020. This was driven by lower electricity demand in 2025 due to a milder winter than in 2024 and signs of an economic slowdown.



Japan's gas generation fell by 8.5 TWh (-2.4%), marking the eighth consecutive year of gas power declines. Japan's decarbonisation strategy has supported this consistent reduction in gas use, along with the gradual reactivation of nuclear power and continued growth in solar generation.

Despite its gas-to-coal switching in 2025, the United States remained by far the largest generator of gas-fired electricity, producing 1,807 TWh, more than a quarter of global gas generation.

Six of the ten countries most reliant on gas for electricity generation in 2025 were in the Middle East and North Africa.



Middle Eastern countries recorded the highest per capita gas generation rates in 2025, led by Bahrain at 28 times the global average.

Based on the latest available data, 13 countries generated more than 80% of their electricity from gas power in 2025.

3.6 Nuclear

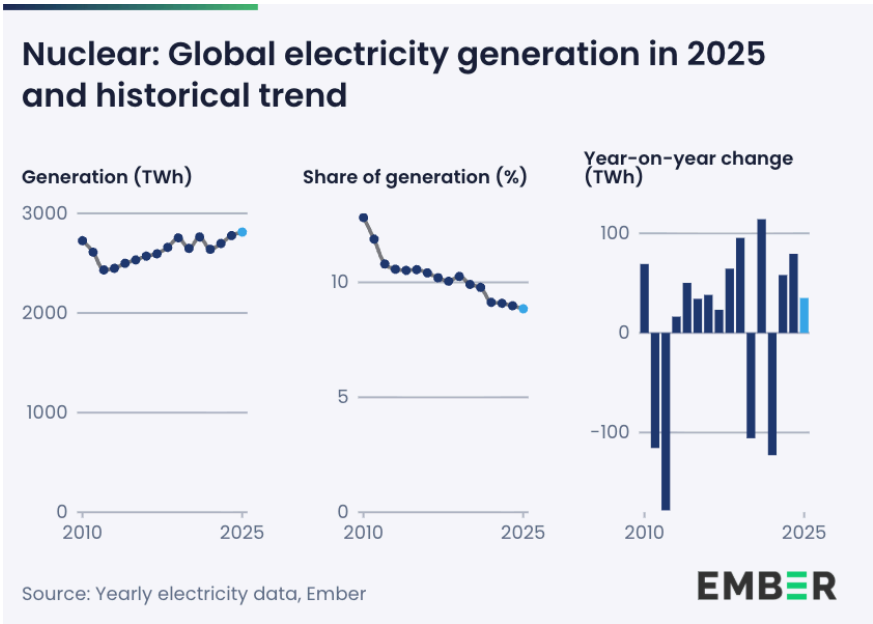
Key highlights

01 **Global nuclear generation rose to a record high in 2025, growing by 1% in line with the ten-year average trend**

02 **Nuclear's share of global electricity generation continued its steady decline, reaching another low of 8.9% in 2025, as its growth was outpaced by rising demand**

03 **The increase in nuclear generation in 2025 was lower than in the previous two years, reflecting ongoing plant retirements despite new builds and higher utilisation rates in a few major markets**

Global nuclear generation rose by 1.3% (+35 TWh) in 2025, to an all-time high of 2,812 TWh. The growth rate in 2025 was lower than in the previous two years, but similar to the 1.0% average annual growth rate of the past decade (2015-2024).

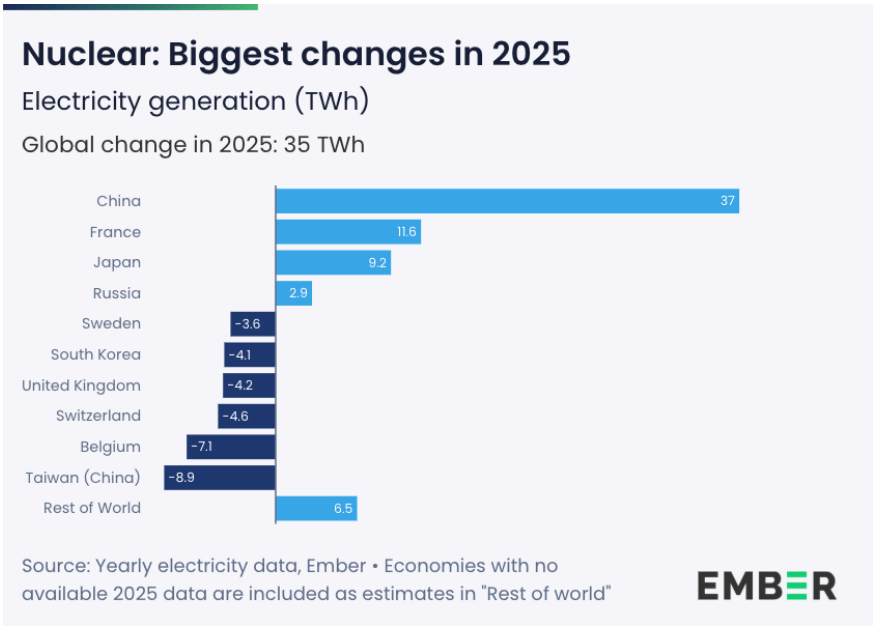


Although nuclear generation reached a new high in 2025, it was only 3% higher than in 2010 prior to Japan's Fukushima disaster. Nuclear's share in the global electricity mix dipped to 8.9% in 2025, its lowest level since the early 1980s.

However, the global pipeline for nuclear power is expanding, with 70 reactors under construction in 15 countries, almost all of which are in Asia. Most of the construction currently underway in China, Russia and South Korea is for large reactors.

China recorded the largest increase in nuclear generation in 2025, with output rising by 37 TWh as new reactors came online.

Nuclear generation in France rose by 11.6 TWh, returning to near-2019 levels after persistent outages had reduced output in recent years.

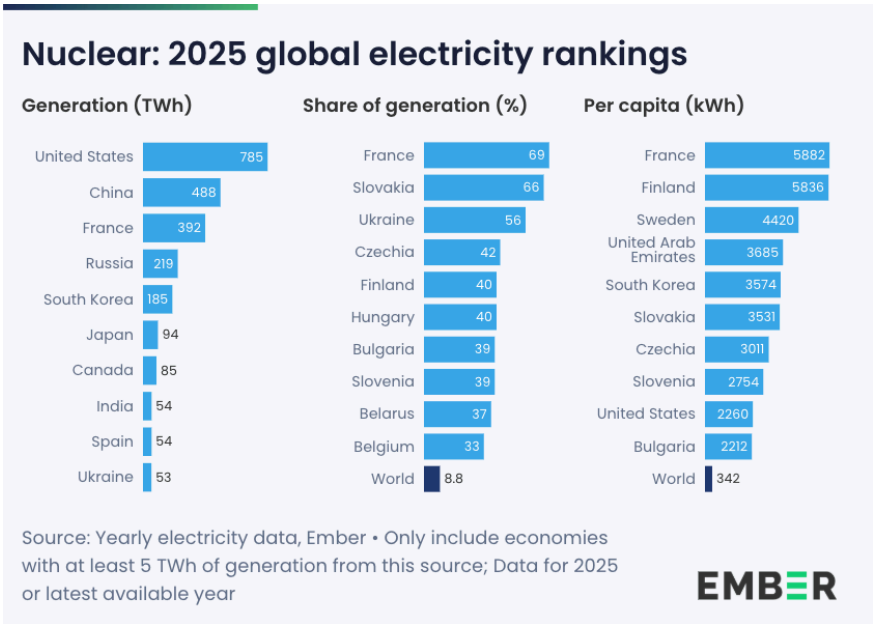


Japan's nuclear generation increased by 9.2 TWh in 2025 following a restart of two reactors in 2024. In 2025, the country's nuclear

restart programme progressed more slowly than expected with no additional units coming back online, though more are expected in 2026. Since 2011, Japan has restarted 14 of the country's 33 potentially operable reactors.

Nuclear generation in Taiwan (China) fell by 8.9 TWh in 2025. This marked a sixth consecutive year of nuclear power declines. Its last operating reactor was shut down in May, completing a planned phase-out of nuclear power. Belgium saw the second-largest nuclear power decline in 2025, with generation falling by 7 TWh due to reactor closures.

The United States remained the largest nuclear power generator globally in 2025, producing 785 TWh – a modest increase (+0.4%) from 782 TWh in 2024.



China generated 488 TWh of nuclear power in 2025, the second-largest globally. The country remains one of the few countries with new reactors under construction. Nuclear accounts for 4.6% of China's electricity generation, relatively unchanged since 2019 despite growing output, as China's total electricity generation is also growing rapidly.

Japan moved from seventh to sixth-largest nuclear generator in 2025 compared with 2024. Japan was the third-largest nuclear generator globally in 2010, before the Fukushima nuclear disaster.

Eight of the ten countries with the highest share of nuclear power in their electricity mix in 2025 were in the EU. Nuclear remained the largest single source of electricity in the EU in 2025, accounting for 23% of total electricity generation. France generated 69% of its electricity with nuclear power in 2025, the highest share of any country, and also recorded the highest per capita generation in 2025 (5,882 kWh).

3.7 Hydro

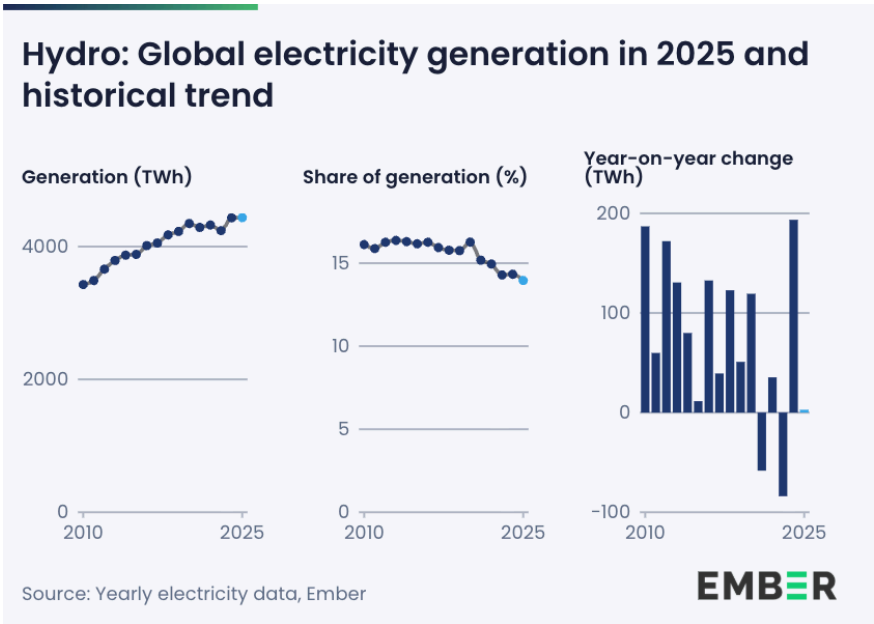
Key highlights

01 **In 2025, hydropower fell to its lowest-ever share of global electricity generation, despite reaching a record high in absolute output**

02 **China and India recorded the largest hydro generation increases in 2025, supported by capacity additions and high rainfall**

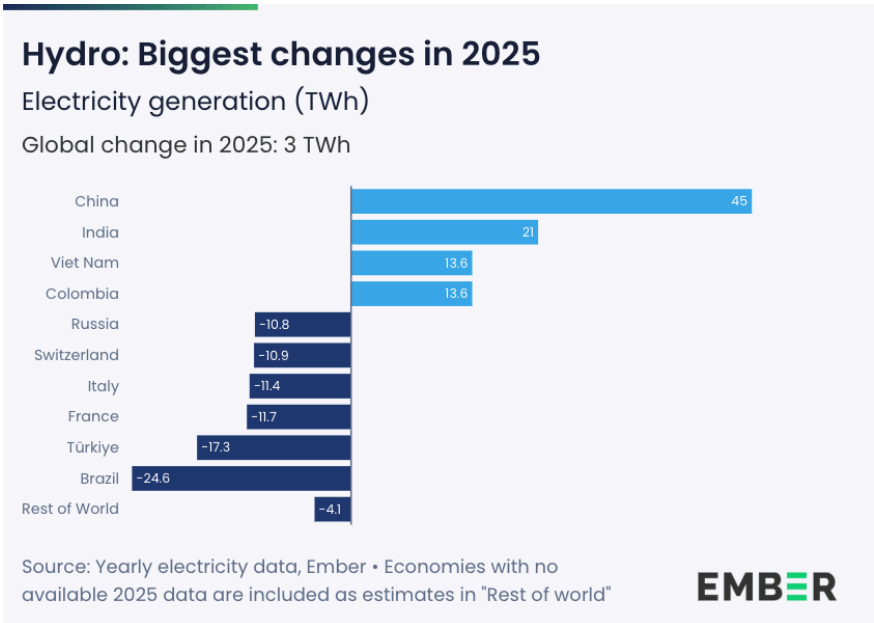
03 **Droughts led to substantial falls in hydro output in Brazil, Türkiye and Western Europe in 2025**

Global hydropower generation was essentially unchanged in 2025, with a very small increase of 3 TWh (+0.1%) from 2024, which pushed it to a record global output of 4,437 TWh. However, hydro generation growth did not keep pace with rising electricity demand in 2025, resulting in its share of global electricity generation falling to an all-time low of 14%.



Since 2010, global hydropower capacity has grown by 43% while generation has risen by only 29%. This points to a decline in average capacity factors, evident in some major markets including Brazil, China and the US, although the underlying patterns differ. In Brazil, the hydro capacity factor fell from over 55% in the early 2010s to around 40% in 2025. In China, capacity factors were mostly stable at around 40% in the 2010s, but declined in recent years. In 2023, they dropped to 34% before recovering slightly to 36% in 2025. In the United States, hydro capacity factors have trended downward from an average of 35% in the 2010s to 31% in the period 2021-2025.

China recorded the largest increase in hydro generation in 2025, adding 45 TWh. After a particularly poor year in 2023, the country's hydro conditions continued to improve through 2024 and into 2025 with rainfall totals substantially above average.



India recorded the second-largest increase in hydropower generation in 2025, adding 21 TWh

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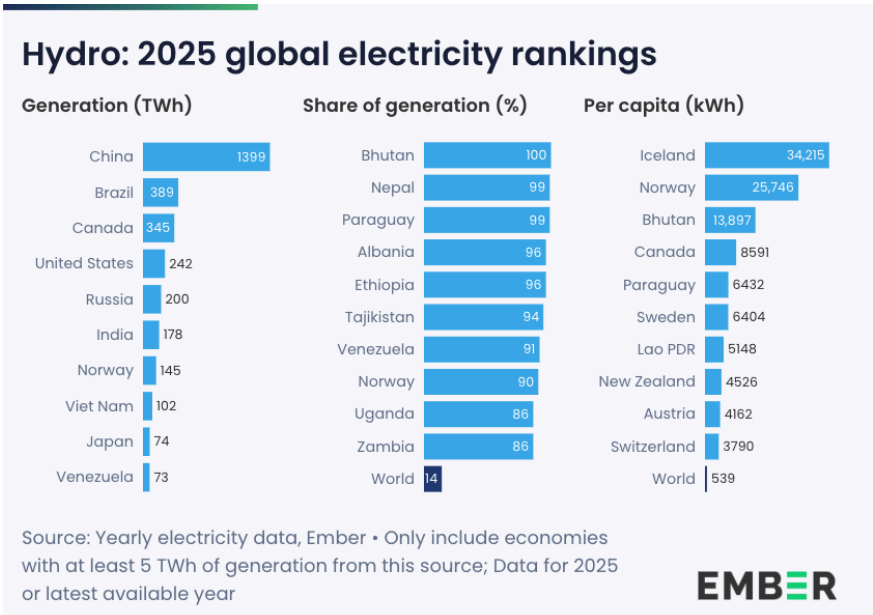
as a result of high monsoon rainfall and increased capacity. 4 GW of new hydro capacity came online in 2025, while average rainfall was higher than in 2024.

Ethiopia recorded the largest increase in hydro generation (+8 TWh) in Africa in 2025, following the full commissioning of the 5.15 GW Grand Ethiopian Renaissance Dam, now the largest hydroelectric power plant on the continent. This helped nearly double Ethiopia's hydro output from 17 TWh in 2023 to 32 TWh in 2025. Ethiopia alone accounted for 60% of Africa's new hydro generation in 2025.

In Brazil, droughts and operational factors pushed hydro output down by 25 TWh in 2025, marking the third consecutive year of declining generation. The decline was almost twice that of 2024, when output fell by 13 TWh.

Türkiye, hit by severe drought, recorded the second-largest hydro generation decline in 2025, with output decreasing by 17 TWh. Among EU countries, the largest hydro generation declines were in France (-11.7 TWh) and Italy (-11.4 TWh). Overall, hydropower in the EU fell by 43 TWh, retreating from the excellent hydrological conditions in 2024 due to regional water scarcity in southern basins in 2025, including the Alpine regions of Italy and France.

China remained the world's largest hydropower generator in 2025, producing 1,399 TWh, despite hydro providing just 13% of China's electricity, far less than its share of electricity generation in Brazil (52%) and Canada (53%), the second- and third-largest hydro generators.



Bhutan had the highest hydro share among countries with at least 5 TWh of hydro generation in 2025, with hydro supplying all of the country's electricity, followed by Nepal (99%) and Paraguay (99%).

On a per capita basis, Iceland and Norway ranked as the highest and second-highest hydro generators in 2025 at 34,215 kWh and 25,746 kWh per person, respectively.

