



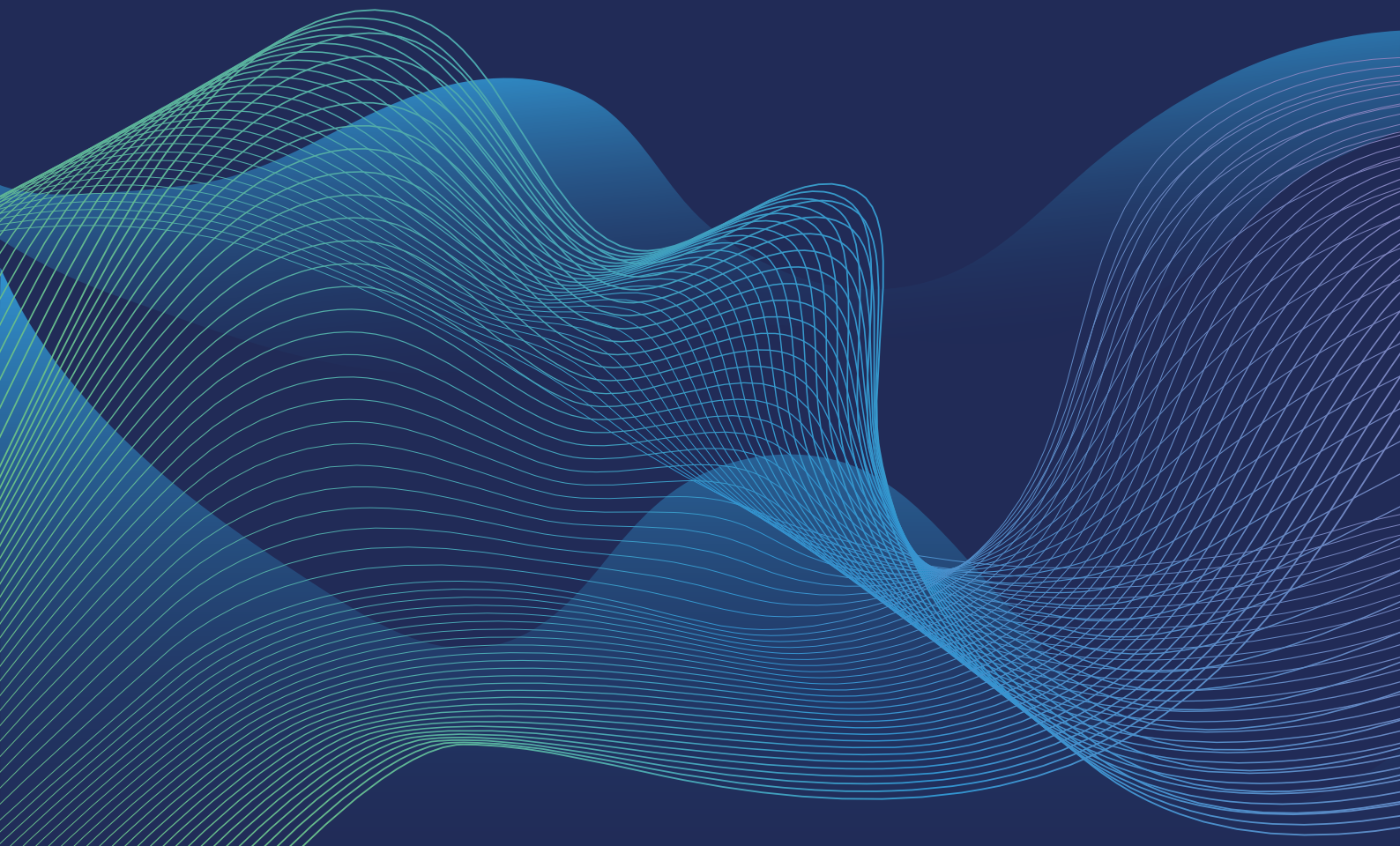
**Global Electricity
Review 2021**
G20 Profile

EMBER
COAL TO CLEAN ENERGY POLICY

BRAZIL

Wind and solar are meeting
Brazil's rising electricity demand

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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BRAZIL

