



**Global Electricity
Review 2021**
G20 Profile

EMBER
COAL TO CLEAN ENERGY POLICY

JAPAN

Japan's coal generation
fell only by 1% 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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ENERGY POLICY

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JAPAN

Japan's coal generation fell only by 1% in 2020

Solar spree helped cut fossil generation, but Japan's electricity transition has a long way to go to phase-out coal

"Japan's announcement on net-zero by 2050 is a welcome development. But if Japan has to achieve this, it needs to significantly reduce its reliance on coal power. In 2020, Japan fell behind as it reduced its coal generation by only 1% and there is a real risk that it won't be able to decarbonize its power sector quick enough to meet the net-zero target. Recent growth in solar generation is promising, but Japan has a huge challenge ahead to transition to a clean electricity system."

Aditya Lolla

Senior Electricity Policy Analyst - Asia, Ember

Key findings

1

Coal generation fell by only 1% in 2020 in Japan

By contrast, the world saw its biggest ever fall in coal generation of 4%. The gap between Japan and G20 countries is growing bigger — even though Japan’s coal generation fell by 15% across the last five years, other countries are phasing out coal much faster, with a 43% fall for the US and 48% fall for the EU-27.

2

Japan’s solar spree reduced fossil generation

Wind and solar have risen to generate a tenth (10.1%) of Japan’s electricity in 2020, more than doubling from 4.1% in 2015. Most of this is from growth in solar generation, which rose by 50 TWh between 2015 and 2020. Fossil generation fell by 158 TWh from 2015 levels, so much of the fall can be attributed to higher solar generation. That’s also true of 2020 itself, where solar rose 10 TWh and fossil fuels fell by 10 TWh.

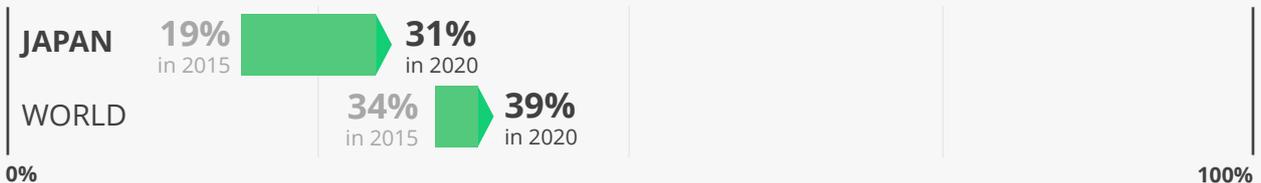
3

Japan’s slow electricity transition means 69% of electricity still came from fossil fuels in 2020

Japan had the seventh highest fossil generation share of all G20 countries. Also, Japan is unusual in that gas generation is falling faster than coal generation. Between 2015 and 2020, coal lost only 3% of its electricity market share in Japan whereas gas lost 8% of the market share to renewables and nuclear.

