



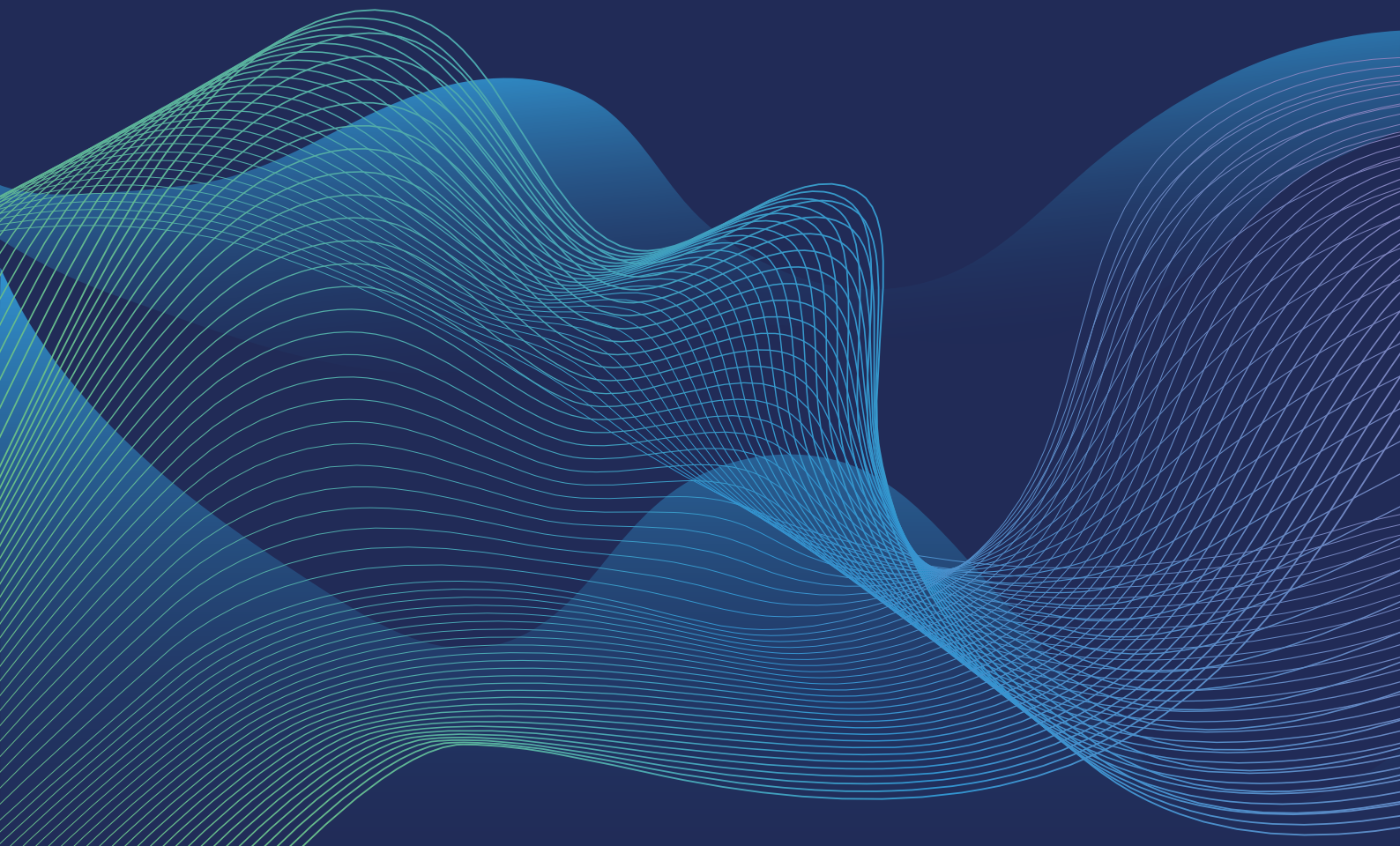
**Global Electricity
Review 2021**
G20 Profile

EMBER
COAL TO CLEAN ENERGY POLICY

CHINA

China was the only G20 country
to see large increase in coal
generation in 2020

March 2021



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About Ember's Global Electricity Review

This annual report analyses electricity data from every country in the world to give the first accurate view of the global electricity transition in 2020. It aggregates generation data by fuel by country from 2000. 68 countries comprising 90% of world electricity generation have full-year data to 2020 and have formed the basis of an estimate for changes in worldwide generation. All remaining countries have full data as far as 2019. G20 countries, which comprise 84% of world electricity generation, each have a separate in-depth country analysis. All the data can be viewed and downloaded freely from Ember's website.