3.8 Coal

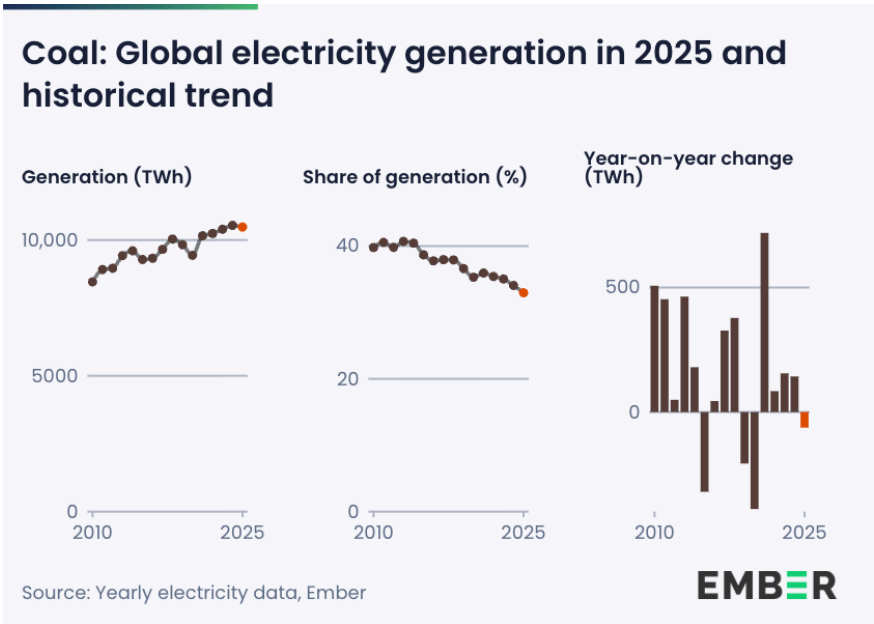
Key highlights

01 **For the first time, coal produced less than a third of global electricity generation in 2025**

02 **Global coal generation fell below renewable generation for the first time in 2025**

03 **China and India recorded the largest declines in coal generation in 2025, driven by clean power growth and milder weather conditions**

Global coal generation fell by 0.6% (-63 TWh) in 2025. For the first time on record, renewable generation (10,730 TWh) exceeded coal generation (10,476 TWh). However, coal remained the single largest source of electricity globally.

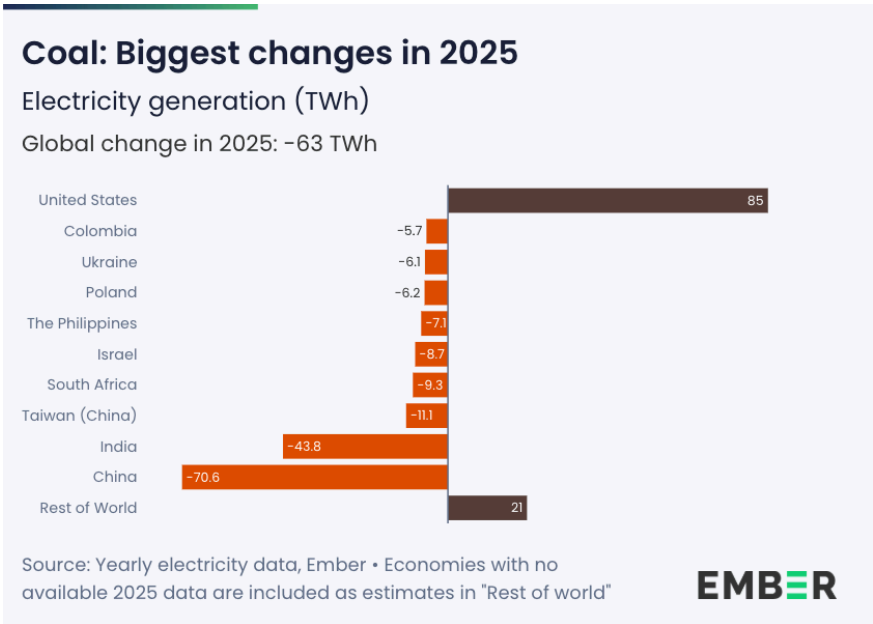


While total electricity generation from coal has grown over the last decade (+13% since 2015), it has not kept pace with growth in overall demand (+32%) over the same period, so its share in the global electricity mix has declined. Coal accounted for 39% of global electricity generation in 2015 but only 33.0% in 2025, dropping below a third for the first year on record.

Coal's diminishing role is most evident in countries outside Asia that have implemented key structural reforms to reduce or eliminate coal use, including setting ambitious targets and introducing carbon pricing. In the United Kingdom, coal reached its highest share this century in 2012 (39%). Since then, growing renewable generation, particularly from wind, has led to a rapid decline in the country's coal use. In 2025, the United Kingdom's electricity system was fully coal-free. Similarly, Greece's share of coal collapsed from 43% in 2015 to 5% in 2025. In Chile, it has declined from 37% to 18% over the same period, driven by rising renewable output.

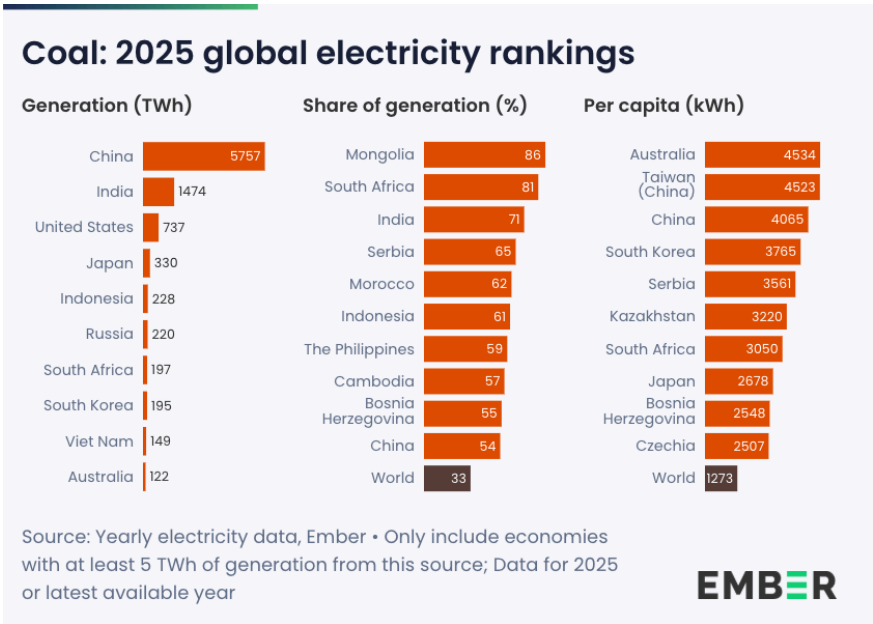
The largest declines in coal generation in 2025 occurred in China and India, where generation fell by 71 TWh (-1.2%) and 44 TWh (-2.9%) respectively. India's coal generation fell in 2025 as a result of the significant rise in solar and wind, helped by cooler temperatures that reduced demand growth compared with 2024. In China, clean electricity growth outpaced demand growth, driving down coal generation.

The largest increase in coal generation in 2025 occurred in the United States, with a rise of 85 TWh (+13%). There was a reduction in gas-fired electricity generation in favour of coal, as US natural gas spot prices rose by 56% in 2025, up from 2024's record low, due to a cold winter, below-average storage levels and rising export demand. This marked only the second annual increase in US coal power in the last decade and went against the prevailing longer-term trend in which gas and renewables have displaced the country's coal generation.



China and India remained the two largest coal generators globally in 2025, despite declines in both countries. Together, they accounted for 69% of global coal generation.

Mongolia (86%), South Africa (81%) and India (71%) remained the top three countries by coal's share of total electricity generation. However, Mongolia's total generation is far smaller than that of South Africa and India. Based on the latest available data, 14 countries generated more than half of their electricity from coal in 2025.



Australia still had the highest per capita coal generation (4,534 kWh), despite substantial declines over the last two decades.

Chapter 4

Analysis of Major Countries and Regions

An in-depth look at data on the world's seven largest power sectors in 2025, including an overview of changes in the last year and trends in the last two decades.

This chapter breaks down the latest trends in China, the United States, the European Union, India, Russia, Japan and Brazil. Collectively, they account for 72% of global electricity demand. The countries and regions are ordered according to their total electricity demand in 2025.

Overview of the global power sector in 2025

Key data points on electricity generation worldwide and in the seven largest power sectors

Country or region	Demand (TWh)	Clean share (%)	Fossil share (%)	Wind and solar share (%)	Clean generation (TWh)	Year-on-year change in clean generation (TWh)	Emissions (MtCO2e)
World	31,779	43	57	17	13,542	887	14,564
China	10,573	42	58	22	4,411	561	5,565
United States	4,536	43	57	19	1,944	105	1,737
European Union	2,774	71	29	30	1,987	6	587
India	2,083	27	73	14	555	97	1,395
Russia	1,176	36	64	1	426	-9	536
Japan	1,030	33	67	11	336	18	492
Brazil	762	89	11	27	666	-1	83

Source: Yearly electricity data, Ember
'Clean' includes renewables and nuclear power; 'Fossil' includes generation from coal, gas, oil and other products such as fossil waste

EMBER

4.1 China

Key highlights

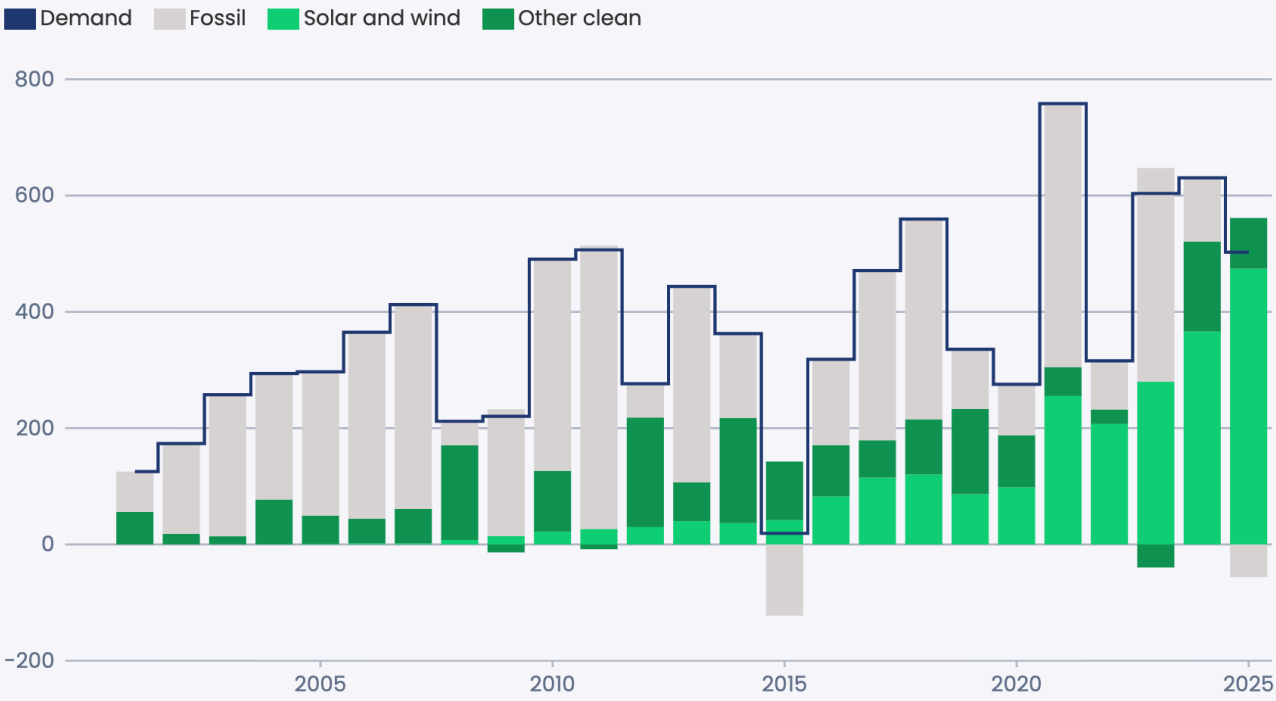
01 **China's fossil generation fell in 2025 for the first time in a decade, as clean power outpaced demand growth**

02 **China accounted for more than half of the global increase in wind and solar generation in 2025, for the third consecutive year**

03 **China's solar generation grew by 40% in 2025, similar to the previous two years**

China's fossil generation fell in 2025 for the first time in more than a decade as clean power met all new demand

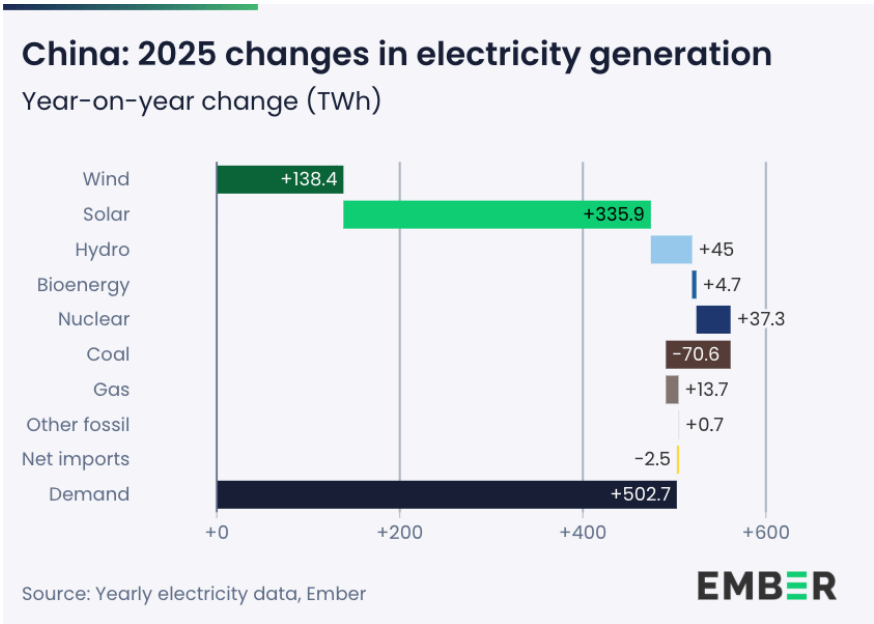
Annual change in electricity generation (TWh)



Source: Yearly electricity data, Ember
'Other clean' includes hydro, nuclear, bioenergy, geothermal and other renewables

EMBER

China's electricity demand increased by 5% in 2025 (+503 TWh). Growth was below the average annual rate of 6.7% between 2020 and 2024 despite slightly higher cooling demand than in 2024 and GDP growth similar to recent years.



China's clean generation growth (+561 TWh, +15%) was sufficient to meet all the additional demand in 2025. Wind and solar alone added 474 TWh (+26%), covering 94% of China's demand growth in 2025.

Solar remained the dominant force reshaping China's electricity mix. Solar generation increased by 336 TWh in 2025 (+40%). Over the last five years, solar generation has been growing at an average annual rate of 35%.

The magnitude of China's solar growth is unprecedented. China added more solar generation in 2025 (+336 TWh) than the entire world added in 2023 (+331 TWh) and more than the United Kingdom's total annual electricity demand (322 TWh in 2025). It was also four times as large as the second-highest solar increase in 2025 (+85 TWh in the US).

Wind generation increased by 138 TWh (+14%) in 2025, reaching 11% of China's total generation, one percentage point higher than last year.

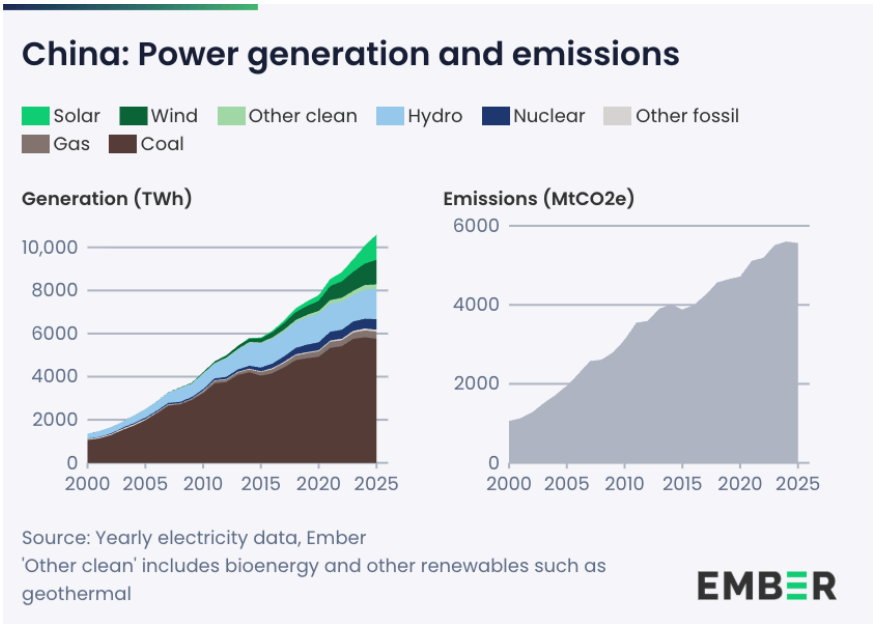
China's renewable capacity deployments were particularly high in the first half of 2025, as developers aimed to complete projects before new rules on wind and solar compensation took effect in June 2025. Additions remained robust even in the second half of 2025 despite expectations of a significant slowdown. Overall, China accounted for 58% of global solar installations (378 GW (DC)) and 72% of global wind installations (119 GW).

Beyond domestic additions, China also plays a decisive role in enabling solar deployment worldwide by expanding its solar photovoltaic exports.

China’s nuclear generation increased by 37 TWh (+8.2%) in 2025, more than double the annual increases in 2023 (+17 TWh) and 2024 (+16 TWh). Nuclear accounted for 4.6% of China's electricity mix in 2025.

China’s fossil generation declined by 56 TWh (-0.9%) in 2025. This was the first year since 2015 without an increase. Coal declined by 71 TWh (-1.2%), which was partially offset by a 14 TWh (+4.3%) increase in gas generation compared with 2024.

China's electricity demand reached 10,573 TWh in 2025, accounting for a third of global electricity demand. Over the past decade, China’s electricity demand has nearly doubled from 5,802 TWh in 2015.



China’s wind and solar generation in 2025 reached 2,310 TWh, almost double that of 2022 (1,190 TWh). Solar output in 2025 (1,175 TWh) was more than four times as large as it was five years ago (261 TWh in 2020).