Progress to 100% clean electricity

Percentage of all renewables & nuclear in total generation



Progress on phasing out coal

Percentage of coal in total generation

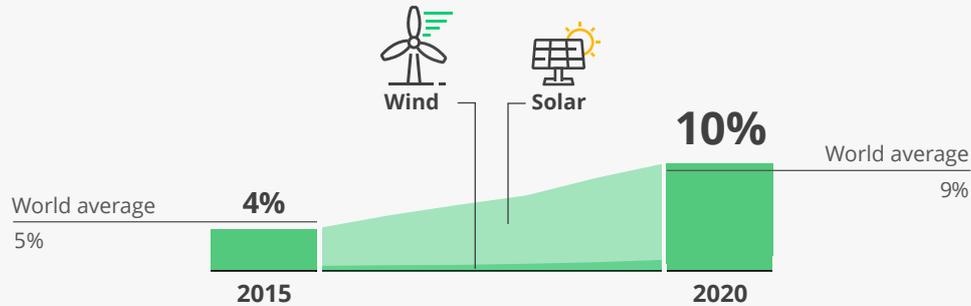


Japan's electricity transition in the spotlight: 2015-2020

Wind and solar share more-than doubled since 2015

Wind & solar in electricity mix

Percentage of total generation

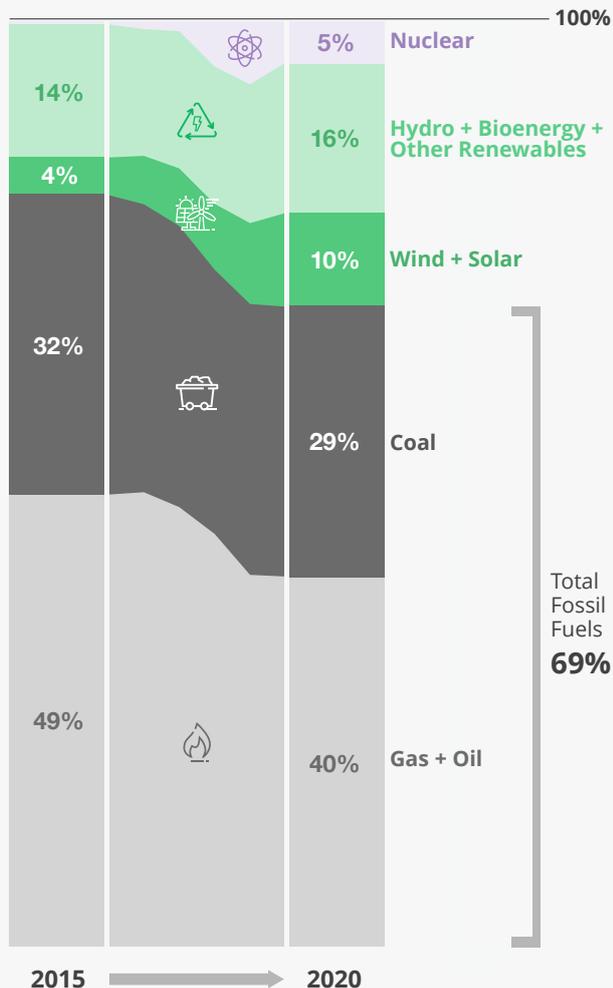


Fossil fuels are still 69% of Japan's electricity

Coal has fallen only 15% in absolute terms

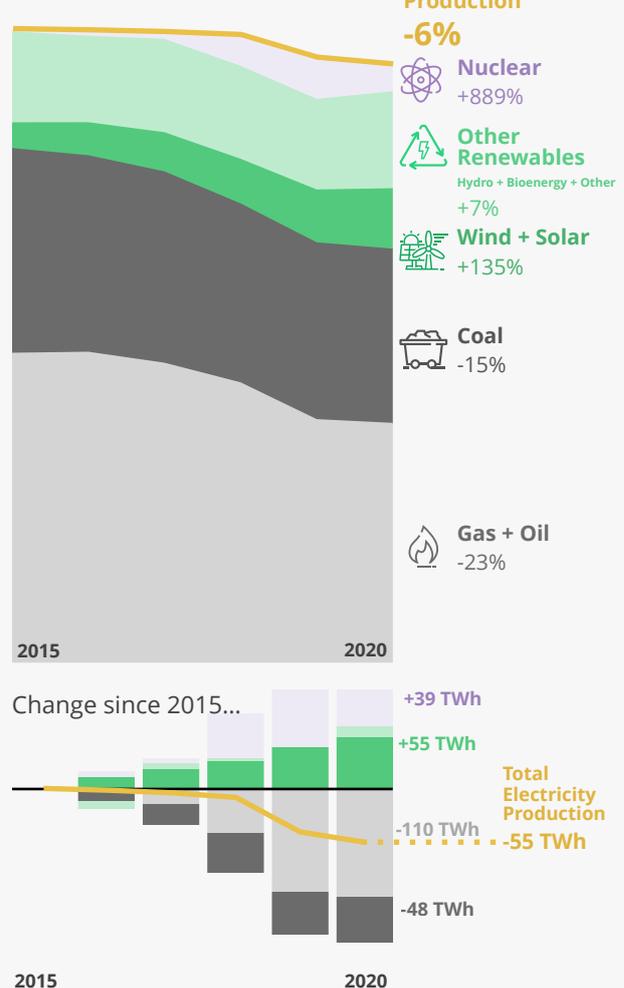
Electricity mix

Percentage of total generation



Electricity generation

Terawatt hours



Fossil fuels continued to dominate Japan's power sector between 2015 and 2020, but the country is increasingly producing its electricity from renewables. Fossil fuels accounted for 69% (651 TWh) of Japan's total electricity generation in 2020, down from 81% (809 TWh) in 2015. Two-fifths of this fall came as a result of renewable generation increasing from 18% of the power mix in 2015 (183 TWh) to 26% in 2020 (248 TWh). This also means that renewables have now closed the gap on coal which had a share of 29% in 2020 (274 TWh). However, reliance on coal still remains high; its share in the power mix declined only by 3 percentage points since 2015.