www.ember-climate.org/global-electricity-review-2021

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EMBER COAL TO CLEAN
ENERGY POLICY

Contents

Key findings	1
China's electricity transition in the spotlight: 2015-2020	2
What happened in 2020?	4
China's transition in comparison with G20 countries	5
China's wind and solar generation just above the world average in 2020	5
China only G20 country to see a noticeable increase in coal generation in 2020	6
Coal continues to occupy a central place in China's generation-mix	7
China matches the world, as wind and solar eat into coal's market share	8
China's per capita electricity demand now higher than Italy and the United Kingdom	9
Concluding remarks	10

CHINA

China was the only G20 country to see large increase in coal generation in 2020

Increased electricity demand outpaced new clean electricity, leading to coal rise

"The transition towards a low-carbon electricity system is a mainstay of China's bid to become carbon neutral by the mid-century. Making the country's growth of electricity demand more sustainable is critical for facilitating this transition. For this, China needs to drive electricity consumption to be more efficient, to further promote 'high-quality' economic growth, and to deepen electricity pricing reform, aimed at making electricity prices more cost-reflective."

Muyi Yang

Senior Electricity Policy Analyst, Ember

"The finding that newly-added renewable generation failed to meet the additional power demand highlights an additional challenge in countries like China that are experiencing high electricity demand growth. More aggressive renewable development plans and energy efficiency policy are required. Rather than building new coal capacity, existing coal capacity should also be better utilised to facilitate large-scale renewable uptake before its phase-out in the coming years. For example, with proper renovations, some of the existing coal-fired power plants can provide fast-responsive capacity to the power system. This is critical for maintaining system reliability while enabling large outputs from variable renewable sources."

Xunpeng Shi

President of the International Society for Energy Transition Studies

Key findings

1 China's coal generation rose by 1.7% in 2020, while it fell or remained flat in all other G20 countries

Globally, coal generation had its biggest fall on record, leaving China with an increasing share of global coal generation: up from 44% in 2015 to 53% in 2020.

2 Between 2015 and 2020, electricity demand grew by over 1,880 TWh in China

This is greater than India's total electricity generated in 2020. The country's electricity demand per capita is now higher than the United Kingdom and Italy.

3 China's strong growth of electricity demand has necessitated the expansion of both renewable and non-renewable generation

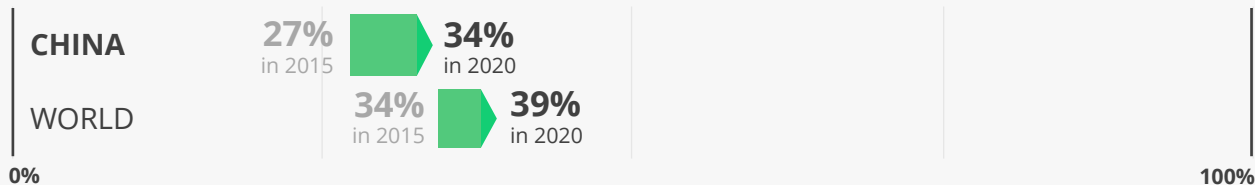
The expansion of renewable generation (821 TWh) in China, though impressive, could not meet its significant electricity demand growth. In order to maintain the sufficiency of electricity supply, coal also had to rise, supplying 39% of China's electricity demand growth (734 TWh out of 1,884 TWh).

4 Wind and solar now supply almost a tenth of China's electricity, in line with the world average

Compared with other G20 countries, China has made average progress on transitioning to a low-carbon electricity future since 2015, with wind and solar gaining a 6% market share from coal. More significant progress has been made in other G20 countries, especially in Germany and the United Kingdom, which achieved over 10% market share gains for wind and solar. In addition, because of the rapid growth in electricity demand, although coal's share fell relatively in China, absolute coal generation continued to increase.