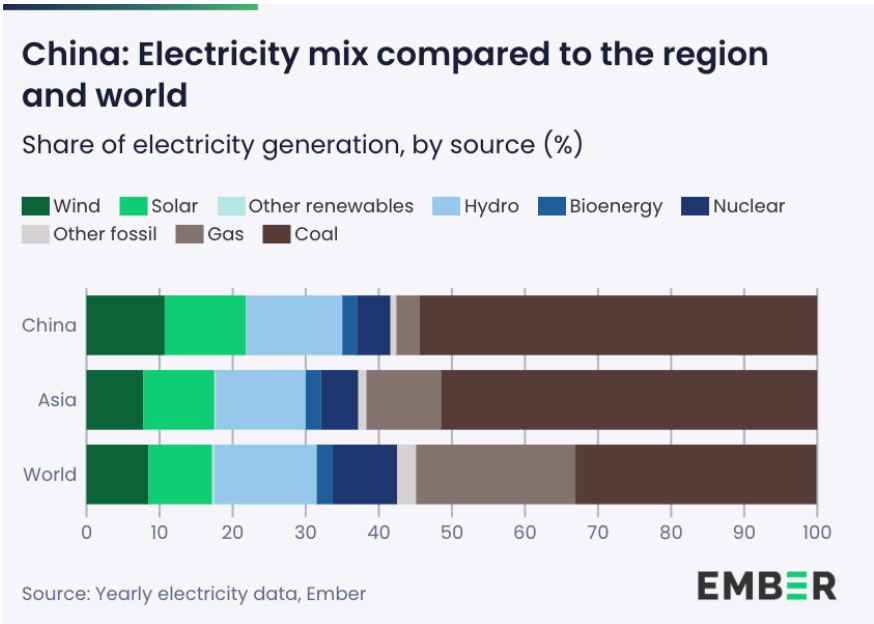
Coal's share of electricity in China fell from 70% in 2015 to 54% in 2025. However, absolute coal generation remained high at 5,757 TWh in 2025, accounting for 55% of global coal generation. Over the past decade, China has shifted coal’s role from a baseload provider to a more flexible source of generation, as wind and solar become increasingly important in the electricity mix.

As fossil generation fell in 2025, China’s power sector emissions declined by 37 MtCO2e (-0.7%). This was the first absolute decline since 2015, when emissions fell by 3.4%.

Despite leading the world in wind and solar generation, China remains the world’s largest power sector emitter due to the scale of its coal generation. However, the stabilisation of emissions in 2025 may indicate that coal generation is plateauing in China.

Given the scale of China's power sector, it is a key driver of the global electricity transition. In the last decade, increases in China's fossil generation accounted for 85% of the global rise.

In 2025, fossil generation accounted for 58% of China's electricity mix, closely matching the global average (57%). Coal provided 54% of China's electricity, far above the global average share of 33%.

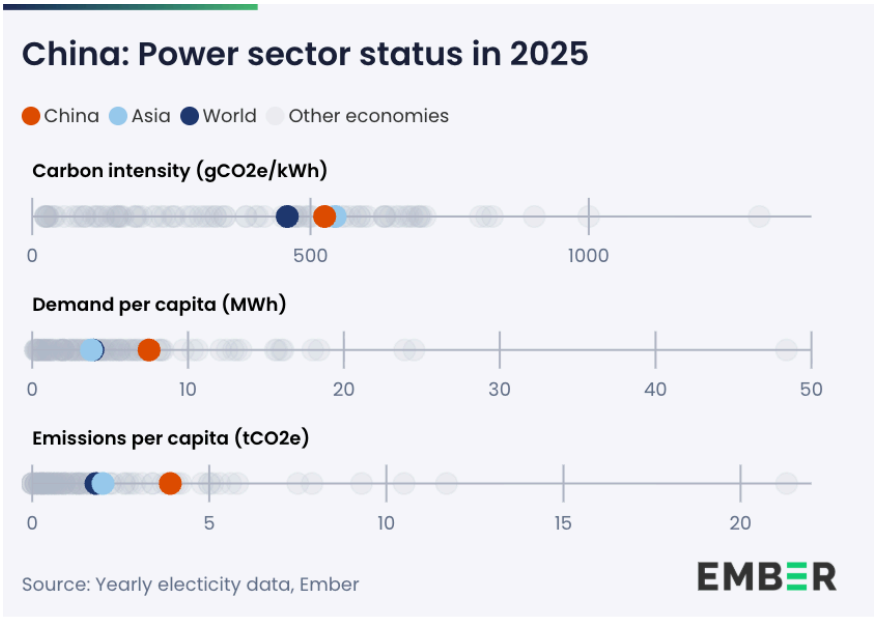


Clean power accounted for 42% of China's electricity mix, the same as the global average. Hydro was China's largest source of clean power at 13%.

Wind and solar reached 22% of China's electricity mix in 2025, up from 18% in 2024. This share, a new record, now exceeds both the global and Asian averages of 17%. It is also higher than the average for OECD countries (20%).

The carbon intensity of China's electricity generation fell to 525 gCO2e/kWh in 2025, down 5% from 2024. This reduction is more than double the average annual decline of 2.2% between 2020 and 2024.

Despite this progress, China's carbon intensity remains above the global average of 458 gCO2e/kWh. However,



China is decarbonising its electricity system faster than the world average, as global carbon intensity fell by 2.7% in 2025. China is also increasingly using electricity to rapidly decarbonise its buildings, industry and transport sectors.

China's per capita electricity demand reached 7.5 MWh in 2025, rising 6% from 7.1 MWh in 2024. This is almost double the global average (3.9 MWh) and the Asia average (3.8 MWh), and more than five times as high as India's (1.4 MWh).

The combination of a high and rising per capita electricity demand and continued reliance on coal generation kept China's per capita power sector emissions high at 3.9 tCO2e in 2025. This was double the global average (1.8 tCO2e), almost double the Asia average (2.1 tCO2e), and four times the level of India (0.95 tCO2e).

4.2 United States

Key highlights

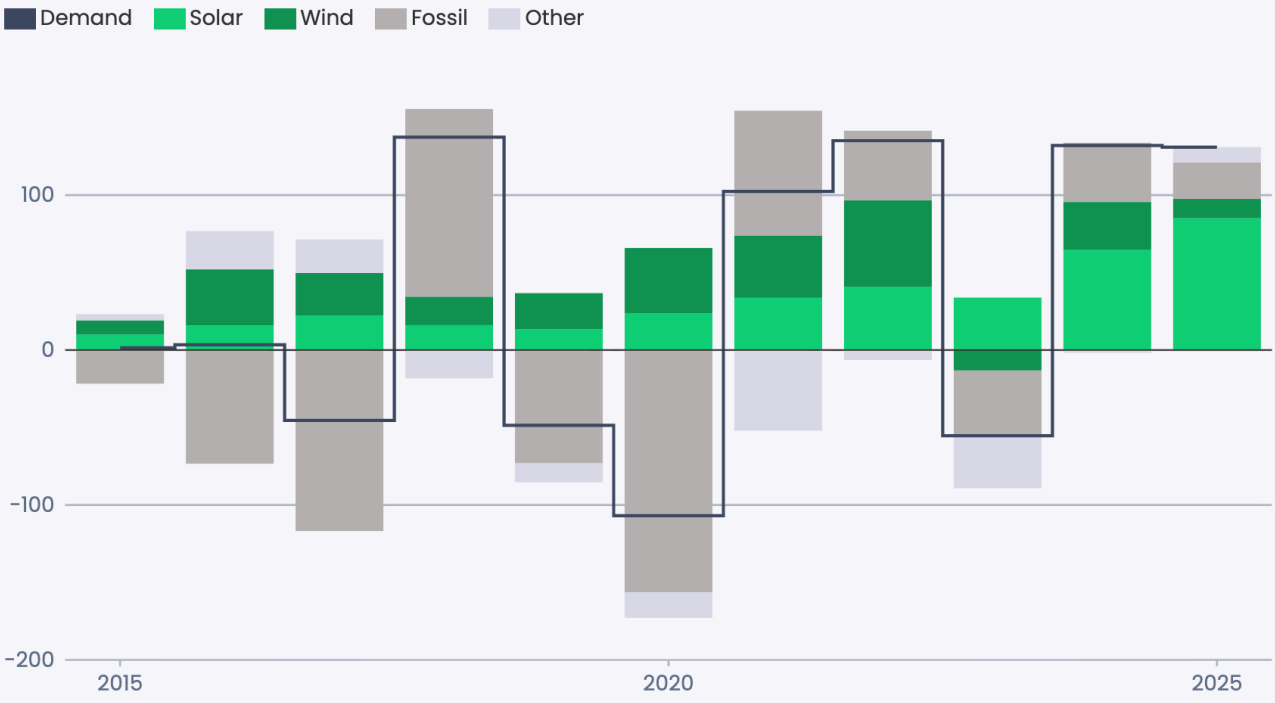
01 **Wind and solar met three-quarters of electricity demand growth in the US in 2025**

02 **Wind and solar generation combined surpassed nuclear generation in the US for the first time in 2025**

03 **Despite US fossil generation rising by only 0.9%, power sector emissions increased by 3.1% in 2025, driven by gas-to-coal switching**

Three-quarters of the rise in US electricity demand in 2025 was met by solar and wind growth

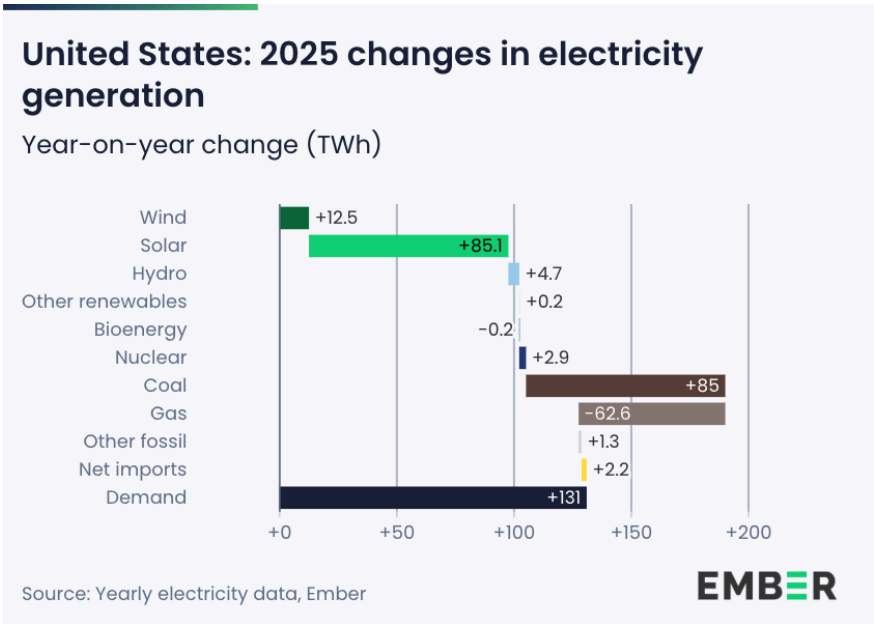
Annual change in electricity generation, by source (TWh)



Source: Yearly electricity data, Ember
'Other' includes nuclear, hydro, bioenergy, geothermal, net imports and other low-carbon sources

EMBER

Electricity demand in the US grew by 3% (+131 TWh) in 2025, similar to growth in 2024 (+132 TWh, +3.1%). This is well above the average annual growth of 0.6% recorded over the previous decade (2015-2024). The increase was partly driven by the rapid expansion of data centres, which are projected to account for around half of total US demand growth through 2030. Colder winter temperatures also drove up electricity demand for heating in 2025, although this was partially offset by milder summer temperatures and reduced cooling demand.



Almost two-thirds (65%) of the rise in electricity demand in the US in 2025 was met by solar growth (+85 TWh, +28%). This was the second-largest increase in solar generation globally in 2025. Wind generation rose by 12.5 TWh (+2.8%), meaning that wind and solar together met 74% of the increase in US electricity demand.

US coal generation increased by 85 TWh (+13%) in 2025, while gas generation declined by 63 TWh (-3.4%), driven by a substantial rise in gas prices over record low prices in 2024. This marked a departure from the long-term pattern in the US of declining coal generation and growing gas generation.

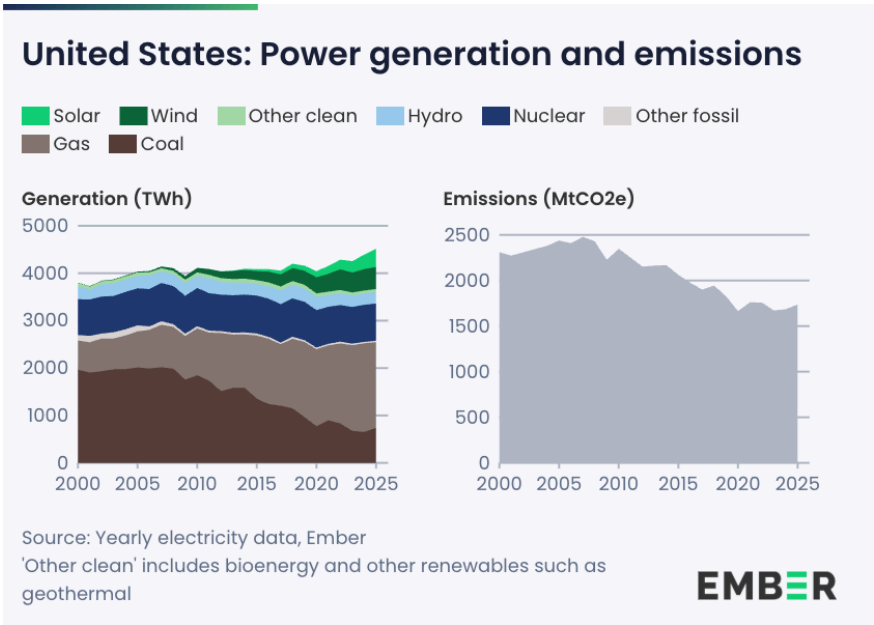
In the four years since 2021, clean power met 88% of demand growth in the US. During this period, combined wind and solar generation increased by 57%, rising from 543 TWh to 853 TWh. This sustained growth resulted in wind and solar overtaking nuclear power in the US for the first time in 2025.

Solar's share of US electricity generation reached 8.6% in 2025, an increase of 1.7 percentage points compared with the previous year. This rapid rise has been driven by strong momentum at the state level. In six states, the share of solar increased by more than five percentage points in the 24 months ending October 2025. California and Nevada lead the US, with solar shares above 30%.

The share of fossil generation in the US has declined over the last decade, from 67% in 2015 to 57% in 2025, as renewables have increasingly met rising demand. Despite declining in 2025, gas remains the single

largest source in the US power mix, at 40%. The US accounted for 26% of global gas generation in 2025.

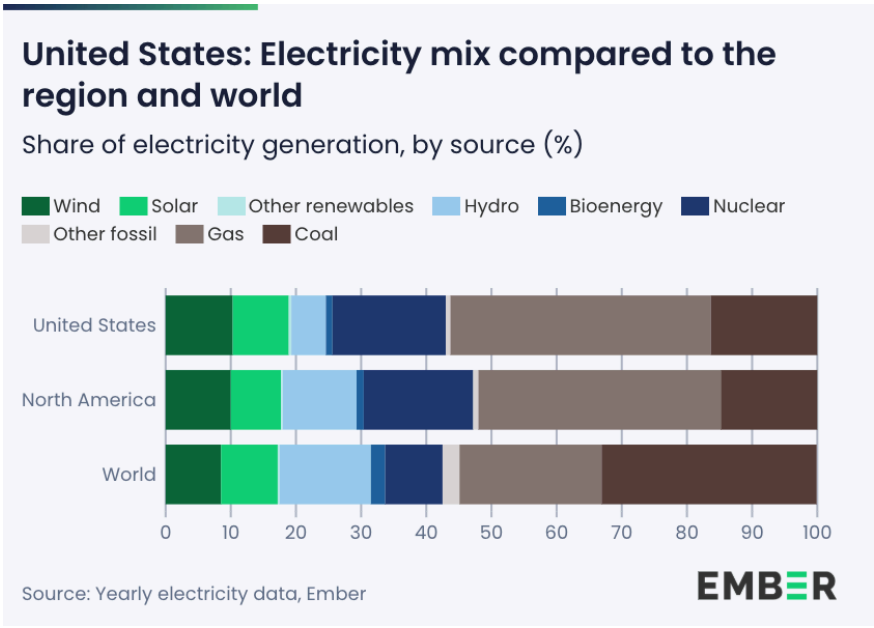
Although gas-to-coal switching led to an increase in coal generation in the US in 2025, coal power has fallen by nearly two-thirds (-1,279 TWh) since its 2007 peak. In contrast, wind and solar have risen by 818 TWh over the same period.



Gas-to-coal switching in 2025 caused US power sector emissions to rise by 3.1% (+52 MtCO2e), despite fossil generation growing by just 0.9%. However, US power sector emissions remain well below their peak in 2007, which coincided with the peak in coal-fired generation. Since then, emissions have declined by 30%, from 2,479 MtCO2e to 1,737 MtCO2e in 2025.

The US generated 43.0% of its electricity from clean sources in 2025, just above the global average of 42.6%. Wind and solar accounted for 19% of total electricity generation, slightly above the global average of 17%.