Solar drove Japan's renewable electricity growth between 2015 and 2020. Renewable generation grew by 64 TWh in 2020, compared to 2015. More than three-fourth of this growth came from solar—mainly due to strong investments for large-scale solar photovoltaic projects, feed-in tariff (FiT) scheme and the government's electricity buy-back program. As a result, solar power share almost tripled between 2015 and 2020 to 9% (a 50 TWh growth). The FiT scheme also pushed bioenergy's share of electricity from 3% to 5% (an increase of 13 TWh) in the same period. Share of hydro remained unchanged from the 2015 level at 9%, while wind grew from a near-zero share to 1% in 2020. Wind's share of electricity may increase in the future as a large collection of onshore wind projects is set to come online by 2025, likely increasing Japan's wind capacity from 3.8 GW in 2019 to 8.2 GW in 2025.

Japan's total electricity demand has been declining steadily since 2015.

Japan has had one of the lowest electricity demand growth rates in Asia. In 2020, its electricity demand stood at 942 TWh, down by 6% from 997TWh in 2015. Much of this fall came in the last 2 years. It fell by 4% in 2019 due to warmer winter weather and lower industrial output, followed by 1% decline in 2020 due to the economic shock from COVID-19 as well as continued warm winter weather.

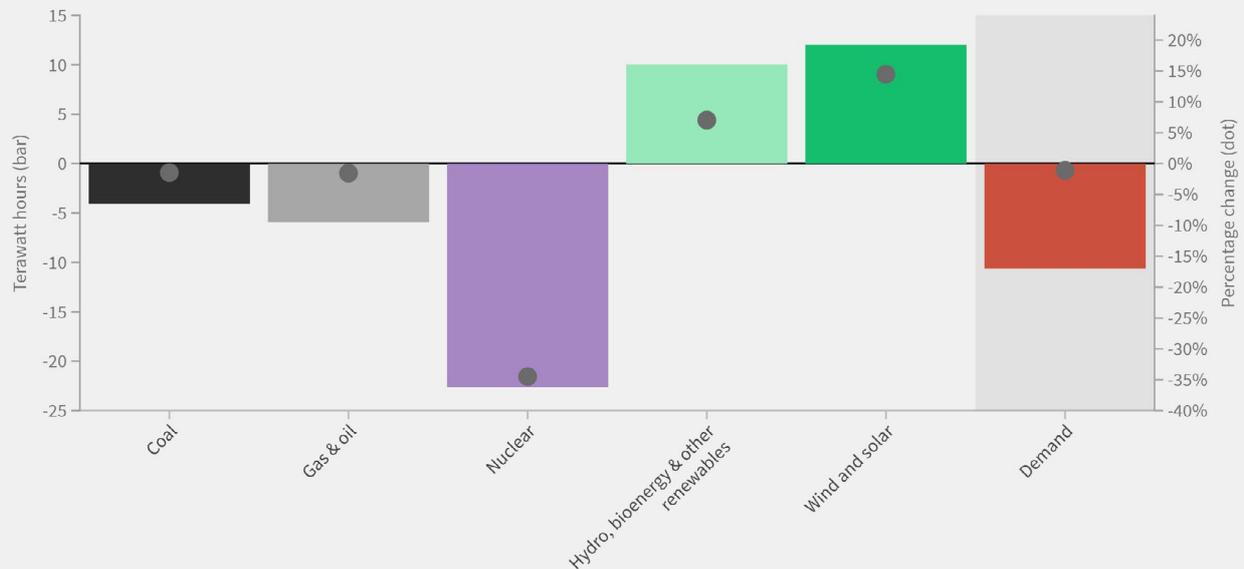
As nuclear grew, coal and gas generation declined in the last 5 years.