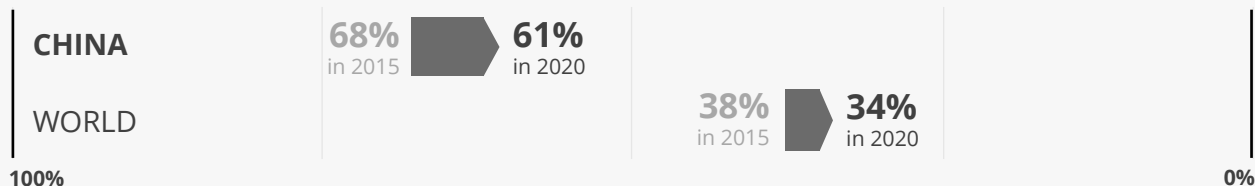
Progress to 100% clean electricity

Percentage of all renewables & nuclear in total generation



Progress on phasing out coal

Percentage of coal in total generation

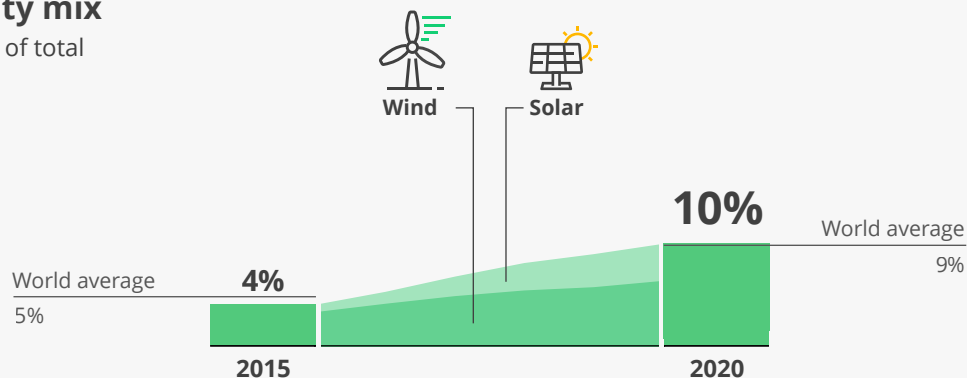


China's electricity transition in the spotlight: 2015-2020

Wind and solar share more-than doubles, to be in line with global average

Wind & solar in electricity mix

Percentage of total generation

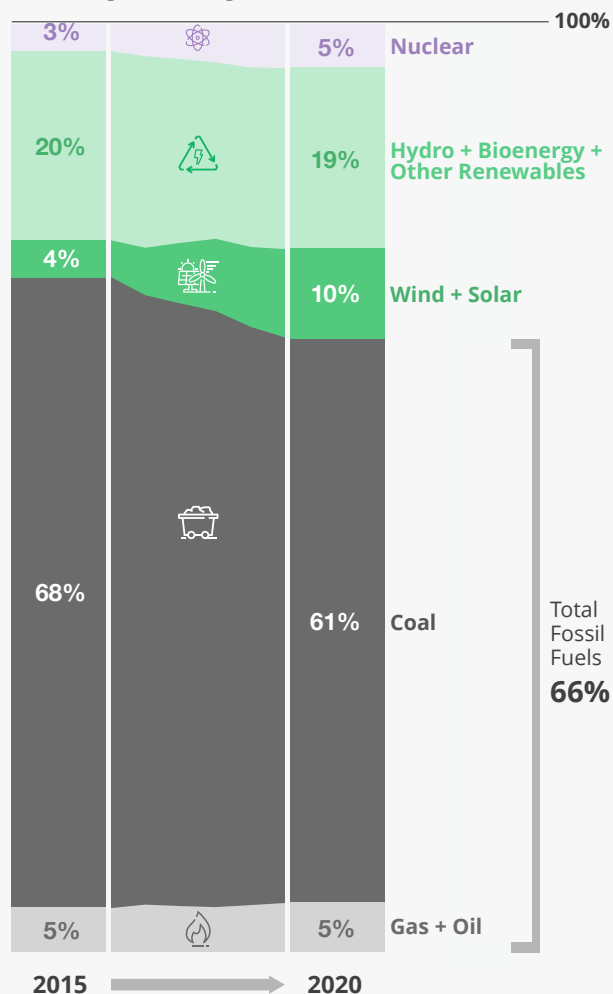


Wind and solar took market share from coal

Electricity demand rises, so coal rises by 19% in absolute terms

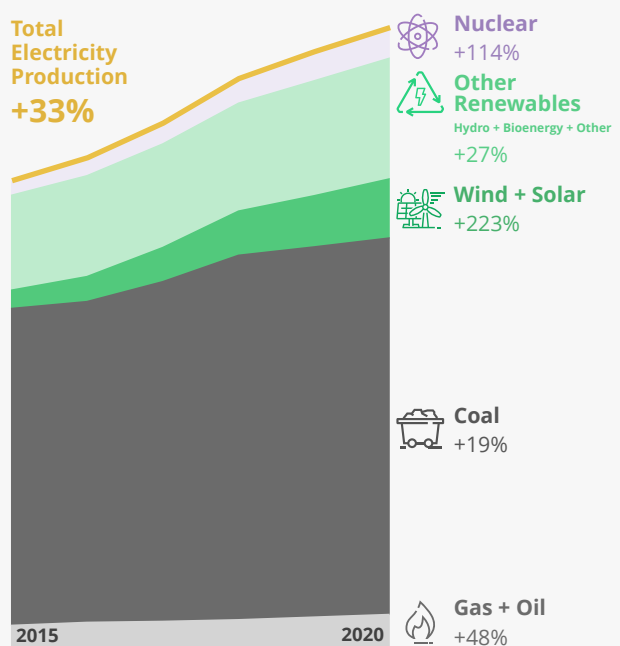
Electricity mix

Percentage of total generation

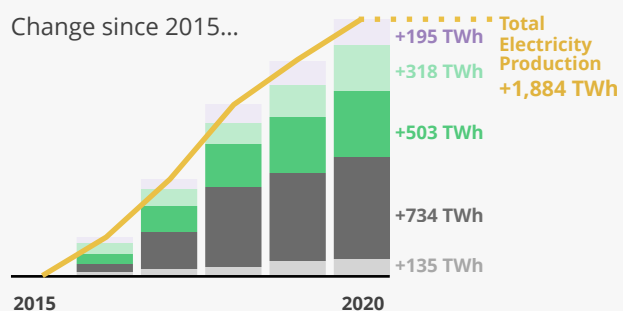


Electricity generation

Terawatt hours



Change since 2015...



Renewable generation has experienced an exceptional growth in China over the period 2015-2020, with wind and solar being the main driver. China's renewable generation has increased by 821 TWh; from 1,392 TWh in 2015 to 2,213 TWh in 2020. Of this, more than 60% (+503 TWh) is from wind