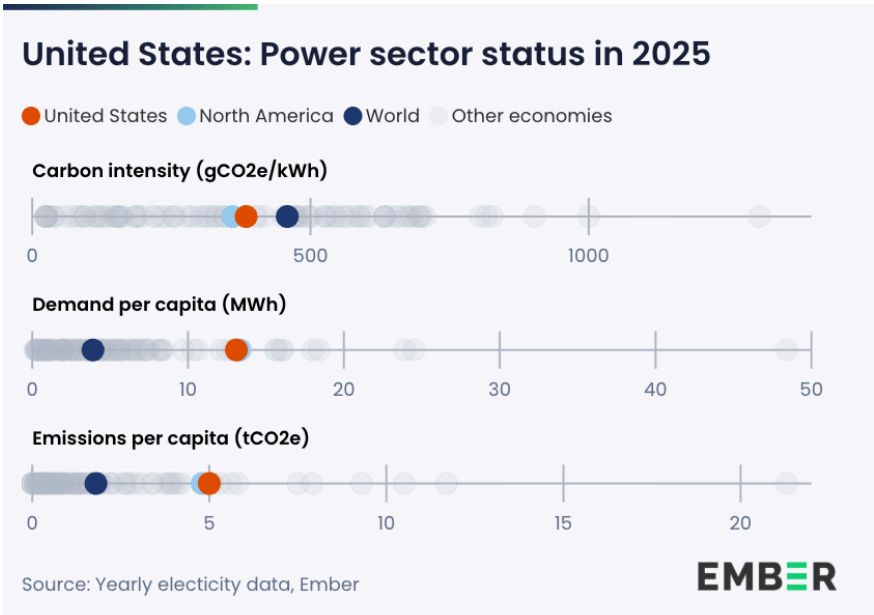
Fossil fuels generated 57% of US electricity in 2025, primarily from gas (40%), followed by coal (16%). While the overall fossil share in the US (57.0%) was similar to the global average (57.4%), the US relies more heavily on gas, with a share of generation (40%) almost twice the global average (22%).



Energy storage continues to expand across the US. In 2025, battery energy storage system (BESS) installations surpassed 57 GWh, a year-on-year increase of 29%. At the state level, California increased its BESS capacity to 17 GW by October 2025, two and a half times its level at the end of 2022. Texas surpassed 15 GW by September 2025, more than 11 times its 2022 level.

The US power sector is undergoing a policy shift, with support for low-cost renewable technologies being scaled back in favour of measures to sustain fossil fuel development. Nevertheless, wind and solar still met 74% of electricity demand growth in the US in 2025.

Despite similar fossil shares, US carbon intensity in 2025 (384 gCO2e/kWh) was below the global average (458 gCO2e/kWh), reflecting the country's heavier reliance on gas over coal, a fuel with lower emissions intensity.



Per capita electricity demand in the US reached 13.1 MWh in 2025, more than three times the global average (3.9 MWh), roughly double the EU average (6.2 MWh), and 75% higher than China's (7.5 MWh).

Per capita power sector emissions in the US stood at 5 tCO2e in 2025, nearly three times the global average of 1.8 tCO2e.

4.3 European Union

Key highlights

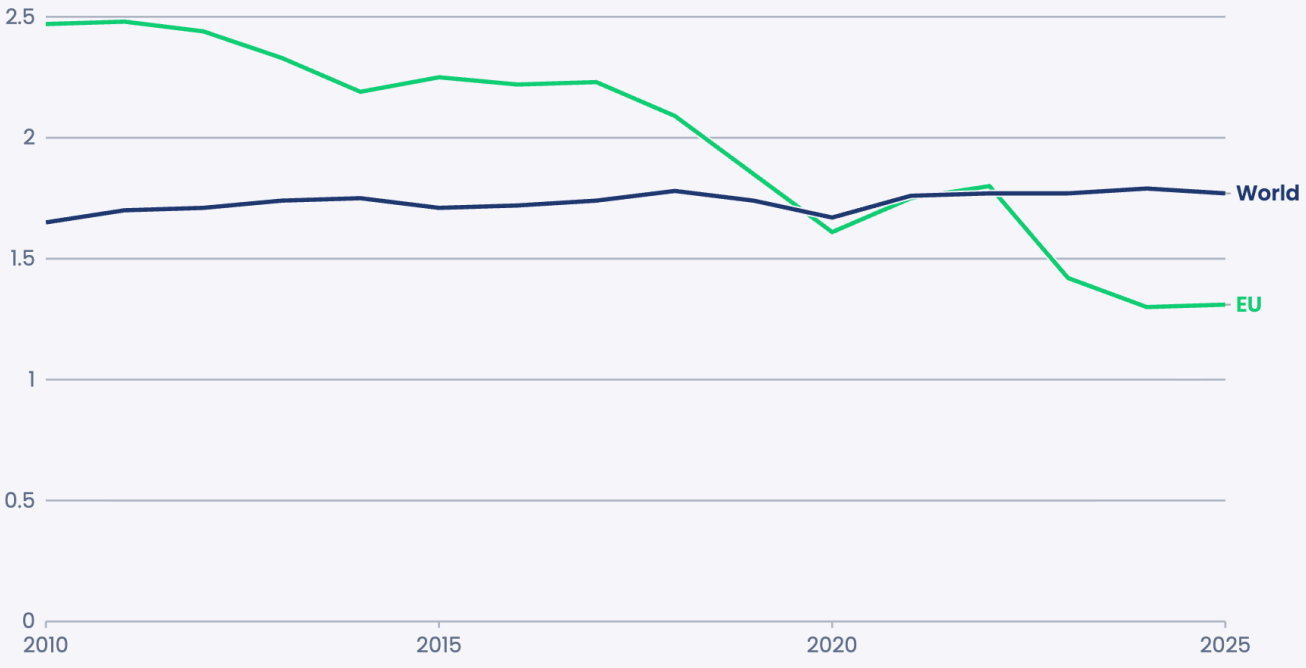
01 **In the EU, solar and wind generation exceeded fossil generation for the first time in 2025, reaching 30% of total power generation, up from just 5% in 2010**

02 **EU coal generation hit a record low in 2025, while gas rose 8% to offset lower hydropower output**

03 **Per capita power sector emissions in the EU have almost halved over the past 15 years, driven by strong growth in solar and wind**

The EU's power sector emissions per capita have almost halved over the past 15 years

Per capita power sector emissions (tCO2)

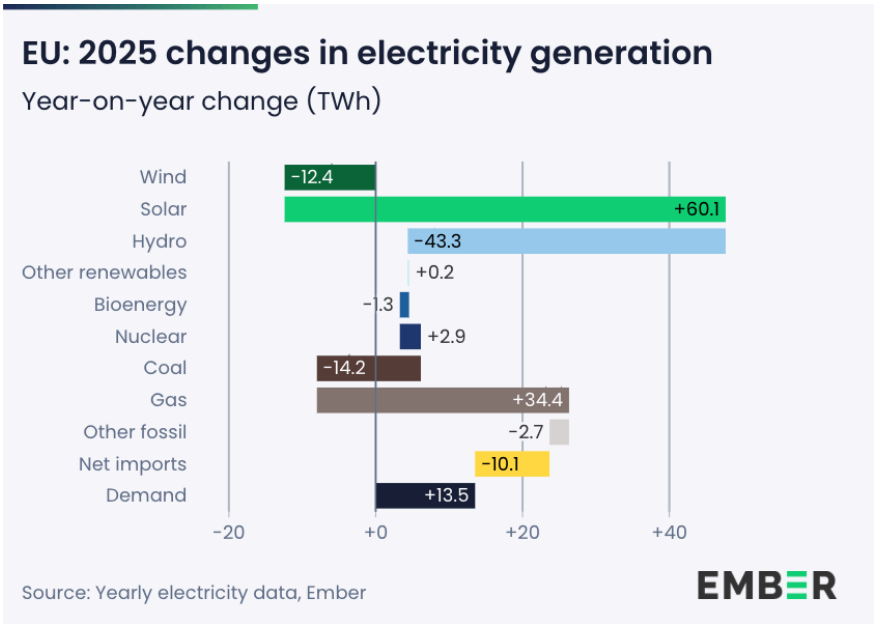


Source: Yearly electricity data, Ember

EMBER

Electricity demand in the EU increased by a modest 0.5% (+13.5 TWh) in 2025, below the 2024 increase of 1.9%.

Solar had the largest absolute increase in electricity generation in the EU in 2025, growing by 20% (+60 TWh). The EU added over 65 GW of new solar capacity in 2025, nearly equally split between utility-scale solar farms and rooftop installations.



Wind generation declined by 2.5% (-12 TWh) in 2025, following a modest increase of 2.8% in 2024. Exceptionally low wind speeds at the start of the year led to a dip in generation in the early months of 2025. However, a return to normal wind conditions later in the year, along with further fleet expansion, meant wind remained the EU's second-largest electricity source, at 17% of generation. The EU's wind capacity continued to expand, growing by 6% (+13 GW) in 2024 and a further 6% (+15 GW) in 2025.

EU hydro generation declined by 43 TWh (-12%) in 2025, following an exceptionally strong year in 2024. Hydro generation in 2025 was 21 TWh (-6%) lower than in 2020.

Fossil generation increased by 2.2% (+18 TWh) in 2025, as declines in coal were offset by increases in gas generation.

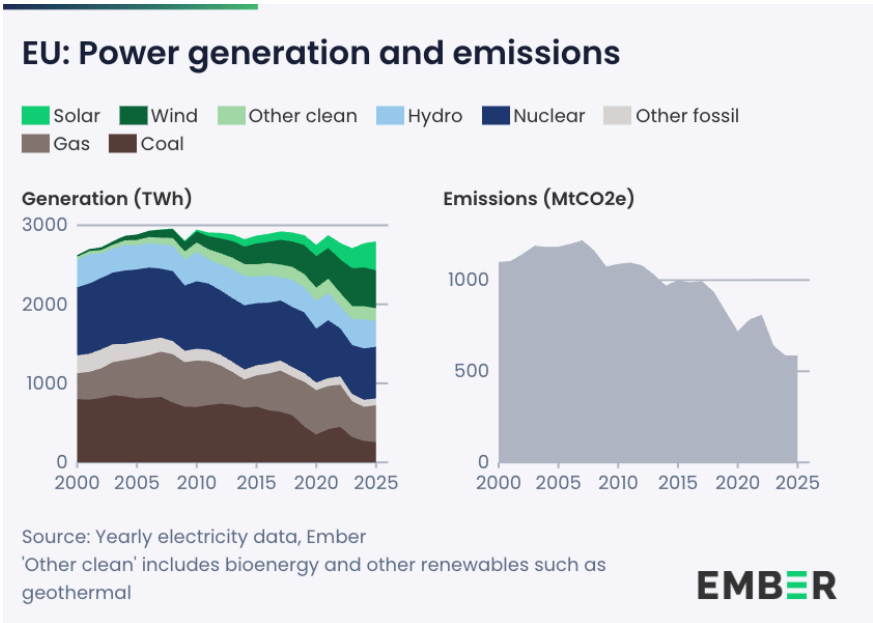
Coal generation declined by 5% (-14 TWh) in 2025, marking the third consecutive year of decline. Coal now generates 9.2% of EU electricity, down from 16% in 2022.

EU gas generation rose by 8% (+34 TWh) in 2025, though it remained 18% below its most recent peak in 2019. The increase in gas generation was mainly driven by lower hydro output due to reduced rainfall. Higher gas generation drove the EU power sector's gas import bill to €32 billion in 2025, 16% higher than the previous year.

Nuclear generation increased by 0.4% (+2.9 TWh) in the EU in 2025, following an increase of 4.8% in 2024.

Electricity demand in the EU has remained relatively flat in recent years. At 2,774 TWh in 2025, demand remained below pre-pandemic levels (2,877 TWh in 2019), despite a rebound in 2021.

The past four years have seen a rapid rise in wind and solar generation in the EU, growing by 54% (+296 TWh) from 2021 to 2025. Combined, they now account for nearly a third (30%) of EU electricity generation, up from 19% in 2021.



EU solar generation more than doubled in four years, from 163 TWh in 2021 to 367 TWh in 2025. Despite limited solar potential and political hurdles, solar power generation in Central Europe, a region once heavily dependent on coal, has grown at twice the EU average rate since 2019.

Despite a small increase last year, EU fossil generation declined by 24% (-257 TWh) between 2021 and 2025, with its share falling from 37% to 29% in the same period.

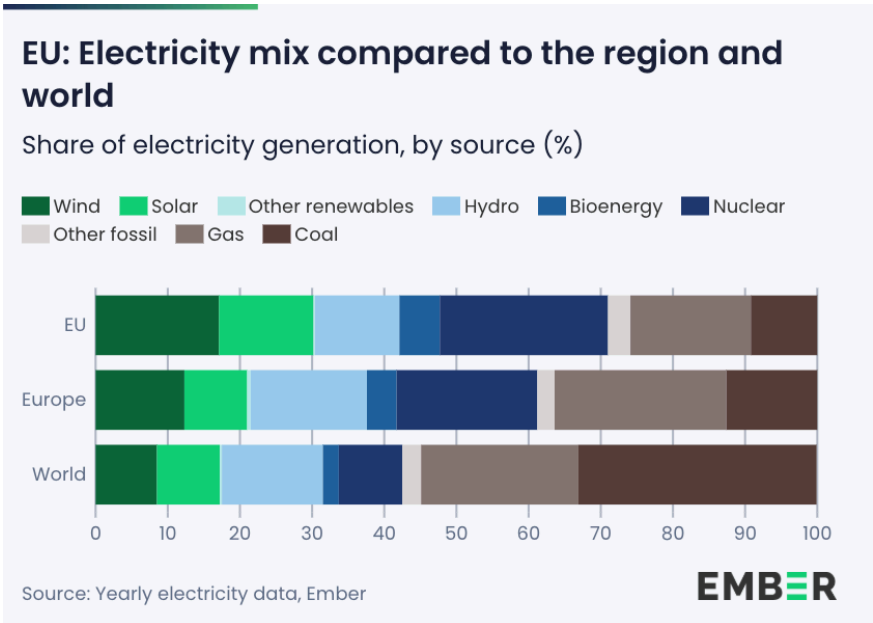
Coal generation accounted for almost two-thirds of the EU's fossil power decline (-162 TWh) since 2021. Nineteen EU countries now have less than 5% or no coal in their power mix, with Ireland ending coal generation in June 2025 and Finland in April 2025.

Gas generation accounted for almost a third of the EU's fossil power decline (-81 TWh) since 2021. While gas generation increased in 2025 compared with 2024, it has declined by 15% over the past four years overall. Nevertheless, the EU remains heavily reliant on imported fossil gas, with implications for energy security and geopolitical stability. While the EU has passed a full ban on imports of Russian gas by the end of 2027, a new dependency has emerged with rising imports of US LNG. Recent gas market volatility linked to the US-Israel war with Iran has further highlighted the EU's continued exposure.

The EU's electricity transition continues to gather pace. Solar generation overtook coal generation in 2024. In 2025, wind and solar exceeded fossil fuels for the first time, after drawing level in 2024.

Power sector emissions in the EU peaked in 2007 at 1,217 MtCO2e and have halved since then (587 MtCO2e in 2025), despite a small increase in 2025 compared with 2024 (+0.2%).

With rapid growth in wind and solar, alongside a steep decline in coal, the EU has cemented its position as a global leader in clean power. The EU generated 71% of its electricity from clean sources in 2025, well above the global average of 43%.



Wind is the EU's second largest source of power at 17.1%, double the global average of 8.5%. Among countries generating more than 5 TWh from wind globally, nine of the ten with the highest wind shares are in the EU.

Solar contributed 13.1% of EU electricity in 2025, a significant increase from 5.3% in 2020, well above the global average of 8.7%, and ahead of both the US (8.6%) and China (11.1%). Hydropower accounted for 11.7%.

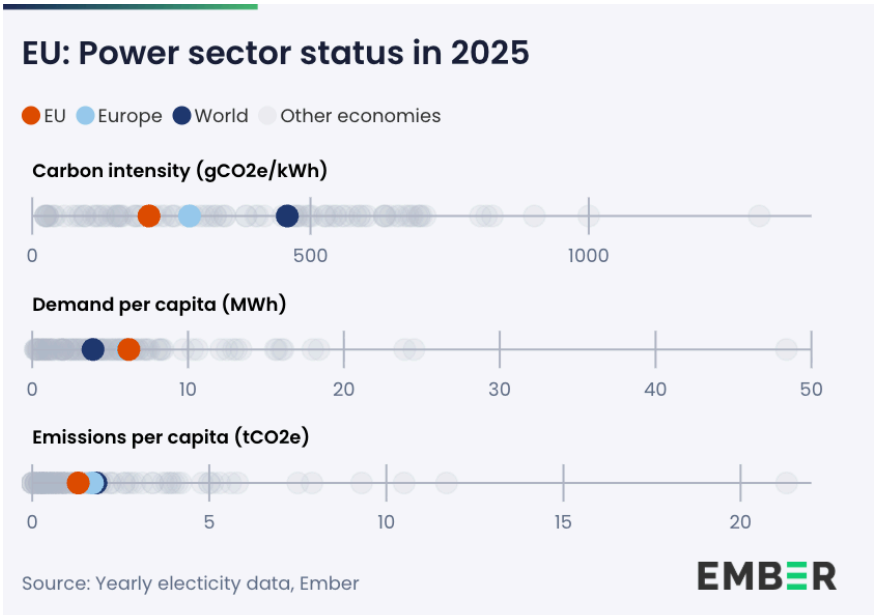
The EU's largest single source of electricity is nuclear, at 23%, more than double the global average. Eight of the ten countries with the highest nuclear shares globally are in the EU.

Fossil generation accounted for 29% of the EU electricity mix in 2025, unchanged from 2024 and roughly half the global share of 57%. Gas was the EU's third-largest source of electricity at 16.7%, while coal's share was 9.2%.

The carbon intensity of electricity generation in the EU was 210 gCO2e/kWh in 2025, broadly unchanged from 2024 (211 gCO2e/kWh) and less than half the global average (458 gCO2e/kWh).

Per capita electricity demand in the EU was 6.2 MWh, less than half that of the US (13.1 MWh), slightly below China's (7.5 MWh), but still 60% above the global average of 3.9 MWh.

Although demand per capita in the EU is higher than the global average, its per capita power sector emissions are lower (1.3 tCO2e, compared to 1.8 tCO2e globally), reflecting a higher share of clean generation. EU per capita power sector emissions have almost halved over the past 15 years, falling from 2.5 tCO2e in 2010 to 1.3 tCO2e in 2025. Over the same period, the global average increased slightly, from 1.7 tCO2e in 2010 to 1.8 tCO2e in 2025.