Wind and solar are meeting Brazil's rising electricity demand

"Brazil's strong growth of wind and solar generation means that rising electricity demand can be comfortably met by wind and solar generation. This further dampened the enthusiasm for the expansion of fossil generation. Brazil should further accelerate its uptake of wind and solar generation to supplement hydroelectric power in meeting the rising electricity demand. Otherwise, it may risk going backwards in its transition away from fossil fuels for electricity"

Muyi Yang

Senior Electricity Policy Analyst - Asia, Ember

Key findings

1 Wind and solar have risen in line with the world average to become an important part of the electricity mix in Brazil

Wind and solar generation tripled since 2015 to produce a tenth (10.6%) of Brazil's electricity last year, in line with the world average. Most of this increase has come from wind power, although solar is now starting to play a role as well.

2 Brazil's wind and solar generation saw resilient growth in 2020

The fall in electricity demand caused by Covid-19 in 2020 led to reduced generation from various sources in Brazil, except for wind and solar. Wind and solar generation rose by 2.6% in 2020.

3 Wind and solar have so far met Brazil's increased demand for electricity

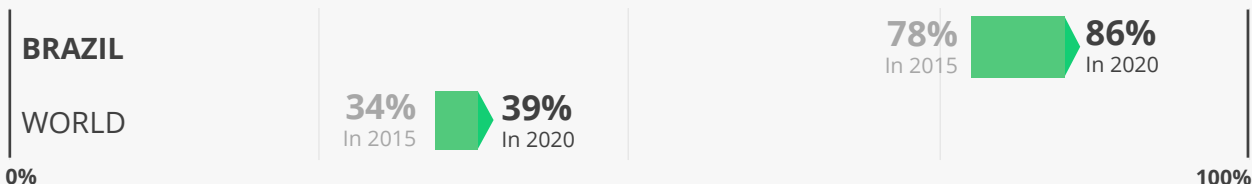
Electricity demand was 5% higher in 2020 than in 2015; that 28 TWh of extra electricity was easily met with wind and solar, which increased by 43 TWh over the period.

4 Brazil's per capita electricity demand is 10% below the world average

Fast-growing electricity demand, driven by robust economic growth and a burgeoning middle class, may become one of the most important factors that will shape Brazil's future electricity generation mix. It will require the uptake of non-hydro renewables to accelerate rapidly in order to ensure the sufficiency of electricity supply. Failing that, Brazil risks going backwards in its transition from fossil fuels to clean electricity.