and solar, and this increase in wind and solar generation is comparable to South Korea's total electricity generated in 2020. The same period also saw a large growth of hydro and bioenergy generation: 243 TWh for hydro and 76 TWh for bioenergy.

Besides renewables, China's electricity generation from non-renewable sources has also grown significantly, with coal generation alone accounting for almost 70% of the growth. This growth brought China's share of the global coal generation to 53%, rising from 44% in 2015.

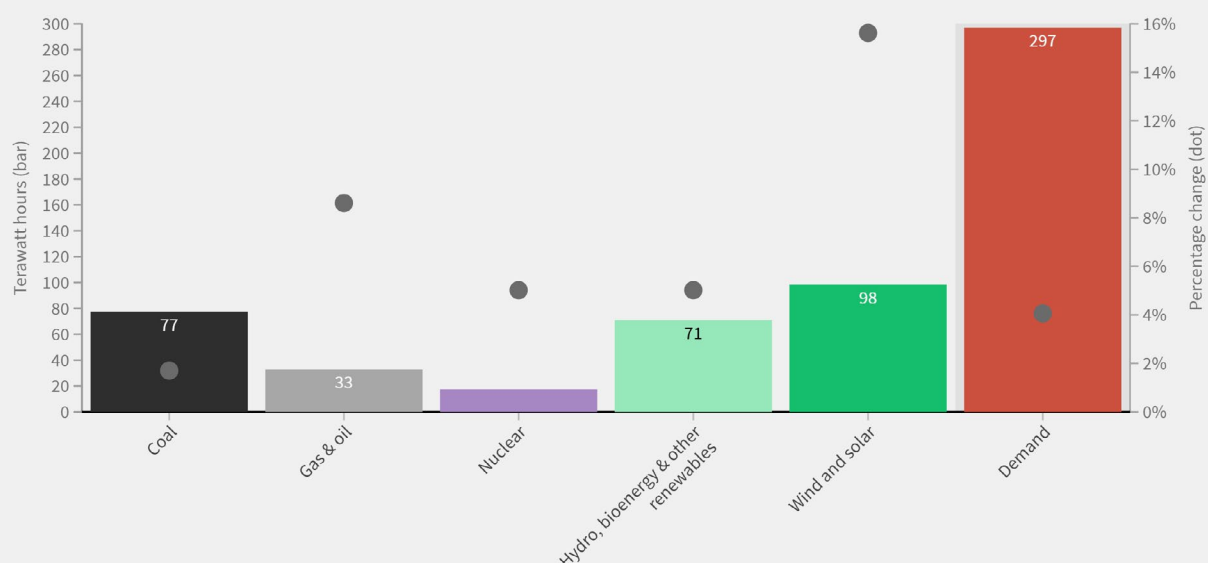
Power generation in China became relatively, but not absolutely, cleaner. China's share of wind and solar generation increased from 4% in 2015 to 10% in 2020. The same time period has also witnessed a 7% reduction in the share of coal generation, suggesting that renewables are replacing coal's share in the electricity generation-mix. However, in absolute terms, all generation has been expanding since 2015, although wind and solar generation has expanded at a rate (45% per year) far exceeding that for coal (4% per year).