4.4 India

Key highlights

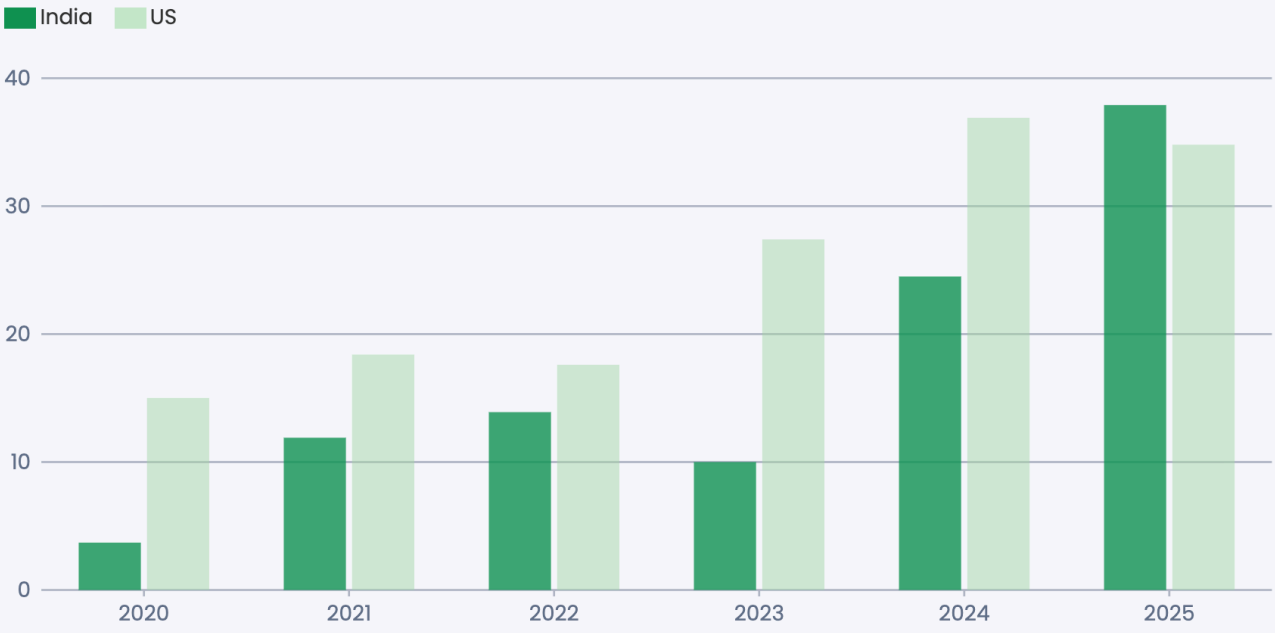
01 **Coal generation in India fell in 2025, as renewable generation grew twice as much as electricity demand**

02 **India recorded the world's second-largest increase in wind generation and third-largest increase in solar generation in 2025**

03 **In 2025, solar generation became the largest source of clean electricity in India, overtaking hydropower for the first time**

India added more solar capacity than the US in 2025, a 54% increase over its 2024 additions

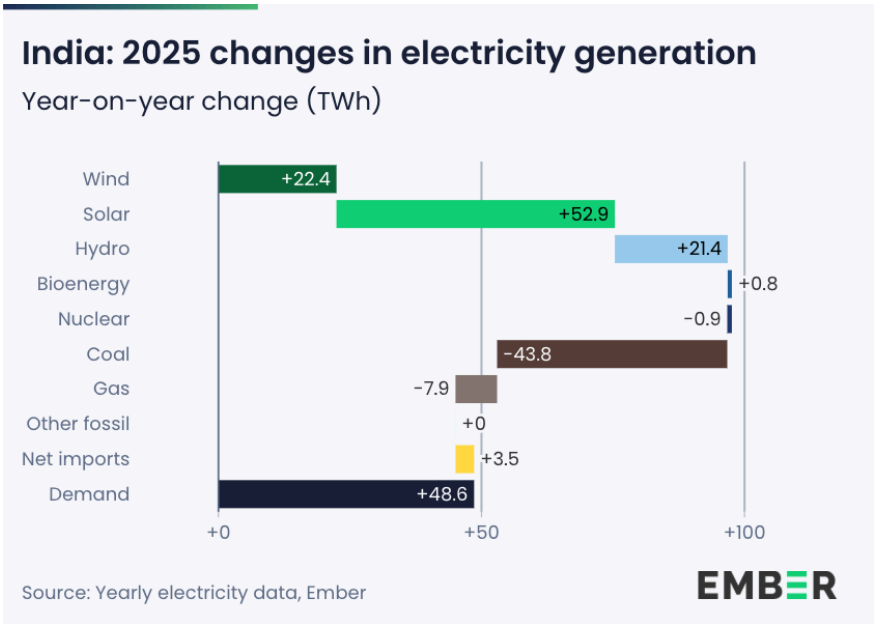
Solar capacity additions (GW)



Source: Monthly wind and solar capacity data, Ember; India Central Electricity Authority; US Energy Information Administration
Capacity reported in GW(AC)

EMBER

India's power demand increased by 49 TWh in 2025 (+2.4%). This was less than half the demand growth of 118 TWh (+6.2%) in 2024, and well below the 4.9% average annual growth rate recorded in the previous decade (2015 to 2024). India experienced very mild summer temperatures in 2025, in contrast to a record-hot 2024, leading to an estimated 32 TWh reduction in cooling demand. Industrial demand also slowed in 2025. India's GDP growth was 6.6% in 2025, similar to the 6.5% growth in 2024.



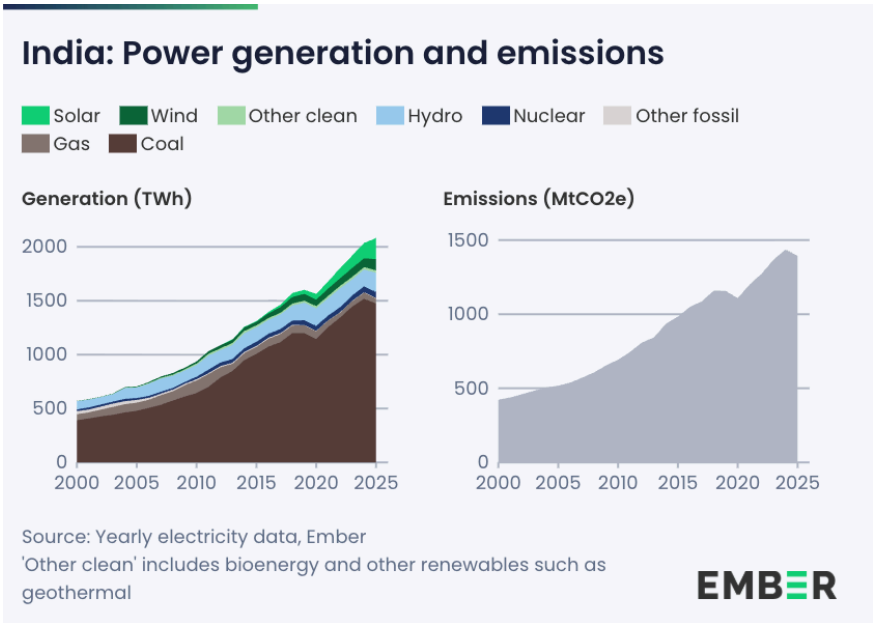
India's renewable generation grew twice as much as demand, increasing by 98 TWh in 2025. This was primarily driven by strong growth in solar (+53 TWh), followed by wind (+22 TWh) and hydro (+21 TWh). Combined, wind and solar growth reached 75 TWh, more than double the previous record of 32 TWh in 2022.

India achieved the world's third-largest increase in solar generation (+53 TWh, +37%) in 2025. Capacity additions also reached a record of 38 GW(AC) in 2025, a 54% increase from 2024. For the first time, India installed more solar capacity than the US in 2025. India introduced a new rooftop-PV support scheme in 2024, which continued into 2025, and has spurred faster deployment. Distributed solar accounted for an estimated 22 TWh of the 53 TWh solar increase in 2025, a significantly higher increase than in previous years.

India also recorded the world's second-largest increase in both wind and hydro generation. Wind generation growth (+22 TWh, +28%) in 2025 nearly doubled the previous record of 12 TWh in 2023. Hydro generation rebounded strongly, increasing by 21 TWh (+14%) in 2025, primarily due to strong monsoon rainfall. This followed modest growth in 2024 (+4.8%) and a decline in 2023 (-15%). India added 6.3 GW of wind capacity and 4 GW of hydro capacity in 2025.

India's coal generation declined by 44 TWh (-2.9%) in 2025 as a result of the surge in renewables and lower-than-average demand growth. Coal's share of India's electricity generation fell to 71% in 2025 from 75% in 2024.

After India's fall in demand during the Covid-19 pandemic in 2020, demand growth returned to higher levels, surpassing 5% every year from 2021 to 2024. The lower growth in 2025 was likely an outlier due to weather conditions, with underlying structural demand growth expectations remaining high.



In 2025, solar generation became the largest source of clean electricity in India, overtaking hydropower for the first time. Solar output more than doubled in the three years since 2022, from 96 TWh to 196 TWh in 2025. Solar accounted for 9.4% of India's electricity mix in 2025, up from 5.3% in 2022. India was the world's third-largest solar generator in 2025.

Hydropower was India's second-largest clean power source in 2025, accounting for 8.6% of the electricity mix. Hydro's share has declined slightly over the last two decades, from 13.8% in 2005, as its growth has not kept pace with growing electricity demand. However, absolute output reached a new record high of 178 TWh in 2025, surpassing the previous record set in 2022 (175 TWh).

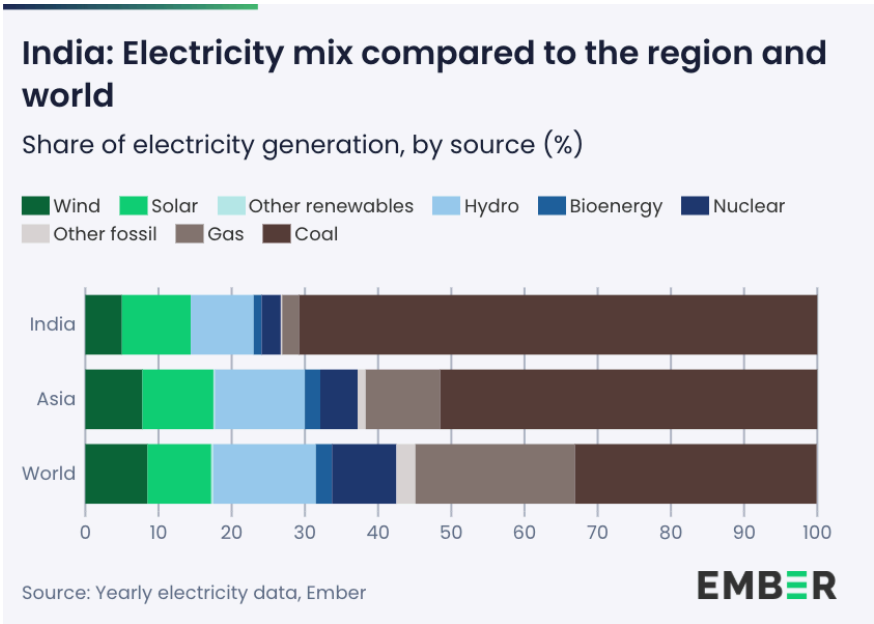
India's wind power has more than tripled in the last ten years, from 33 TWh in 2015 to 104 TWh in 2025. The record increase in 2025 (+22 TWh) alone accounted for nearly a third of the increase in the last decade. In 2025, India overtook the United Kingdom to become the world's fifth-largest wind generator.

Despite the fall in coal power in India last year, coal generation has increased by 468 TWh (+46%) over the last decade and continues to dominate India's electricity mix. India remains the second-largest coal generator globally, behind China.

India is the world's third-largest power sector emitter at 1,395 MtCO2e in 2025. This is a slight decline (-2.9%) from 2024 (1,437 MtCO2e), driven by a fall in fossil generation.

Coal provided 71% of India's electricity in 2025, above the Asian average of 52% and the global average of 33%.

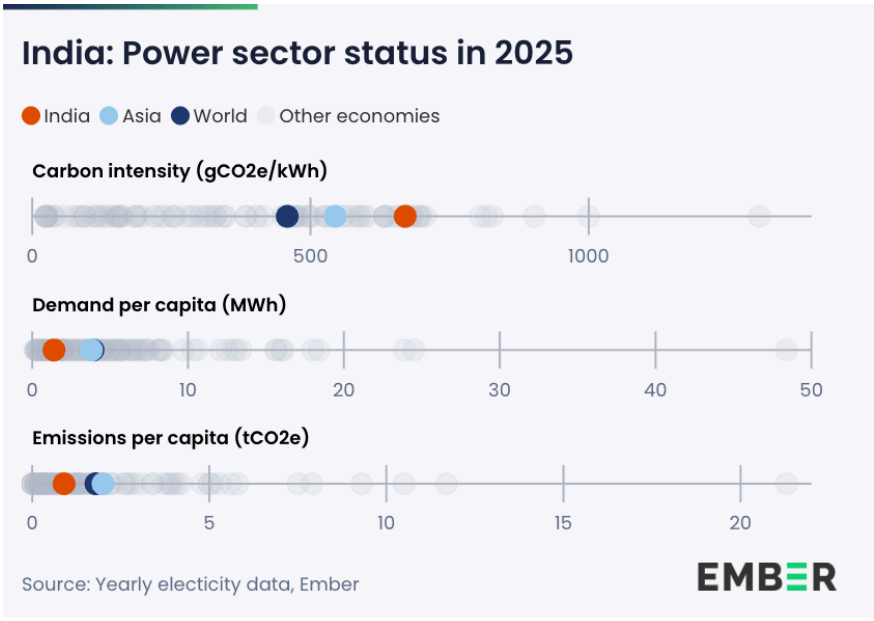
Clean generation accounted for 27% of India's electricity mix in 2025, up from 22% in 2024. Wind and solar together contributed 14% of generation in 2025, below the global average of 17% and China's share of 22%.



Looking ahead, India plans to triple its non-fossil energy capacity to 500 GW from 2022 to 2030, and is considering increasing this target. As of October 2025, India has installed over 250 GW of renewable capacity. The transition is currently driven mainly by solar installations and supportive domestic policies – particularly for energy storage, where a significant pipeline of projects is already underway. Market auctions are also evolving to prioritise firm and dispatchable renewable energy, pairing wind and solar with storage to better match load profiles.

The carbon intensity of India's power sector was 670 gCO2e/kWh in 2025, a substantial decline from 705 gCO2e/kWh in 2024. This remains higher than the Asian average of 544 gCO2e/kWh and the global average of 458 gCO2e/kWh, owing to the relatively high share of coal in the mix.

Per capita electricity demand in India was 1.4 MWh, significantly below the average in Asia (3.8 MWh) and the world (3.9 MWh).



India had the world's third-highest total electricity demand in 2025, yet it is the world's most populous country.

Despite the high carbon intensity of India's power sector, lower per capita demand keeps per capita power sector emissions relatively small at just 1.0 tCO2e – a quarter of China's (3.9 tCO2e) and slightly above half of the world average (1.8 tCO2e).

4.5 Russia

Key highlights

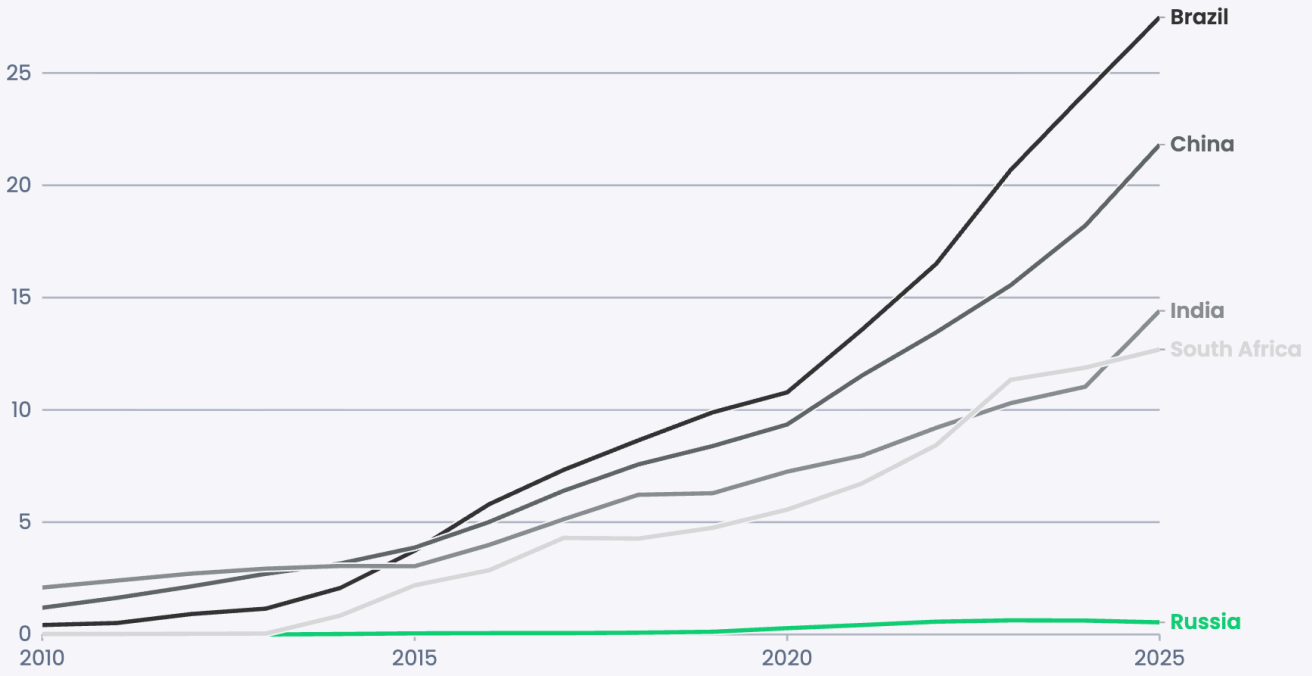
01 **Mild temperatures in Russia were the main driver of a 1.4% decline in electricity demand in 2025**

02 **Russia's gas generation declined 13 TWh (-2.3%) in 2025, the third-largest fall of any country**

03 **Clean power growth remains limited in Russia, with wind and solar accounting for less than 1% of electricity generation**

Of the original BRICS countries, Russia is the only one that has not seen strong wind and solar growth

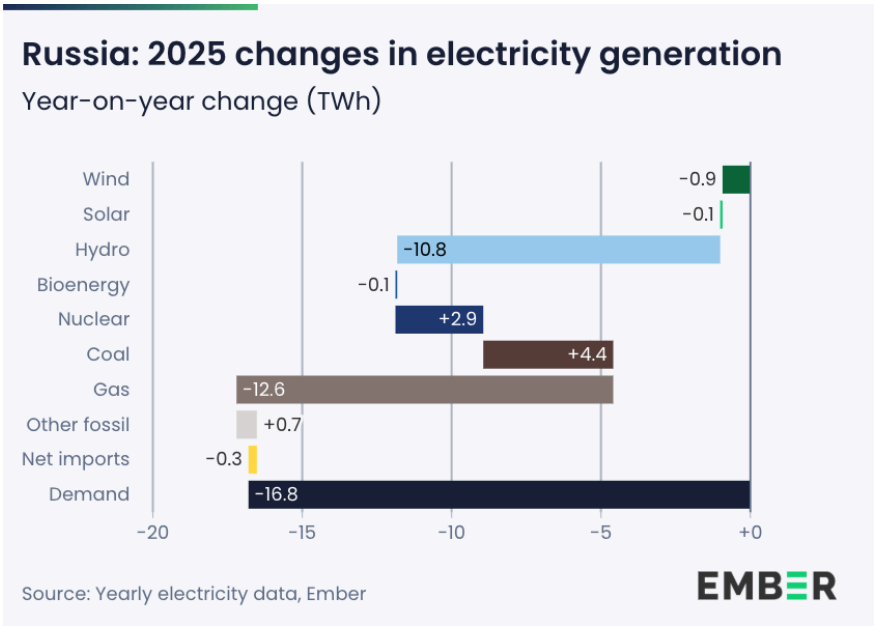
Share of wind and solar in electricity generation (%)



Source: Yearly electricity data, Ember

EMBER

Electricity demand in Russia declined by 17 TWh (-1.4%) in 2025. Russia experienced unusually warm winter temperatures in early 2025, including its warmest January on record. According to Ember analysis, over two-thirds (12 TWh) of Russia's decline in demand in 2025 can be attributed to temperature-driven reductions in cooling and heating demand, with most of this due to reduced heating demand in January.