Japan's nuclear reactors started to come back online from 2015 post the Fukushima accident in 2011. With this, the country's share of nuclear generation increased to 7% (66 TWh) in 2019 before falling to 5% (43 TWh) in 2020 from a near-zero share (4 TWh) in 2015. The government plans to raise this to 20-22% by 2030 as it views nuclear power as a baseload power in the long-term. As electricity demand reduced and solar and nuclear generation grew, gas generation fell to 31% (295 TWh) in 2020, down from 39% (384 TWh) in 2015. Coal generation saw a small fall from 32% (322 TWh) to 29%(274 TWh) between 2015 and 2020. Global Energy Monitor's January update on global coal plants also shows that Japan also built 3.4 GW of coal power plants since 2016, taking the current non-captive installed coal capacity to 41GW. It has 9.1 GW of coal capacity planned or under construction.

What happened in 2020?

Japan - Electricity changes in 2020 by source

Year-on-year change



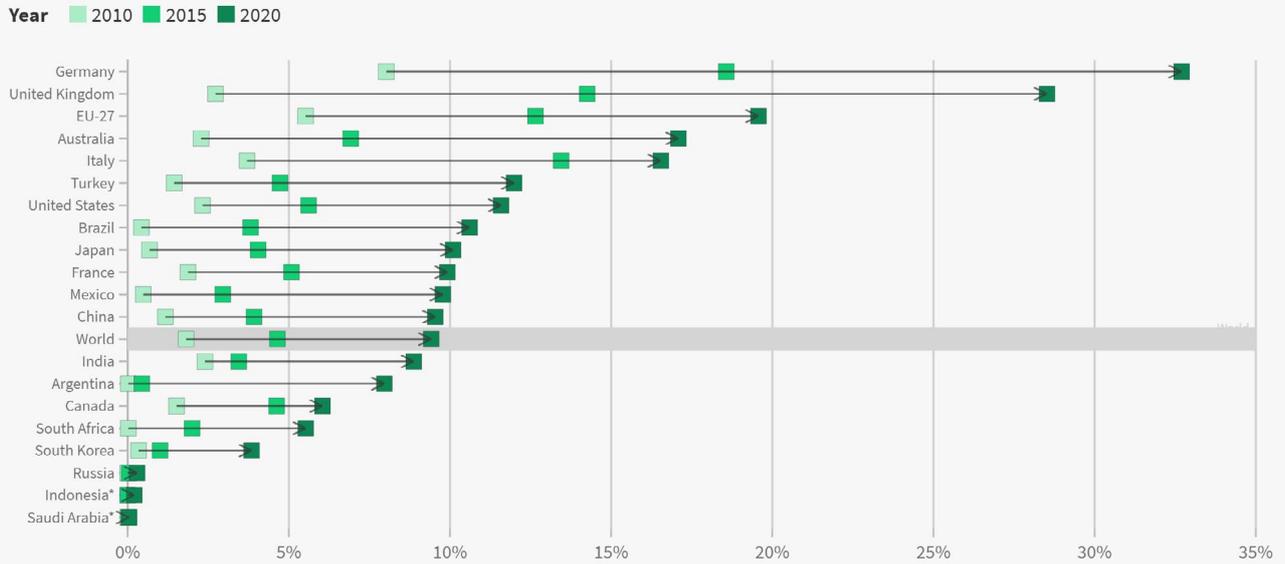
Coal generation fell by only 1% in 2020 despite a growth in renewable generation. Japan's total electricity demand fell by about 11 TWh (-1%) in 2020, mainly due to the effects of the state of emergency imposed to tackle Covid-19 and a warm 2019-20 winter. Its combined wind and solar generation increased by 12 TWh with solar seeing a 10 TWh (+12%) rise and wind a 2 TWh (+22%) rise. Combined generation from hydro, bioenergy and other renewables also increased by 10TWh (+7%). This growth in renewable power