Progress to 100% clean electricity

Percentage of all renewables and nuclear in total generation



Progress to phasing out coal

Percentage of total generation

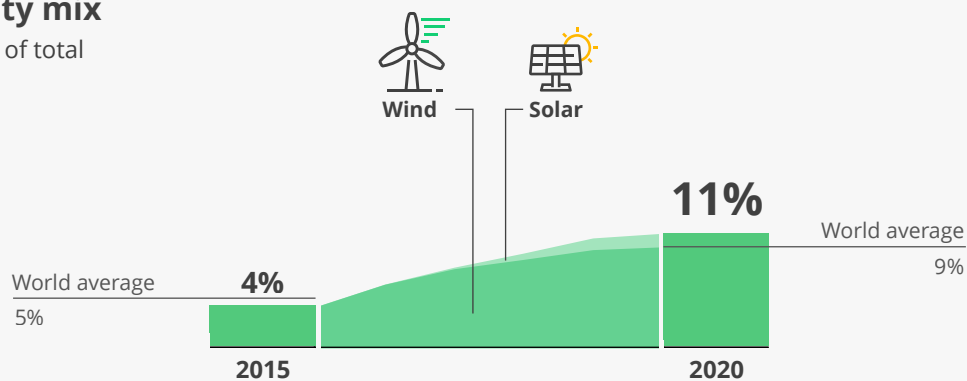


Brazil's electricity transition in the spotlight: 2015-2020

Wind and solar combined, in line with global average

Wind & solar in electricity mix

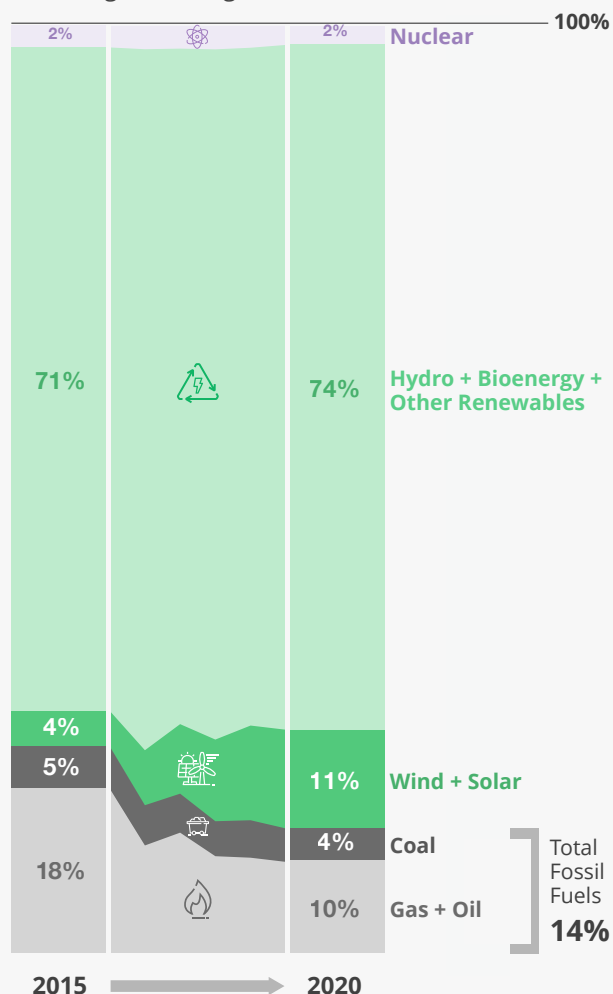
Percentage of total generation



Wind has grown to become a key part of Brazil's electricity mix

Electricity mix

Percentage of total generation

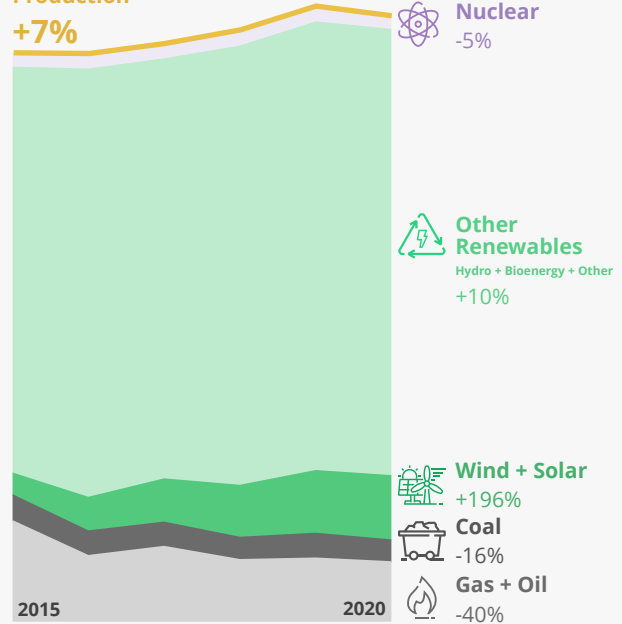


Wind and solar only just keeping pace with rising electricity demand

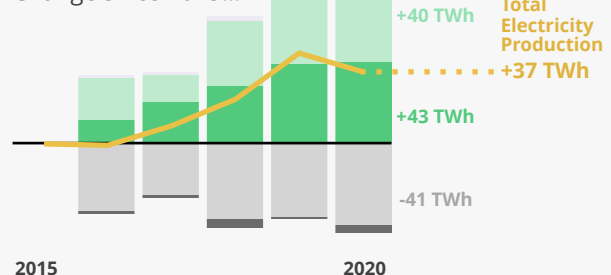
Electricity generation

Terawatt hours

Total Electricity Production



Change since 2015...