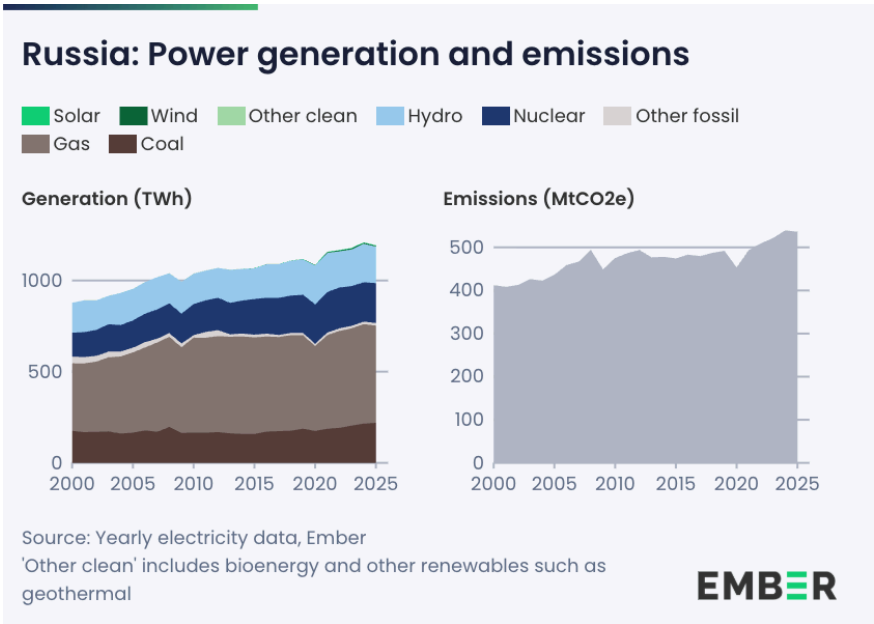
Russia's fossil generation declined by 7.6 TWh (-1%) in 2025. Gas generation alone fell 13 TWh (-2.3%), but was partly offset by an increase in coal generation of 4.4 TWh (+2%). This was Russia's first decline in fossil generation since 2020, but also the fifth consecutive year of coal growth.

Russia's clean generation declined by 9 TWh (-2%) in 2025, driven by a fall in hydro generation (-11 TWh; -5%), following hydro growth in both 2023 and 2024 when conditions were more favourable. Nuclear generation increased by 2.9 TWh (+1.4%) after a small decline in 2024 (-1.7 TWh). Solar and wind remain minimally developed in Russia and play a very small role in electricity generation. The last renewables auction was held in 2021. In 2025, neither wind nor solar generation increased.

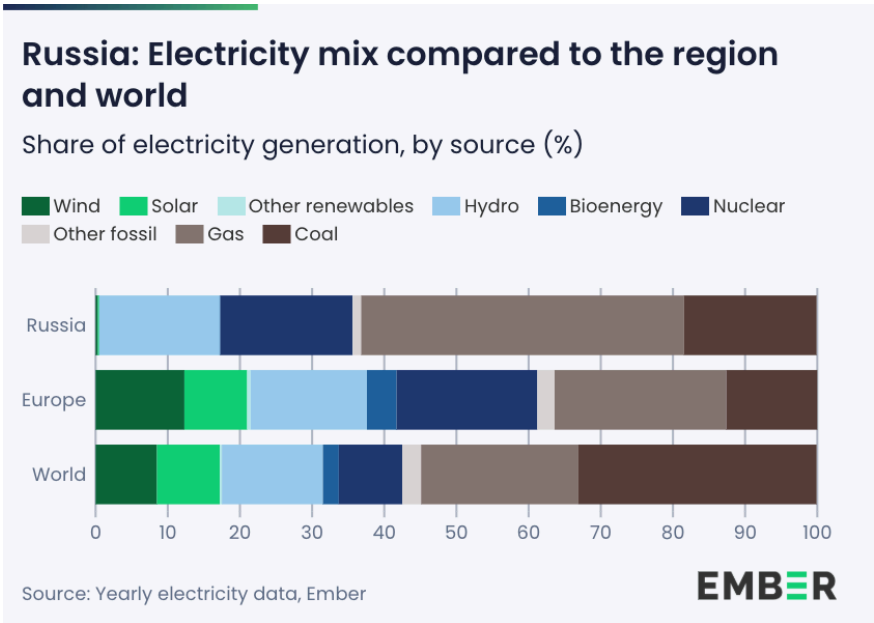
Russia's 1.4% fall in electricity demand last year came after four consecutive years of growth (2021-2024). It marked the first annual demand contraction since the 2.3% decline during the 2020 Covid-19 pandemic.

Russia's share of clean generation, primarily from nuclear and hydro, remained at 36% in 2025, similar to pre-pandemic levels. Consequently, the country's share of fossil generation is unchanged at 64%.

Russia's power sector emissions have risen by 9% since pre-pandemic levels in 2019. However, emissions in 2025 remained broadly similar to 2024 levels (falling only 2.9 MtCO2e, or 0.5%), driven by weather-related demand reductions rather than structural changes in the power sector.



Russia has yet to meaningfully participate in the global electricity transition. Wind and solar remain marginal, accounting for less than 1% of the country's electricity generation in 2025. This is well below China (22%), Europe (21%), India (14%) and the global average (17%).

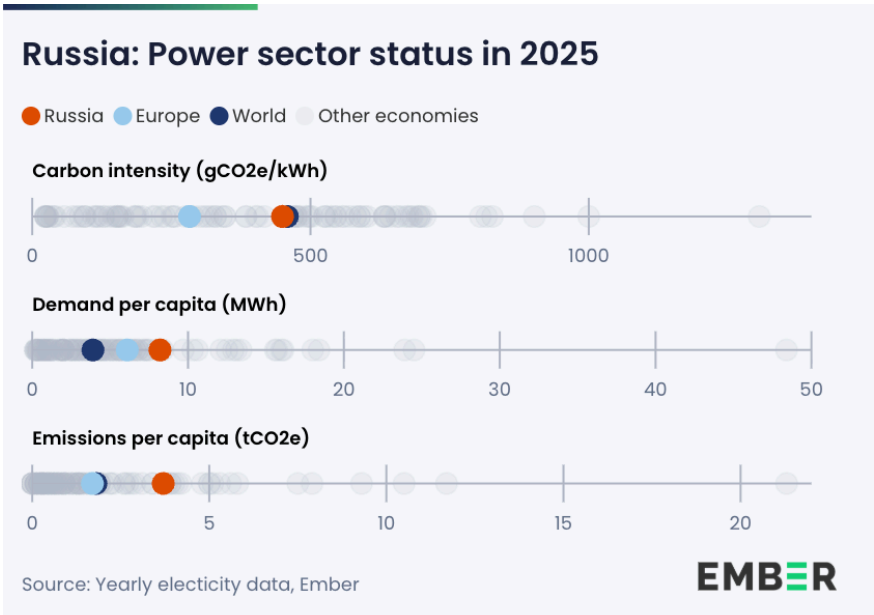


Fossil fuels accounted for 64% of Russia's electricity generation in 2025, higher than the global average (57%) and higher than in China (58%). Gas was the largest component of Russia's fossil generation, providing 45% of the country's electricity – higher than in the US (40%) and double the global average (22%).

Clean power accounted for 36% of Russia's electricity mix, almost entirely from hydro (17%) and nuclear (18%).

Russia's carbon intensity of electricity was 450 gCO2e/kWh in 2025, slightly below the global average of 458 gCO2e/kWh.

Russia's per capita electricity demand was 8.2 MWh, more than twice the global average (3.9 MWh) and a third higher than the European average (6.1 MWh).



Although per capita electricity demand in Russia is only a third higher than the European average, its per capita power sector emissions (3.7 tCO2e) are more than twice as large as the European average of 1.7 tCO2e.

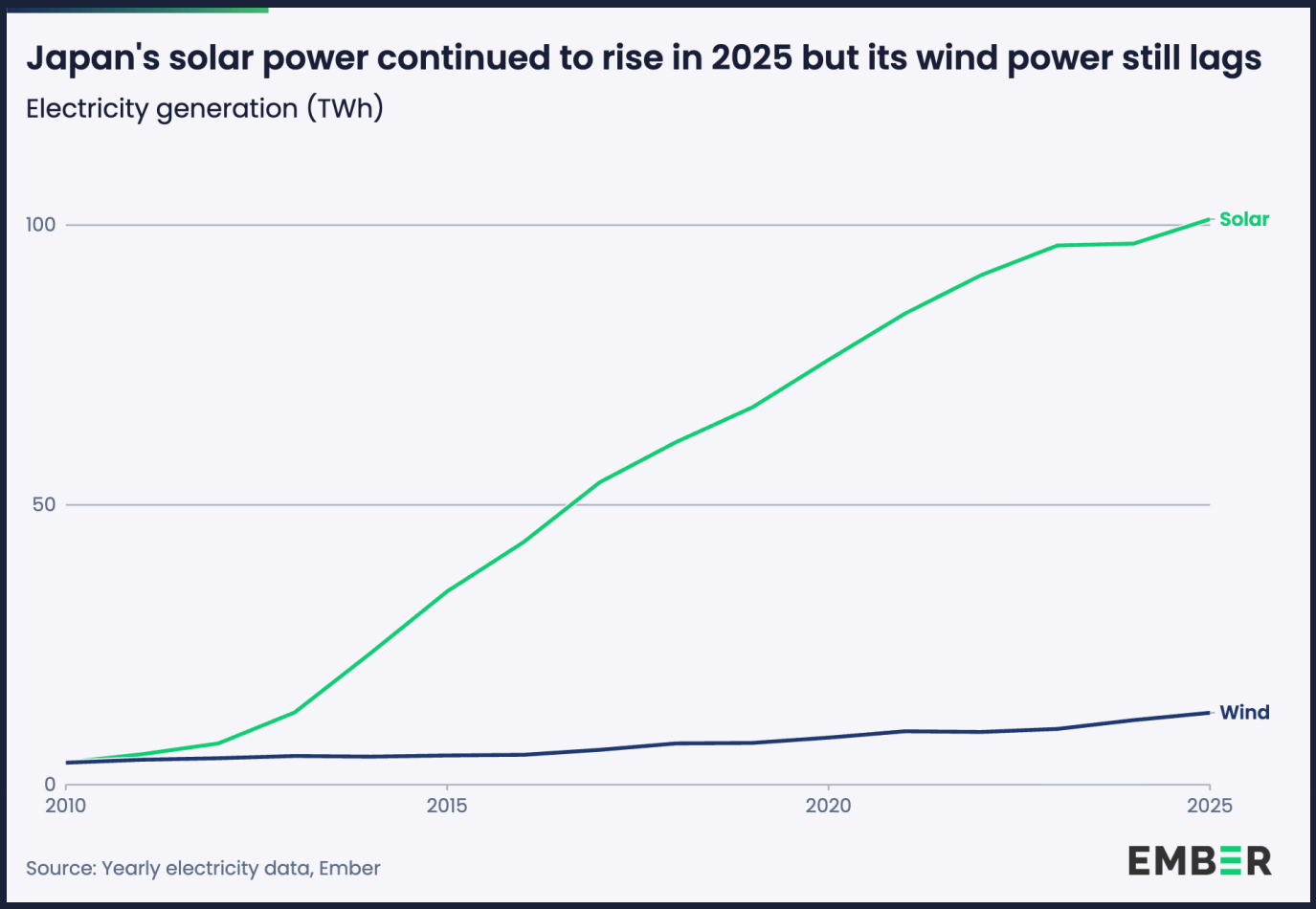
4.6 Japan

Key highlights

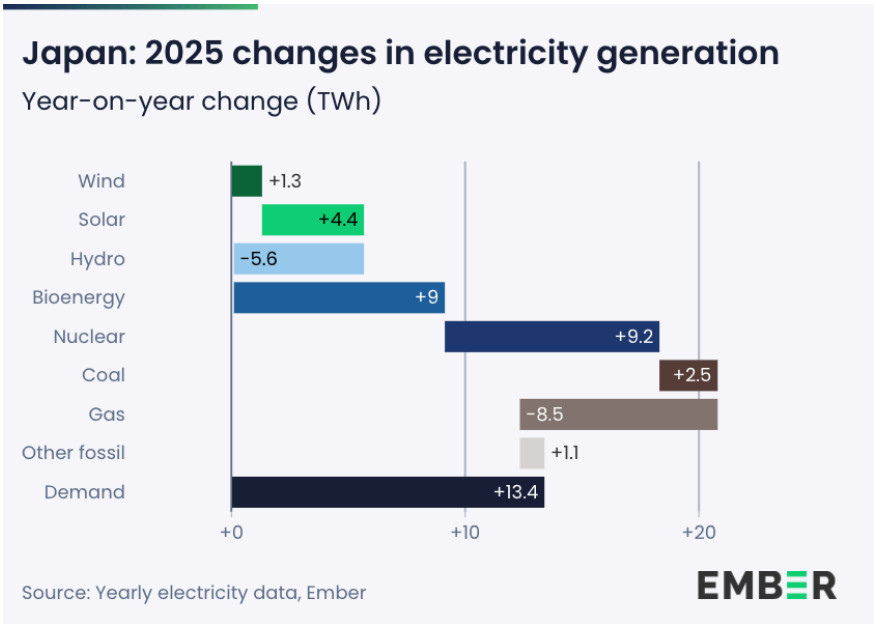
01 **Japan's solar power share has nearly tripled over the last decade to 9.8% in 2025, while wind remained marginal despite its substantial potential**

02 **Fossil generation declined for the third consecutive year in 2025, although it still accounted for more than two-thirds of Japan's electricity generation**

03 **The carbon intensity of Japan's power sector in 2025 fell to the lowest level in 15 years**



Japan's electricity demand increased by 1.3% (+13.4 TWh) in 2025, slightly higher than the 1.0% increase in 2024. In 2025, Japan experienced both the hottest summer on record and a cold winter. According to Ember's analysis of temperature data, an estimated 10 TWh of the country's demand increase can be attributed to higher heating needs in the winter compared with 2024.



Clean generation in Japan increased by 18.3 TWh (+5.8%) in 2025, with roughly equal contributions from renewables (+9.1 TWh, +3.9%) and nuclear generation (+9.2 TWh, +10.8%). Within renewables, bioenergy increased by 9.0 TWh (+19.9%), solar by 4.4 TWh (+4.5%) and wind by 1.3 TWh (+11.4%), while hydro generation fell by 5.6 TWh (-7.0%). Clean generation more than met the increase in Japan's demand in 2025.

Although modest in absolute terms, Japan's wind generation growth in 2025 was its second-largest annual rise ever recorded. Wind deployment has increased slightly in recent years. The country added 570 MW of new wind capacity in 2025, following on from 510 MW in 2024.