China's expansion of both renewable and non-renewable generation was primarily driven by its fast-growing electricity demand. China's electricity demand has grown by an average of 7% per year since 2015, and even with Covid-19, electricity demand still rose 4% last year, reaching 7,612 TWh. This is up from 5,728 TWh in 2015, suggesting a more than 1,880 TWh increase, greater than India's total electricity demand in 2020. The growth of renewable generation (821 TWh), though impressive, has not been able to meet this fast-growing demand for electricity. More electricity has also been produced from non-renewable sources (including coal) to maintain the overall sufficiency of electricity supply.

What happened in 2020?

China - Electricity changes in 2020 by source

Year-on-year change



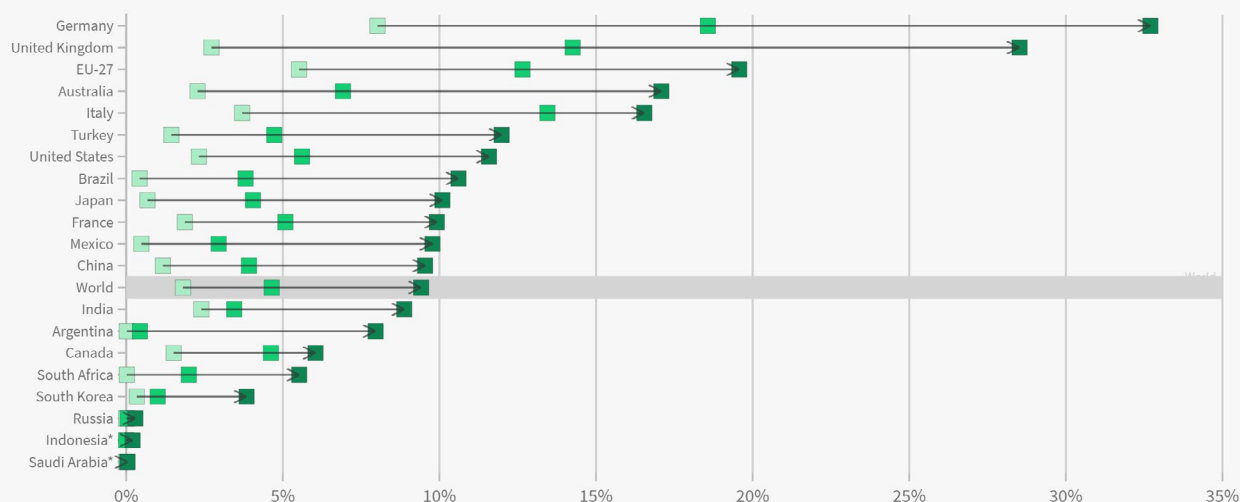
In China, renewable generation increased by 169 TWh last year: 98 TWh (+16%) for wind and solar, and 71 TWh (+5%) for other renewables. This growth, however, did not cause any fall in non-renewable generation. Quite the contrary, non-renewable generation for coal, gas and nuclear also increased by 77 TWh (+2%), 33 TWh (+9%), and 18 TWh (+5%), respectively. This expansion of both renewable and non-renewable generation can be attributed to the country's fast-growing demand for electricity, which rose almost 300 TWh (+4%) last year, greater than the total electricity generation of many countries, including Australia (251 TWh), South Africa (223 TWh), and Turkey (292 TWh). The outbreak of Covid-19 appears to have only slowed the growth of electricity demand rather than reducing it, probably due to a quick economic recovery from the pandemic.