Hydropower remains the backbone of Brazil's generation-mix. Hydro is the single largest source of electricity in Brazil, accounting for over 60% of the country's electricity generation over the past few years. However, its further expansion may be constrained by widespread public concern about the [environmental sensitivity](#) of a large part of the remaining hydro resource in the Amazon basin.

The expansion of wind and solar renewable generation has gained momentum in Brazil. Wind and solar generation has grown in Brazil at an average annual rate of 40% over the period 2015-2020, from 22 TWh in 2015, to 64 TWh in 2020. This compares to 2% for hydro and bioenergy, -3% for coal, and -6% for gas.

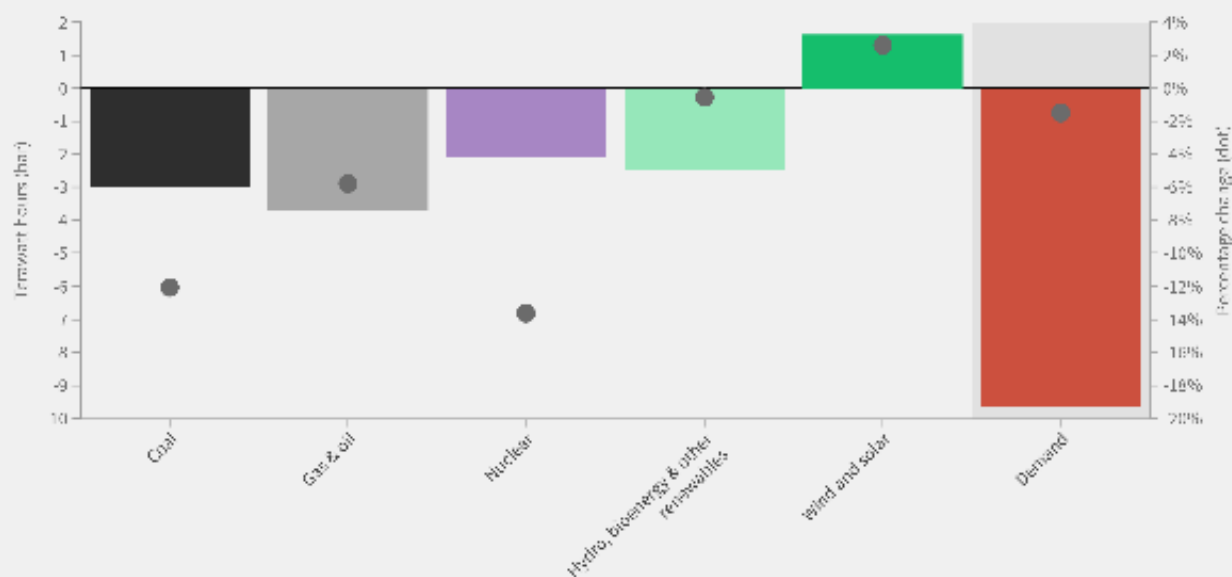
Wind and solar have replaced fossil fuels in Brazil's generation-mix since 2015. Fossil generation fell by 36% (-46 TWh) from 128 TWh in 2015 to 82 TWh in 2020, of which almost 90% (41 TWh) was from oil and gas. This resulted in a 9% reduction in the share of fossil generation in Brazil, from 23% in 2015 to 14% in 2020. The same time period also saw a 7% increase in the share of wind and solar generation, suggesting that wind and solar are replacing fossil fuels in the generation-mix. This trend indicates a shift in the focus of the electricity industry in Brazil towards supplementing hydroelectric power with wind and solar rather than fossil fuels (primarily, oil and gas) in meeting the rising demand for electricity.

Brazil's growth of electricity demand has been modest since 2015. Between 2015 and 2020, electricity demand has grown in Brazil at an average rate of 1% per year, down from 3% in the early-to-mid 2010s. This is probably due to a [slow recovery](#) of the Brazilian economy from the 2014-2016 recession.

What happened in 2020?