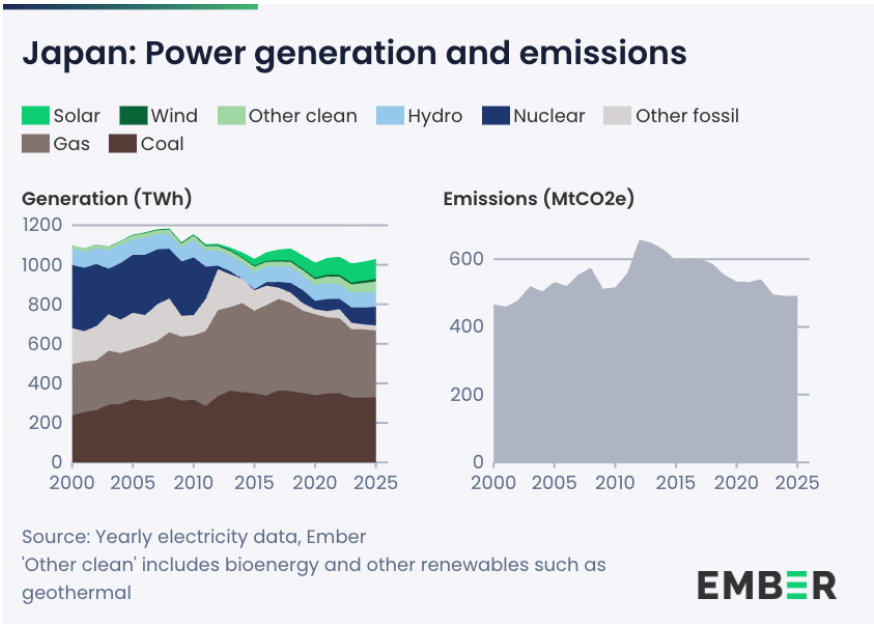
Fossil generation in Japan declined in 2025 (-4.9 TWh, -0.7%). Gas generation fell by 8.5 TWh (-2.4%), while coal increased by 2.5 TWh (+0.8%).

Electricity demand has been relatively stable in Japan over the past ten years, with no net change from 2015 to 2025. Over the same period, clean generation rose by 178 TWh, displacing an equal amount of fossil generation.

Japan's low-carbon generation has been rising steadily since a sharp fall after the 2011 Fukushima nuclear incident, which led to the shutdown of all the country's nuclear reactors. In 2025, clean generation reached 336 TWh, but has yet to return to the pre-Fukushima level of 411 TWh in 2010.

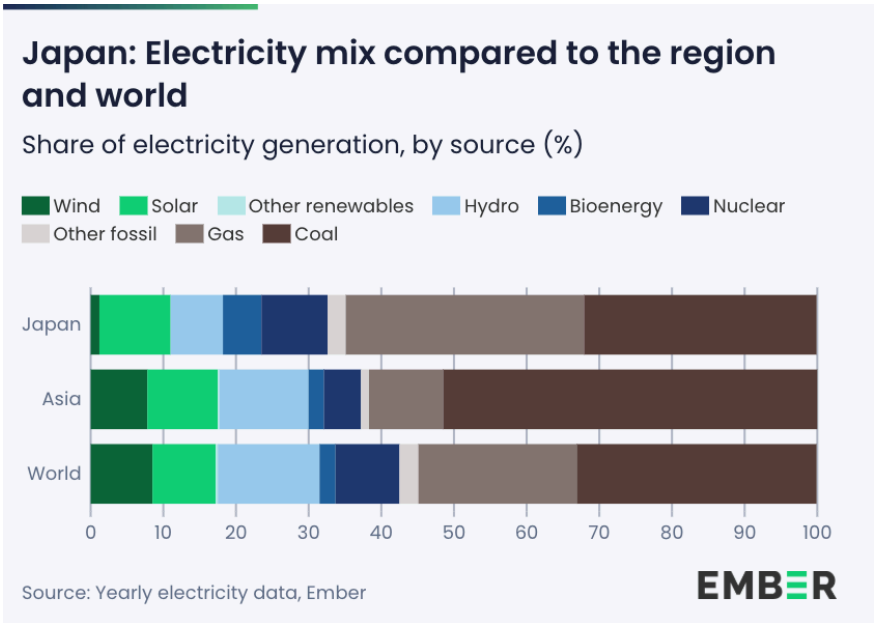
Solar's contribution to Japan's electricity mix has nearly tripled over the last decade (3.4% in 2015 to 9.8% in 2025). However, wind generation still lags significantly, providing just 1.3% of Japan's electricity despite strong potential.

Japan's power sector emissions peaked in 2012 at 658 MtCO2e. Since then, emissions have declined by 25%, to 492 MtCO2e in 2025.



In 2025, Japan relied on fossil fuels for 67% of its electricity generation. This is higher than the Asian (63%) and global (57%) averages, and above China (58%).

The high share of fossil fuels is largely from gas (33% of the mix) and coal (32%). Given that Japan relies almost entirely on imports for coal and gas power, transitioning to solar and wind enhances the country's energy security.



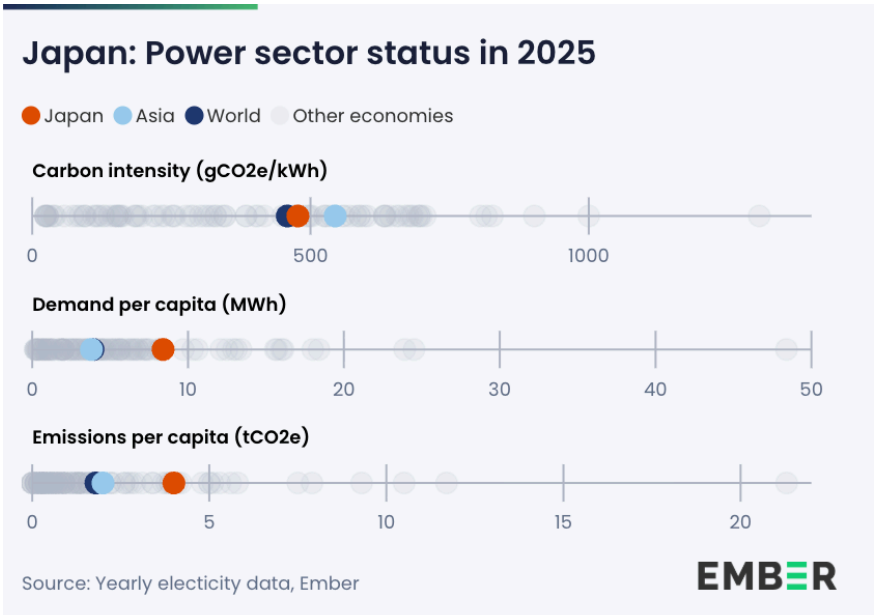
Japan's solar share reached 9.8% in 2025, slightly below China's solar share of 11.1%. However, it remains higher than the Asian (9.7%) and global (8.7%) averages.

Wind accounts for 1.3% of Japan's generation, far behind the Asian (7.8%) and global (8.5%) averages.

Japan's share of nuclear generation reached 9.1% in 2025, up from under 2% during 2012-2016, though still below the pre-Fukushima share of 25% in 2010. Further growth is expected, as Japan's 7th long-term strategic energy plan aims for a 20% nuclear share by 2040.

Japan remains the world's fifth-largest power sector emitter. While it is the world's fourth-largest solar generator, Japan lags behind in wind generation. It is estimated that offshore wind could provide 18% of Japan's electricity by 2035. As such, Japan has yet to unlock its massive untapped wind potential, which would accelerate its electricity transition.

The carbon intensity of Japan's power sector in 2025 was 477 gCO2e/kWh, the lowest in the past 15 years. It was slightly higher than the global average of 458 gCO2e/kWh, but lower than the Asian average (544 gCO2e/kWh). This reflects a higher ratio of gas to coal in the fossil generation mix than the average across Asia.



Japan's per capita electricity demand of 8.4 MWh is more than double the global average (3.9 MWh) and the Asian average (3.8 MWh).

Despite moderate carbon intensity, Japan's relatively high demand contributes to elevated per capita emissions. Japan's per capita power sector emissions were 4 tCO2e in 2025, more than double the global average (1.8 tCO2e) and almost double the Asian average (2.1 tCO2e).

4.7 Brazil

Key highlights

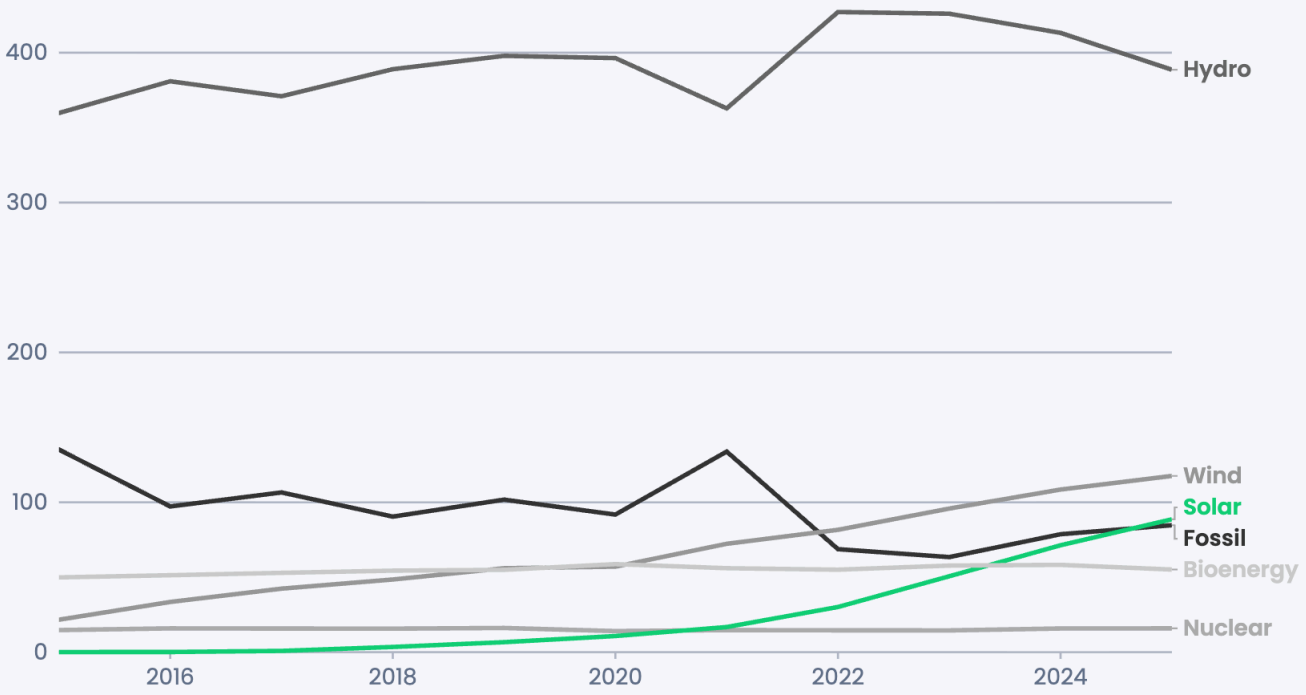
01 **Solar generation surpassed fossil generation in Brazil for the first time in 2025**

02 **Brazil's hydro generation declined for the third consecutive year due to persistent drought conditions**

03 **Electricity demand in Brazil increased by less than 1% in 2025, its lowest growth since 2020's pandemic-related decline**

Solar overtook fossil generation in Brazil for the first time in 2025

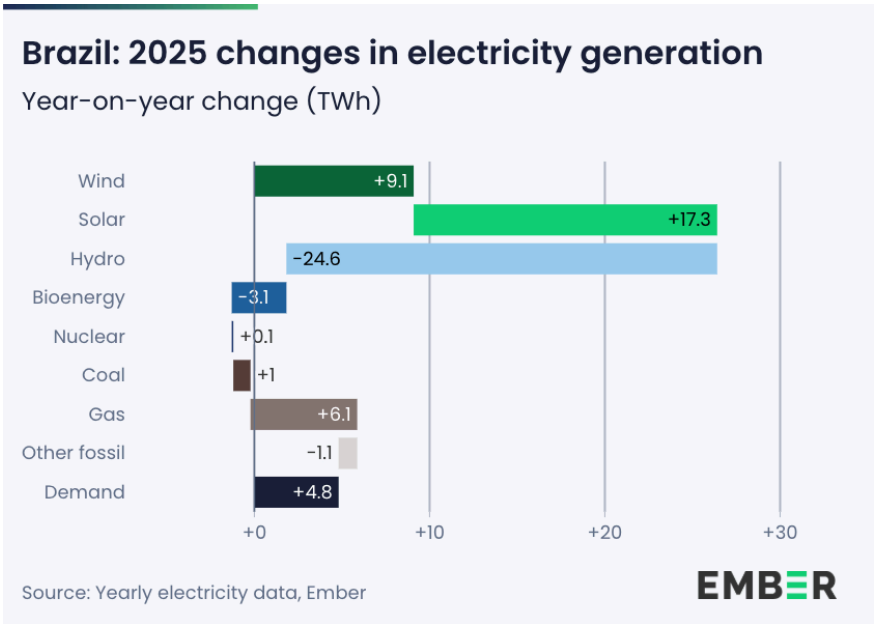
Electricity generation (TWh)



Source: Yearly electricity data, Ember

EMBER

Electricity demand in Brazil increased by only 0.6% (+5 TWh) in 2025, the lowest annual increase since the Covid-related decline in 2020 and a small fraction of the rise in 2024 (+35 TWh). Milder temperatures reduced electricity demand for cooling by an estimated 8 TWh, contributing to lower demand growth.



Brazil's electricity system remains one of the cleanest in the world, with the majority of generation coming from renewable sources. In 2025, growth in solar (+17 TWh, +24%) and wind (+9 TWh, +8%) was more than sufficient to meet the increase in Brazil's demand, although part of this gain was offset by lower hydro generation.

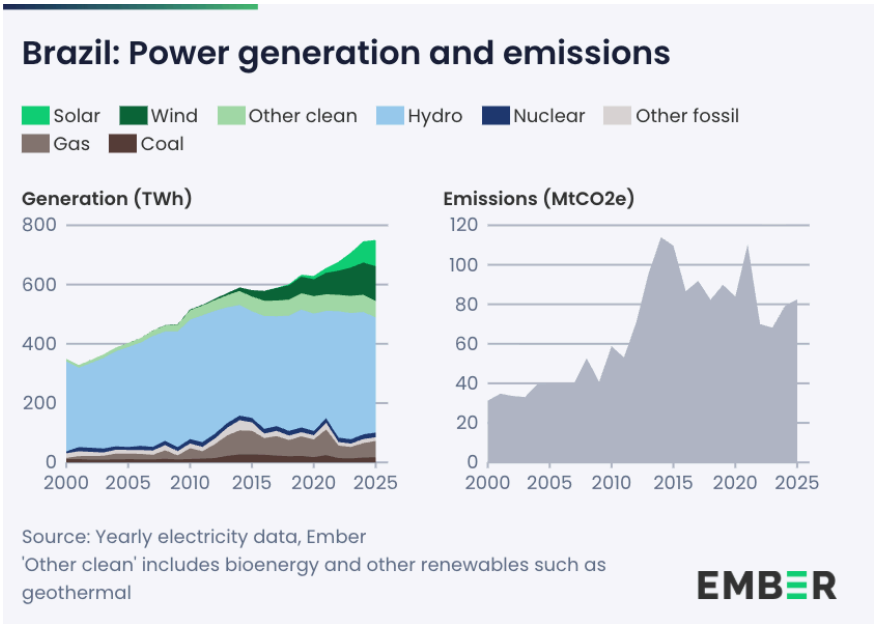
Brazil recorded the world's fourth-largest increase for both solar and wind generation in 2025 and ranks fourth globally in total wind generation and sixth in total solar generation. In 2025, Brazil added 10 GW(AC) of solar capacity and 2 GW of wind capacity.

Brazil's hydro generation declined by 25 TWh (-6%) in 2025, after already declining in 2024 (-13 TWh, -3%), amid prolonged drought conditions. However, output remained higher than during the record droughts of 2021. Bioenergy generation also fell slightly (-3.1 TWh, -5.4%).

Brazil's fossil generation increased by 6 TWh (+7.6%) in 2025. This growth was driven primarily by higher gas generation (+6.1 TWh, +12%), which partly compensated for hydro's decline. Brazil also brought new gas-fired power plants online in 2024 and 2025.

Brazil has historically benefited from large hydropower resources. While hydro output has remained relatively stable over the past 15 years, its share of the electricity mix is now declining. This reflects a combination of limited new capacity additions and recurring droughts, while electricity demand continued to grow. Hydro capacity factors (the average output per unit of capacity) have also declined in the last two decades as a result of changes in plant design and usage.

An increasing number of Brazil's hydro plants are run-of-river, which lack large reservoirs, making them more susceptible to hydrological conditions, and typically have lower capacity factors. As solar generation has expanded, Brazil is seeing stronger midday output, meaning that hydro plants often reduce output during the day and shift towards balancing and ramping roles outside sunlight hours.



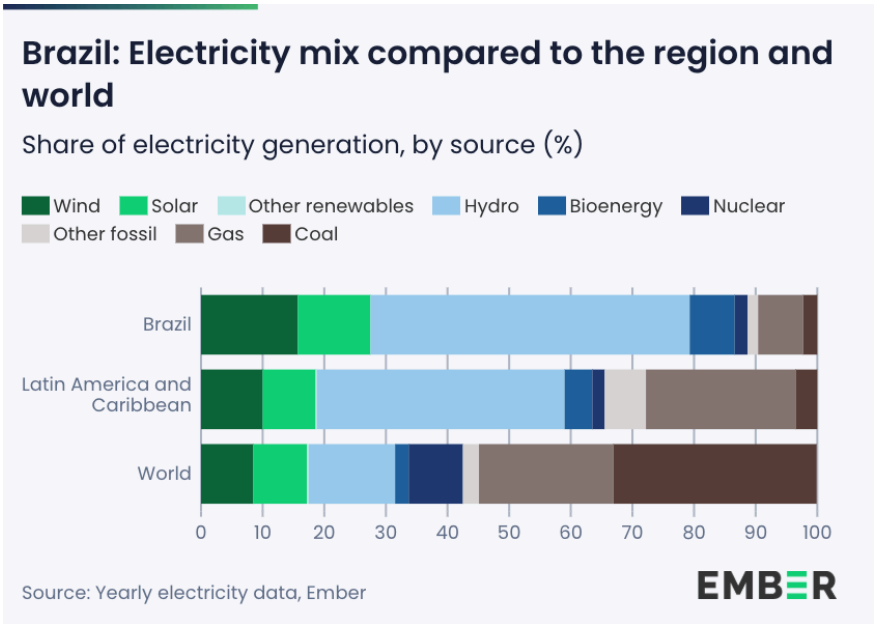
Wind and solar have grown considerably in Brazil, with a particularly rapid rise in solar. Solar generation reached 89 TWh in 2025, increasing more than fivefold from 17 TWh in 2021, and overtaking fossil generation for the first time. Over the same period, the country's solar share rose from 2.6% to 11.8%.