China's transition in comparison with G20 countries

China's wind and solar generation just above the world average in 2020

Wind and solar as % share of electricity production for G20 countries

Year 2010 2015 2020

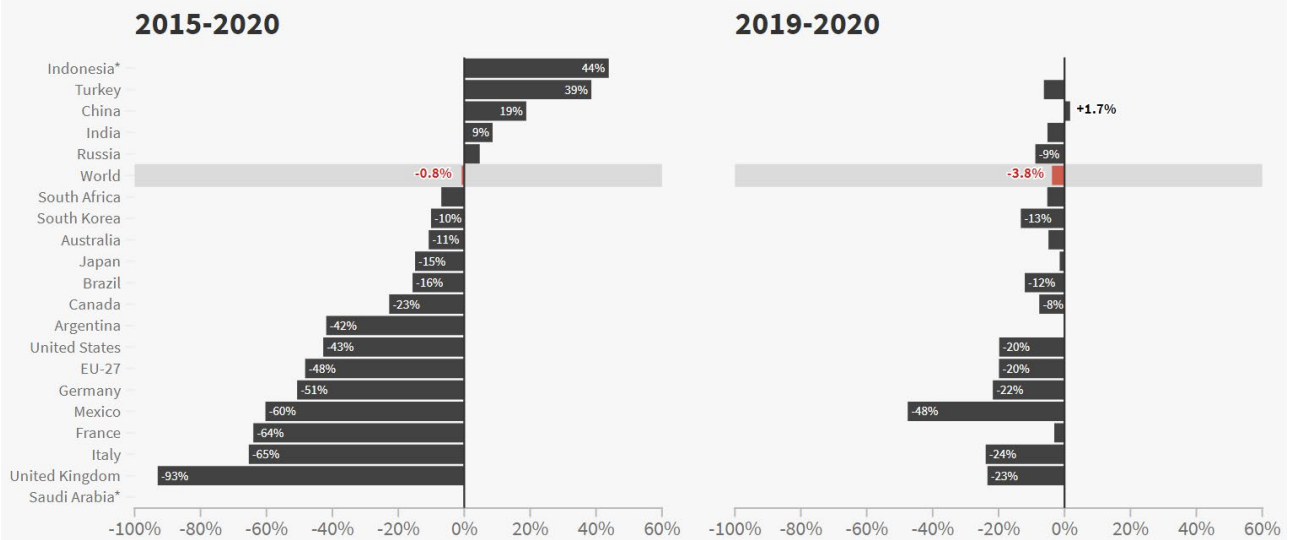


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists
Ember's Global Electricity Review, March 2021.

In China, wind and solar generation accounted for 9.5% of total electricity generated in 2020. This is just above the world average (9.4%) and much less than leading G20 countries, most notably Germany (33%) and the United Kingdom (29%). Nonetheless, in absolute terms, China is leading in wind and solar generation among G20 countries, producing 728 TWh of wind and solar electricity in 2020, accounting for almost 30% of global wind and solar electricity generated in the year. Furthermore, China has also experienced a more than three-fold (224%) increase in wind and solar generation since 2015; this compares to 56% in Germany, 81% in the United Kingdom, and 104% in the United States.

China only G20 country to see a noticeable increase in coal generation in 2020

Change in coal generation, for G20 countries

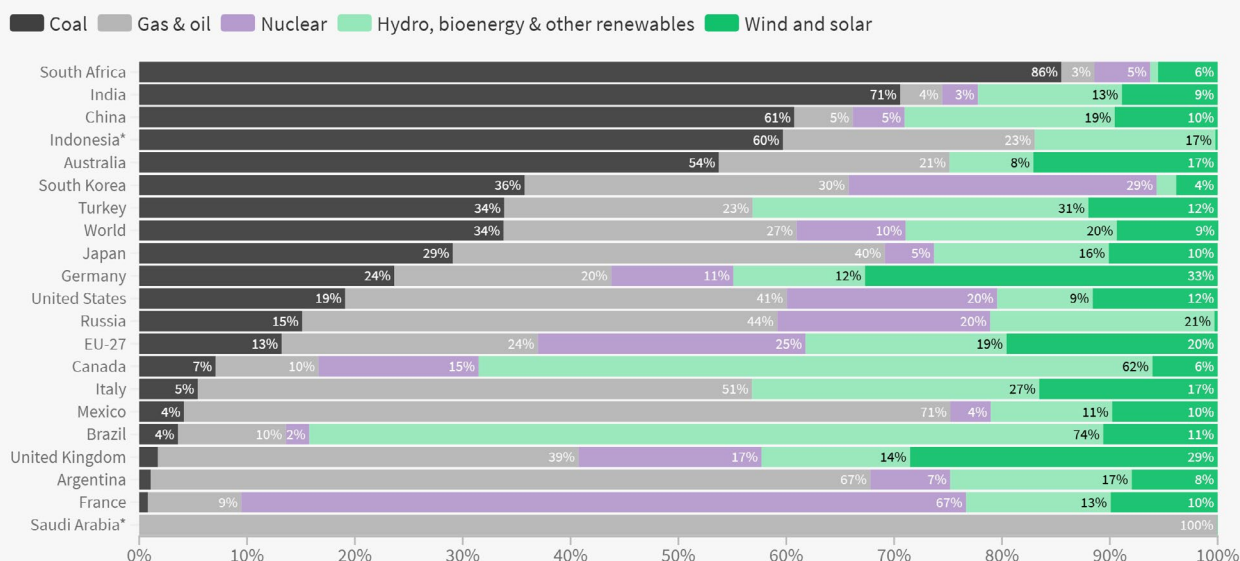


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

China is one of the five outliers among G20 countries where coal generation has continued to expand since 2015. Even with Covid-19, coal generation still increased by 2% in China last year, while it fell in most other G20 countries.