Brazil - Electricity changes in 2020 by source

Year-on-year change



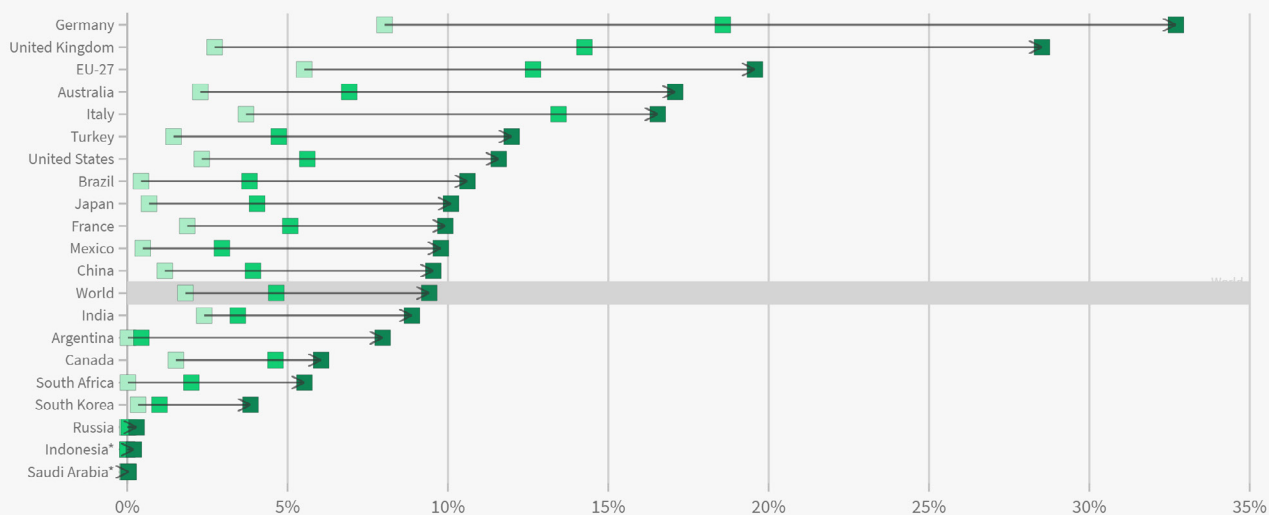
Brazil's total electricity demand fell by 1.5% (-10 TWh) in 2020, mainly due to the Covid-19 pandemic and the policy response to it. This fall in demand led to reduced generation from various sources: -12.1% (-3 TWh) for coal, -5.8% (-4 TWh) for oil and gas, -0.6% (-2 TWh) for hydro and bioenergy and -13.6% (-2 TWh) for nuclear. Wind and solar are exceptions; wind and solar generation rose by 2.6% (2 TWh) in 2020. It is also worth noting that a green recovery plan, aimed at promoting the expansion of renewable energy, represents a big opportunity to overcome the crisis caused by Covid-19 across the Latin American countries (including Brazil). Such a plan could lead to more jobs and significant economic returns, as suggested by the [International Renewable Energy Agency](#). Yet, the Brazilian government does not seem poised to grasp this opportunity, as the announced [recovery plan](#) attaches higher priority to fossil and extractive industries.