Brazil's wind growth started earlier. In the last decade, the country's wind generation grew from 22 TWh in 2015 to 118 TWh in 2025, with its share rising from 3.7% to 15.7%. Solar and wind could achieve even higher levels, but are in part limited by rising curtailment rates.

Bioenergy, which mostly utilises sugarcane bagasse, peaked at 9.3% of Brazil's electricity in 2020 before declining to 7.3% in 2025. This decline coincided with the rapid expansion of solar generation, particularly distributed generation, which has grown quickly in Brazil.

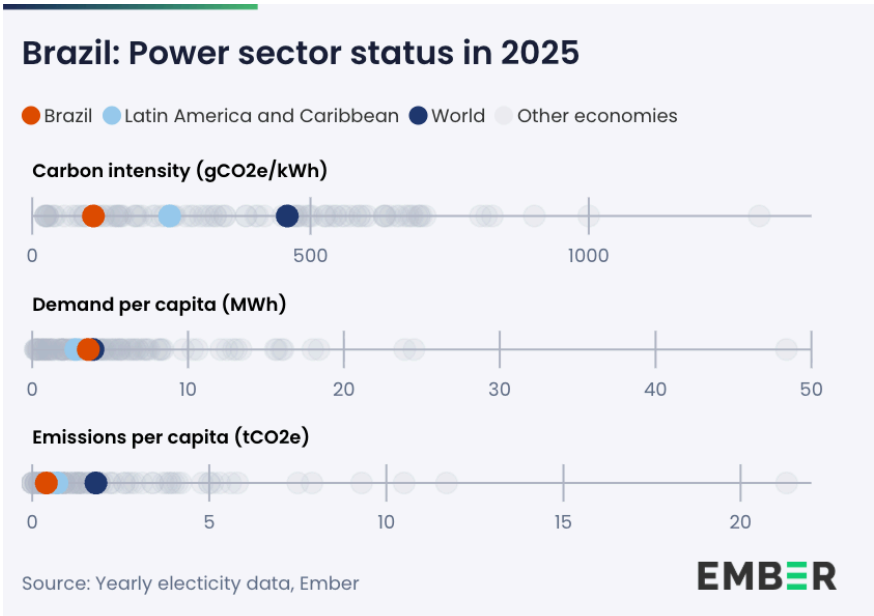
Brazil's power sector emissions peaked in 2014 at 114 MtCO2e. The rise of wind and solar has helped prevent large fossil spikes during drought-related declines in hydropower, avoiding increases in power sector emissions. In 2025, Brazil's power sector emissions were 28% below the 2014 peak at 83 MtCO2e.

Brazil is both a regional leader in renewable electricity and the clear leader among G20 countries. Brazil generated 87% of its electricity from renewables in 2025, more than 20 percentage points higher than second-place Canada at 64%. Brazil's share of renewables is also far above other major economies such as China (37%), the US (26%) and India (24%).



Hydropower still leads the country's electricity mix at 52%, down from around 90% in the early 2000s. Meanwhile, its share of wind and solar reached 27%, well above both the global average of 17% and Latin America's average of 19%. This growth in wind and solar reflects the increasing diversification of Brazil's electricity system beyond hydropower.

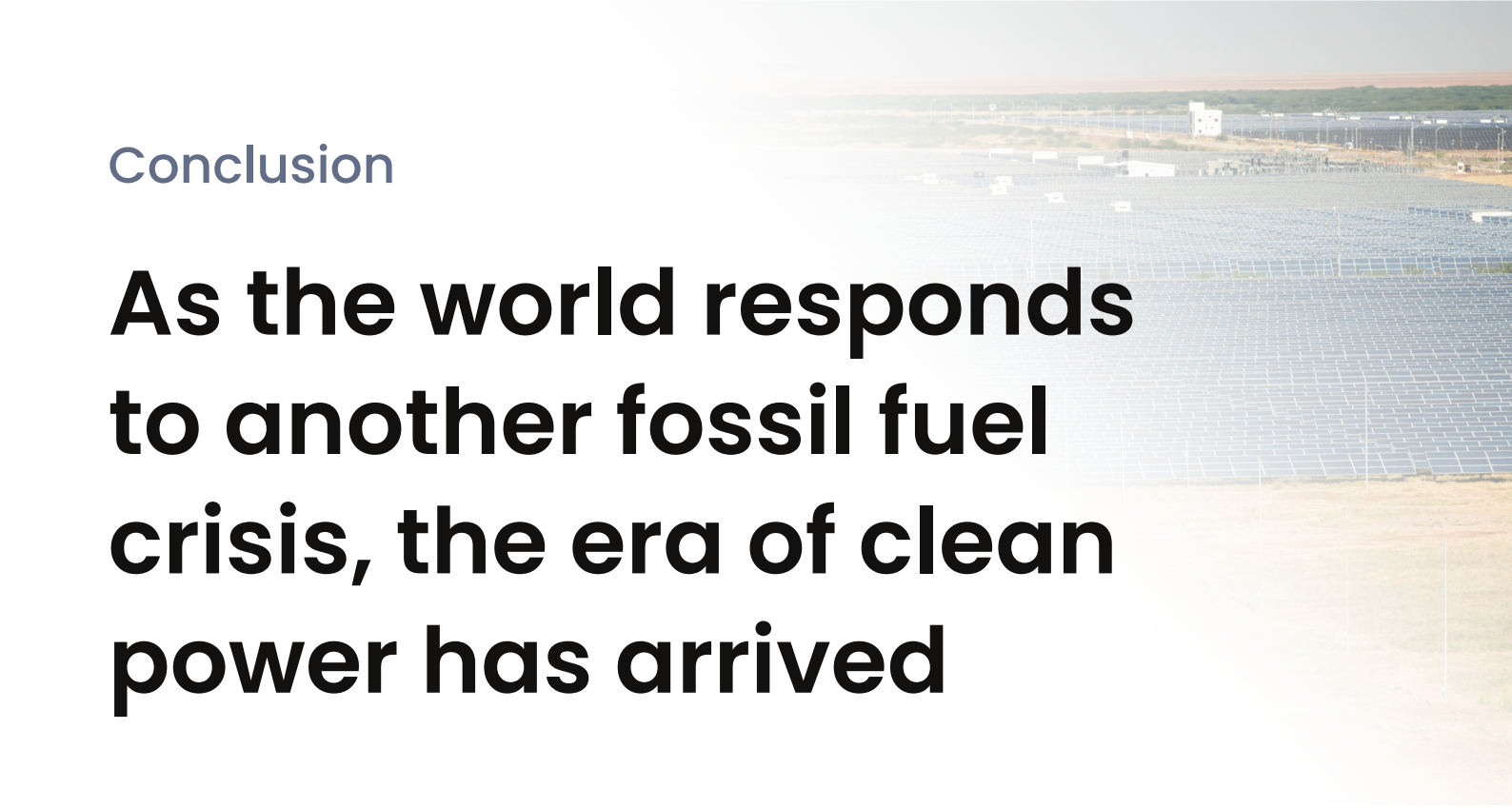
Due to its high share of renewables, Brazil's carbon intensity of electricity generation of 110 gCO2e/kWh is roughly a quarter of the global average (458 gCO2e/kWh) and less than half the regional average in Latin America (247 gCO2e/kWh).



Brazil's per capita electricity demand was 3.6 MWh in 2025, slightly below the global average of 3.9 MWh but above the Latin American average of 2.8 MWh.

Brazil's per capita power sector emissions were 0.4 tCO2e in 2025. This was less than a quarter of the global average (1.8 tCO2e) and just over half the regional average (0.7 tCO2e). Brazil has the second-lowest per capita emissions of any G20 country, just behind France, thanks to its renewables-dominated electricity mix.

Over the past decade in Brazil's power system, per capita demand has increased by 17%, while per capita emissions have fallen by 28%, highlighting how renewables have enabled demand growth without increasing power sector emissions.



Conclusion

As the world responds to another fossil fuel crisis, the era of clean power has arrived

2026 has been marked by major disruptions to global fossil fuel supply, beginning with Venezuela and escalating with the US-Israel war with Iran – the second time in just four years that conflicts severely disrupted global fossil supply chains. The risks of a power system dependent on fossil fuels have never been clearer. Just as 2025 proved the scaling power of solar, wind and batteries, the disruptions of early 2026 are highlighting how exposed the majority of economies are to global fossil fuel markets. The choices countries make now will define how exposed they will be to the next crisis.

2025 marked a turning point in the global power sector. For the first time outside of a major global economic downturn, such as the 2009 financial crisis or the Covid-19 pandemic in 2020, the expansion of fossil fuel generation came to a halt. Solar power and other clean power sources, notably wind, have proven to be the central technologies of this structural shift, growing fast enough to meet all global electricity demand growth.

With battery costs declining rapidly, affordable storage is unlocking the next level of solar growth, pushing fossil fuels out of nighttime hours, reducing power price volatility and enhancing grid stability. Front-runner markets, such as Australia and Chile, are demonstrating that the benefits of fast-scaling daytime solar generation can be expanded into round-the-clock clean power that is ready to deploy at scale.

The steep cost declines in solar and batteries mean the world has even more options on the table to deliver clean, affordable and secure power than four years ago, when Russia's invasion of Ukraine triggered the first fossil shock of the 2020s. In response, many countries – particularly in Europe – accelerated the shift away from fossil fuel imports and towards clean power. The current crisis is creating a similar reckoning in fossil-dependent regions, particularly across Asia. Three-quarters of the world's population live in fossil-importing countries, making them highly susceptible to price changes in gas, coal and oil. This moment could prove to be the catalyst for another accelerated wave of clean power deployment.

The strategic advantages are evident, as many of the world's largest economies actively stride towards lower fossil dependence. In China, clean power is now growing fast enough to meet all electricity demand growth, providing fast-scaling, affordable electricity for China's manufacturing industry and growing economic sectors like data centres and AI. India's record renewable additions in 2025 highlight an accelerating clean power pick-up in the world's second-largest electricity growth market, as they met moderate demand growth and led to a decline in fossil power last year.

The remaining countries with fast-growing fossil generation sit almost exclusively in sunny regions with excellent solar potential, and therefore, they are well-placed to take advantage of affordable solar and battery technology. There are already clear signs of a turning point. Pakistan's solar boom is estimated to save more than $6 billion in gas import costs in 2026 alone. Indonesia's commitment to build 100 GW of solar, alongside battery storage, in the coming years, shows the expected cost and energy security benefits clean power can bring. Chile's world-leading battery deployment is turning round-the-clock solar power into a reality, reducing curtailment and making more effective use of the country's solar resources. These emerging markets now have the same opportunity to take the electrotech fast-track as in India, and grow their economies on a secure base of clean power.

2025 has brought the next stage of the energy transition into view. Clean power is now positioned to deliver fossil-free growth both within and beyond the power sector, enabling a swift transition to a more secure, resilient and stable global energy system.

Methodology

Electricity generation, imports, demand and emissions

Annual data from 2000 to 2024 covers gross generation, sourced from the Energy Institute's Statistical Review of World Energy, the Energy Information Administration (EIA), Eurostat, IRENA, and national sources such as China's National Energy Administration the UK's Department of Energy Security and Net Zero, and Chile's Coordinador Eléctrico Nacional. 2025 data represents estimates of gross generation based on monthly generation data. This estimate is derived by applying absolute changes in monthly generation to the most recent annual baseline. For some countries, such as Ethiopia or Uzbekistan, dedicated annual data sources are used to estimate generation in 2025. A full list of sources for monthly and yearly data and more information about the dataset can be found here.

Net imports from 1990 to 2024 are taken from the EIA and Eurostat, with recent 2025 data estimated in the same manner as generation. Demand is calculated as the sum of generation and net imports, and validated where possible against published direct demand figures. Because it uses gross generation and does not include transmission and distribution losses, it will tend to be higher than end-user demand.

Monthly data is collected for 87 countries from over 70 sources, including national transmission system operators and statistical agencies, as well as data aggregators such as ENTSO-E. In some cases, data is published on a monthly lag; in such cases, recent months are estimated based on Ember's own generation forecasting model.

Official data for Ukraine is only available until 2022, due to the ongoing conflict. Data for Europe and the world still include Ukraine data, but use estimated demand and generation values for recent years.

Both annual and monthly data is often reported provisionally and subject to revision. Every effort has been made to ensure accuracy, and where possible we compare multiple sources to confirm their agreement.

Bioenergy has typically been assumed (by the IPCC, the IEA, and many others) to be a renewable energy source, in that forest and energy crops can be regrown and replenished, unlike fossil fuels. It is included in many governmental climate targets, including EU renewable energy legislation, and so Ember includes it in "renewable" to allow easy comparison with legislated targets. However, we recognise the IPCC reported lifecycle carbon intensity of bioenergy is significantly higher than other renewables and nuclear, and this is incorporated into our power sector emissions estimate.

Terms for 'low-carbon' and 'clean' sources are used interchangeably in the report. Both refer to generation from renewable sources and nuclear power. More information about Ember's classification of electricity sources can be found in the full methodology for Ember's Yearly Electricity Data under "Fuel Types".

References to CO2 emissions in this report use CO2 equivalent emissions, which include emissions from other greenhouse gases such as methane (CH4). Power sector emissions are also based on the methodology from Ember's Yearly Electricity Data.

Solar generation and distributed solar estimates

Official generation data for solar power often underreports generation from distributed solar, or "behind-the-meter" systems. Where possible, distributed solar generation is included in Ember's electricity data and the data used in this report. For countries where it is not directly reported, generation from distributed systems is estimated using various approaches. For example, India's official solar generation data reported by the Central Electricity Authority does not include output for all small-scale systems. For India, solar generation is scaled based on the ratio between capacity with generation reporting and capacity without generation reporting (mostly small-scale systems). A performance penalty is applied for performance in small-scale distributed systems, as they tend to have a lower capacity factor than utility-scale systems.

Further information on scaling approaches, behind-the-meter solar coverage, and detailed methodology breakdowns by country can be found in Ember's monthly and yearly electricity dataset.

Solar and wind capacity

Solar and wind capacity deployment data is sourced from Ember's Monthly Wind and Solar Capacity Data, which tracks monthly deployment for 25 countries, covering 93% of solar and 92% of wind capacity installed globally as of 2025. Global capacity additions are estimated using monthly capacity data from national sources through end-2025. Global deployment data for 2025 requires estimates for data not covered in country-level capacity tracking. For solar, estimates for remaining countries are derived from analysis of Chinese solar PV module export data. For wind, the total deployment reported by available countries is scaled up to global values using the ratio of their combined capacity to total global installed capacity, based on previous years with full coverage.

Solar capacity is reported in either GW(AC) or GW(DC) depending on reporting conventions and data sources. In the report, it is clearly marked as either AC or DC. GW(DC) values are the nameplate capacity, reflecting the maximum potential panel output. Global additions and solar export figures in the report are typically reported in GW(DC). For some country-level figures, such as India's 2025 additions, the report uses GW(AC) data, which represents the maximum output capacity of a power plant at the grid connection point. DC capacity is typically around 1.2 to 1.3 times larger than AC capacity.

Further information on the dataset, its sources, and a detailed methodology can be found on the dedicated page on Ember's website.

Calculation of temperature impacts on electricity demand

Temperature impacts on electricity demand were estimated using regression analysis applied to population-weighted cooling degree days (CDD, above 22°C) and heating degree days (HDD, below 18°C), derived from ERA5 hourly temperature data accessed via the EU's Climate Data Store. The analysis was conducted for 38 countries and regions covering 86% of global electricity demand, with results scaled to represent global totals. Monthly electricity

demand, sourced from Ember's Monthly Electricity dataset, was normalised against a 12-month trailing average to isolate temperature-driven variations from structural trends such as economic growth or electrification. Temperature anomalies were calculated relative to a 2015-2024 baseline and used to derive absolute demand impacts in TWh, enabling a clearer assessment of underlying structural changes in electricity demand.

Battery storage

The share of new solar generation that can be shifted with new battery capacity is estimated based on Ember's yearly electricity data for solar generation and battery capacity installations measured in GWh from various sources. The year-on-year increase of solar generation in 2025 compared with 2024 in GWh is divided by the number of days in 2025 to produce the increase on the average day. The battery capacity installed in 2025 is then divided by the daily growth in solar generation, assuming one full cycle per day, as an order of magnitude estimate of how much of the new daily solar generation can be absorbed by the battery capacity on the average day. No additional assumptions are made on battery operation such as depth of discharge.

Representative global solar profile

The estimated hourly share of solar power in global electricity demand uses representative hourly profiles from large electricity markets with available hourly data like the US, EU, India, and Brazil. The derived profile was scaled to match the monthly average at global level.

EV demand and oil displacement

Electricity demand growth from EVs is estimated by multiplying changes in EV stock, disaggregated by vehicle type, by reference electricity consumption values per vehicle type. Vehicle types covered include passenger cars, buses, trucks, and vans, across both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). Historical reference data is sourced from the IEA's Global EV Data Explorer. 2025 demand growth is estimated using 2025 EV sales data published by BloombergNEF. Oil displacement estimates are based on historical IEA values, assuming the ratio between EV stock and displaced oil remains constant by vehicle type between 2024 and 2025.

LNG volumes and electricity generation from gas equivalent

LNG volumes (metric tonnes) are converted to electricity generation using the IEA standard net calorific value of 48.6 GJ/tonne (LHV basis). A 50% plant efficiency factor is applied, representing a modern combined cycle gas turbine (CCGT), yielding a conversion factor of 6.75 MWh per tonne of LNG.

Other data sources

This report makes use of a variety of datasets curated by Ember, including data on exports of Chinese solar PV modules. A full methodology for this dataset can be found here.

All of Ember's datasets, including a variety of data tools for exploring the data, are available on Ember's data page.

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Cover image

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