Coal continues to occupy a central place in China's generation-mix

Electricity production mix in 2020, for G20 countries

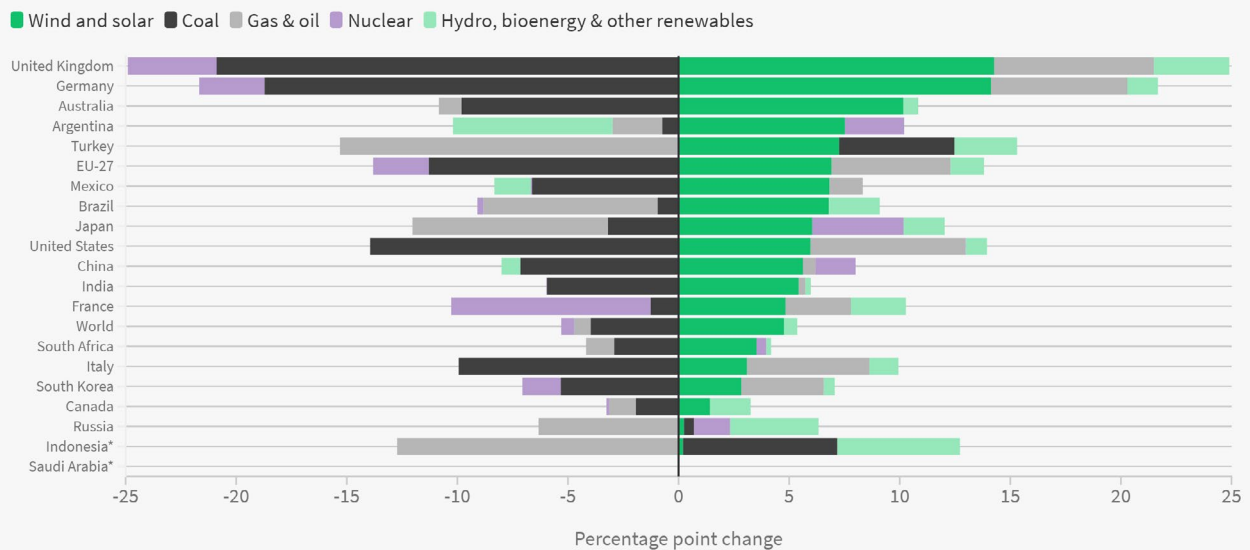


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

China's generation-mix is still dominated by coal, which accounts for over 60% of the electricity generated in 2020. Other G20 countries with a similar dependence on coal generation in 2020 include South Africa (86%), India (71%), Indonesia (60%) and Australia (54%).

China matches the world, as wind and solar eat into coal's market share

Change in electricity market share between 2015 and 2020, for G20 countries



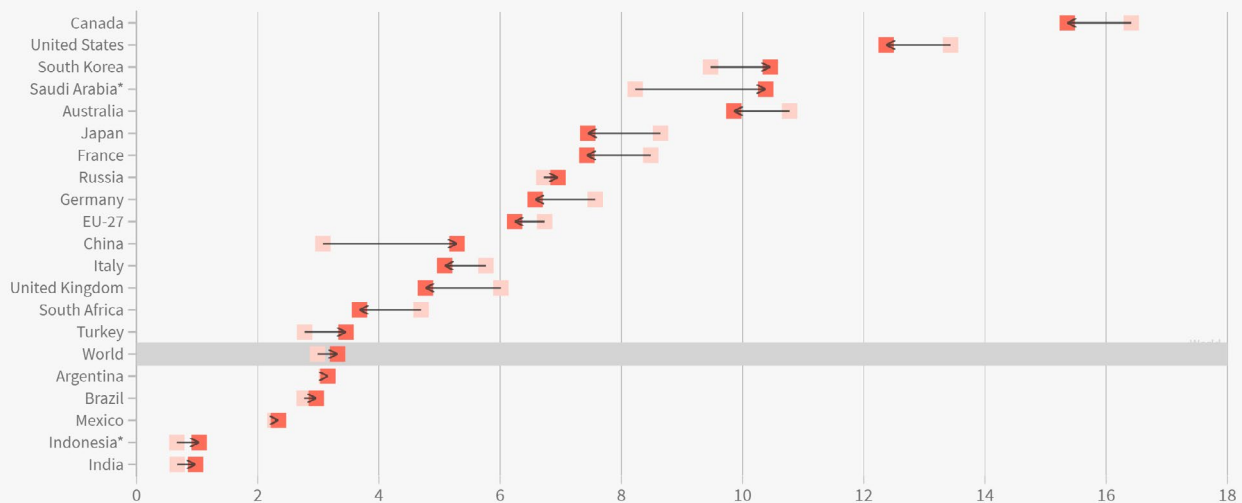
*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