Brazil's transition in comparison with G20 countries

Brazil's wind and solar generation matches the world average in 2020

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

Year 2010 2015 2020

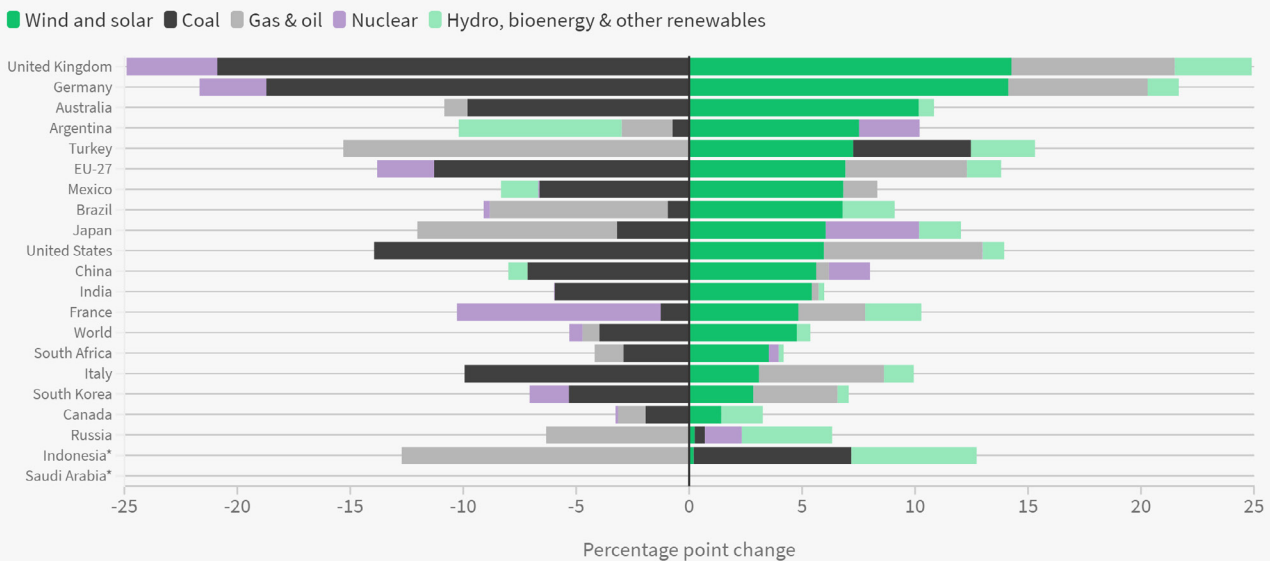


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists
Ember's Global Electricity Review, March 2021.

In Brazil, wind and solar generation accounted for 11% of total electricity generated in 2020, slightly higher than the world average of 9.4%. Growth in wind and solar generation has accelerated since 2015, when they generated 4% of electricity. However, this growth is slow when compared with Argentina, where the share of wind and solar generation increased from 0.44% in 2015 to 8% in 2020.

Wind and solar take market share from fossil fuels in Brazil

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

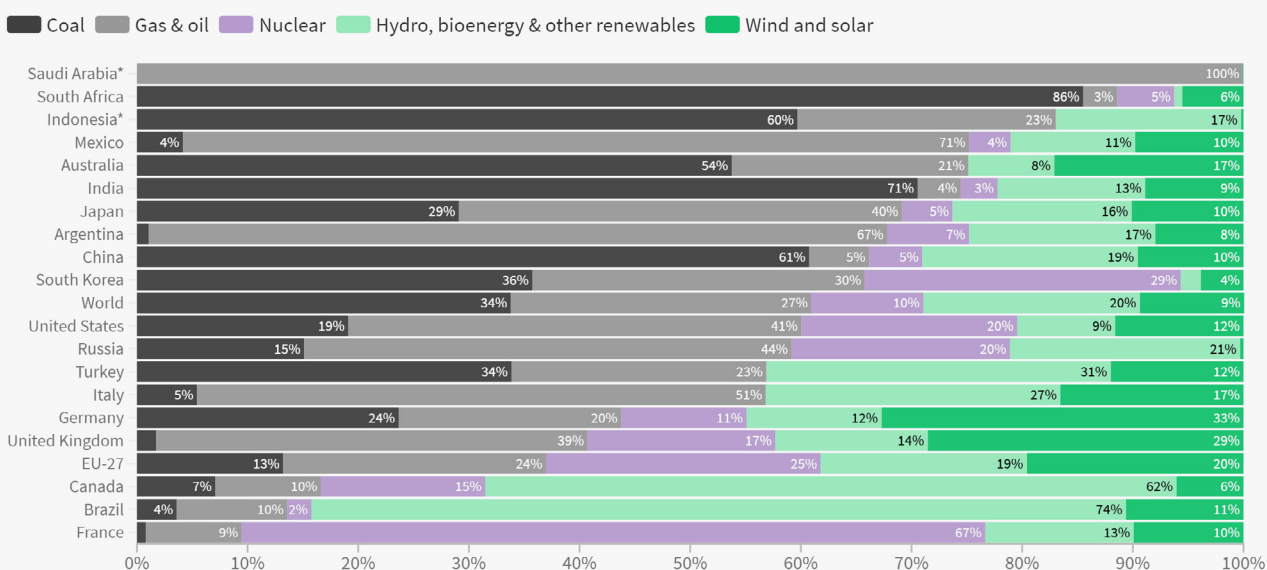


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

Since 2015, wind and solar have captured a 7% market share from fossil fuels in Brazil, implying that wind and solar are increasingly attractive as a supplement for hydroelectric power in meeting the country's rising demand for electricity.

Brazil ranks 2nd in the G20 for fossil-free electricity, only after France

Electricity production mix in 2020, for G20 countries



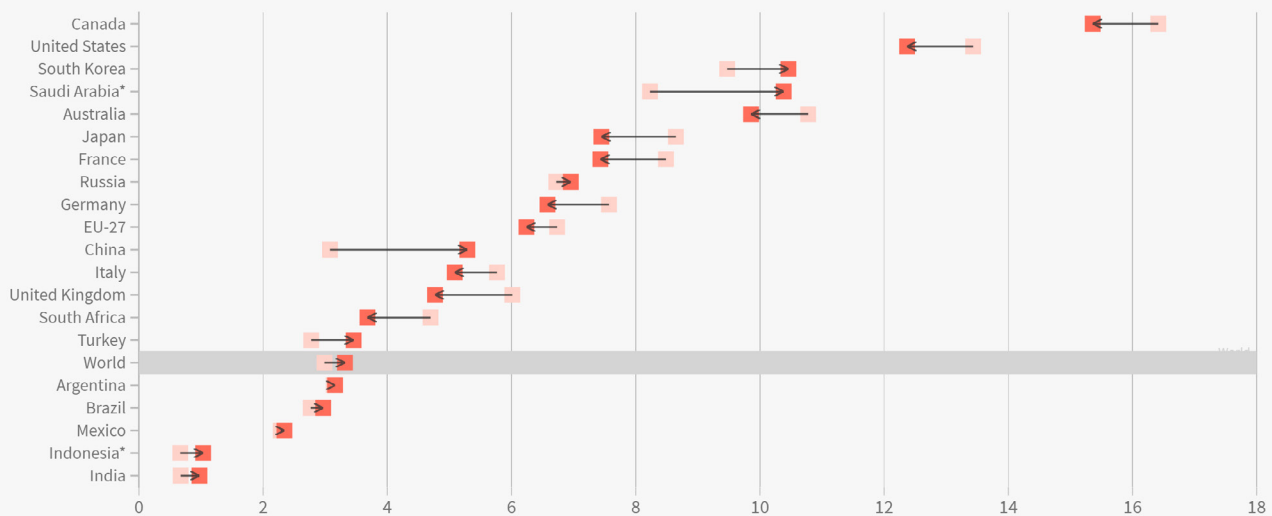
*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

Brazil ranks second in the G20 for fossil-free electricity in 2020, with over 80% of the electricity generation from renewable sources, primarily hydro.