The depth of coal-to-clean electricity transition is modest in China when compared with that for other G20 countries. In China, wind and solar have captured a 6% market share from coal since 2015. This transition from coal to wind and solar is modest when compared with other G20 countries, especially Germany and the United Kingdom, where much faster transition (more than 10% market share gains for wind and solar) has been achieved.

China's per capita electricity demand now higher than Italy and the United Kingdom

Electricity demand per capita (Megawatt hours), for G20 countries

Year 2010 2020



For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists. • Population sourced from United Nations. Ember's Global Electricity Review, March 2021.

China's per capita electricity demand has increased by more than 70% over the past ten years or so; this is one of the quickest among the G20 countries. In 2020, its per capita electricity demand is higher than that for Italy and the United Kingdom, where per capita electricity demand fell considerably (12% for Italy and 25% for the United Kingdom) over the past ten years or so. However, China's per capita electricity demand is still much less than many other high-income countries. This suggests that China's rapid electricity demand growth may continue in the coming years, which may in turn make the country's low-carbon electricity transition even more difficult to attain.

Concluding remarks

Global CO₂ emissions from the combustion of coal need to fall by around 80% in just the next 10 years to put the world on track for 1.5 degrees. In such a context, China – the world's largest coal generator, responsible for over half of the coal-fired electricity generated in 2020 – must ensure its coal generation collapses in the 2020s. However, emerging evidence, as discussed above, suggests that China's fast-growing electricity demand has necessitated the expansion of all generation, including coal. Accordingly, making the growth of electricity demand more sustainable is critical for China's transition towards a low-carbon electricity future. Some possible options for achieving this are as follows.

- » **Prioritising efficiency improvement** across various economic sectors. This can be achieved by, for example, introducing more stringent Minimum Energy Performance Standards for electric appliances and equipment and extending the scope of existing energy efficiency regulation to include more sectors.
- » **Further promoting economic restructuring** with particular emphasis on less energy-intensive services and high-tech sectors. This can contribute to more sustainable electricity demand growth in China. It is also aligned with the country's [current policy priority](#), i.e., promoting economic growth through, for example, innovation, industrial restructuring and phasing out less efficient production capacity. The pursuit of this option requires the country to turn its back on the old playbook of stimulating economic growth through infrastructure investment, which some have argued has led to [more emissions](#) last year.

- » **Electricity pricing reform**, aimed at creating cost-reflective pricing and eliminating cross-subsidisation. This could provide better incentives for electricity consumers to save energy.
- » **International collaboration** can help share best practices for electricity efficiency improvement with China. This can be facilitated through various regional and international mechanisms, such as G20 Energy Efficiency Leading Programme (EELP), China-EU Energy Dialogue, and APEC Expert Group on Energy Efficiency & Conservation.

Making the growth of electricity demand more sustainable is important; however, promoting a timely and orderly phase-out of coal and replacement with renewables is equally important. For this, Chinese policymakers may consider introducing a moratorium on new coal-fired power plants. This would not only curb the expansion of coal generation, but would also avoid the issue of stranded assets, as much of the existing coal capacity is already underutilised in China with low annual average operating hours. In addition, for promoting the uptake of renewables, policymakers may consider providing 'right' price signals for investors. They may also consider strengthening the electric grid and enhancing the flexibility of the electricity system (through, for example, building more storage capacity). These could provide a more effective solution for redressing the issue of wind and solar curtailments, further incentivising the expansion of wind and solar capacity.

More information about the Global Electricity Review 2021

Global Electricity Review 2021

www.ember-climate.org/global-electricity-review-2021

Main Report	Global Trends	English	Español 中文
G20 Profiles	Argentina	English	Español
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	France	English	Français
	Germany	English	Deutsch
	India	English	
	Indonesia	English	Bahasa Indonesia
	Italy	English	Italiano
	Japan	English	にほんご
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	Russia	English	русский
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