Brazil's growth of per capita electricity demand stagnant since 2015

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

Year 2010 2020

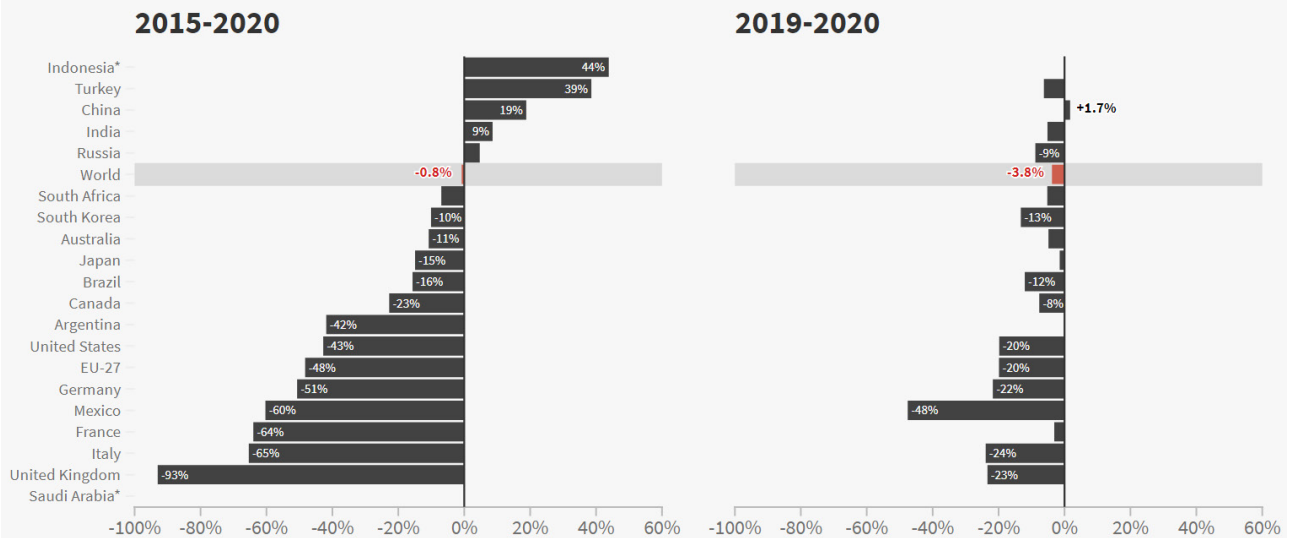


For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists. • Population sourced from United Nations. Ember's Global Electricity Review, March 2021.

The growth of per capita electricity demand has been stagnant in Brazil since 2015. In 2020, the country's per capita electricity demand is 3.0 MWh. This is 10% below the world average (3.3 MWh) and 6% lower than that for Argentina (3.2 MWh). Brazil's electricity demand growth is perhaps one of the most important factors that will shape the country's future electricity generation mix. Fast-growing electricity demand, driven by robust economic growth and a burgeoning middle class, could require the uptake of non-hydro renewables to accelerate in order to maintain the sufficient supply of low-carbon electricity.

Coal generation fell by 16% in Brazil since 2015

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.

Brazil's coal generation fell by 16% since 2015. But this is only equal to 4 TWh because of the minimal role that coal has played in the country's generation-mix. To put this in context, Japan's 15% drop in coal generation is 48 TWh in absolute terms. Nonetheless, it is still encouraging to see Brazil following the global trends towards phasing out the use of coal for electricity generation.

Concluding remarks

Hydropower remains the backbone of Brazil's generation-mix, responsible for over 60% of the electricity generation in 2020. However, its potential for further expansion may be limited, as much of the remaining hydro resource is located in environmentally sensitive areas, especially those in the Amazon basin. This has promoted the expansion of wind and solar generation in recent years to supplement hydroelectric power in meeting the rising demand for electricity. This reverses the trends observed earlier, when fossil fuels (primarily gas) seemed to be favoured, as indicated by a rapid expansion of fossil generation from 49 TWh in 2011 to 128 TWh in 2015. The attractiveness of wind and solar gets further substantiated if one notes that [over half](#) of the contracted capacities in the recent national energy auction held in October 2019 were from wind and solar, even though fossil projects were also allowed to participate in the auction.

It is also worth noting that Brazil's per capita electricity demand is still quite low. In 2020, it was 10% below the world average and 6% lower than that for Argentina. Future electricity demand growth may become one of the most important factors that will shape Brazil's electricity generation-mix. Given the uncertainty about future hydro capacity expansion in Brazil, a fast-growing electricity demand would require the uptake of non-hydro renewables (primarily wind and solar) to ramp up in order to maintain the sufficiency of electricity supply. Failing that, Brazil risks going backwards in its transition from fossil fuels to clean electricity.

More information about the Global Electricity Review 2021

Global Electricity Review 2021

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

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