helped cover for a fall in nuclear generation by 23 TWh (-35%) as [delays](#) in completing necessary safety measures and court cases against nuclear power projects led to its fall for the first time since 2014. This meant coal generation fell by just 4 TWh (-1%), while combined gas & oil generation fell by 6 TWh (-2%). Overall, Japan's power sector continued to rely heavily on coal and gas, which combined to generate about 60% of its electricity in 2020.

Japan's transition in comparison with G20 countries

Japan's wind and solar power share is slightly above the world's average in 2020

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



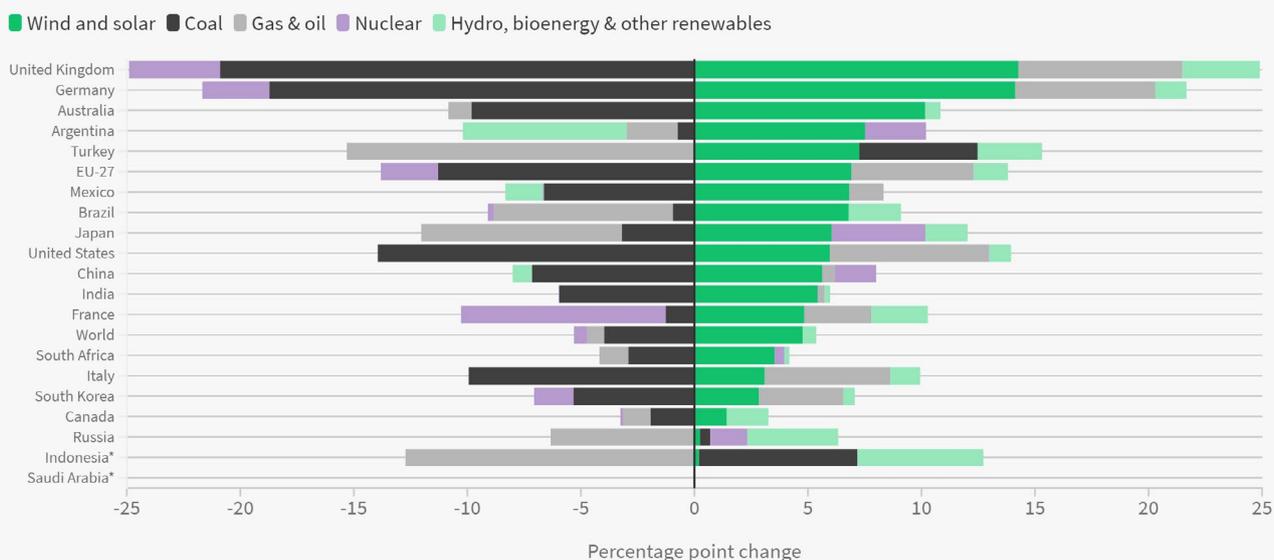
*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists
Ember's Global Electricity Review, March 2021.

Japan is currently one of the leaders in the G20 countries when it comes to solar generation. It produced 9% of its electricity from solar in 2020 which is second only to Italy (10%). However, low wind generation meant that wind and solar combined to produce a tenth (10.1%) of Japan's electricity in 2020, which is slightly more

than the global average of 9.4%. While Japan's combined wind and solar share more than doubled from 4.1% seen in 2015, the share is still much smaller than several G20 countries like Germany (33%), the UK (29%) and Australia (17%).

Coal lost only 3% of Japan's electricity market share between 2015 and 2020

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

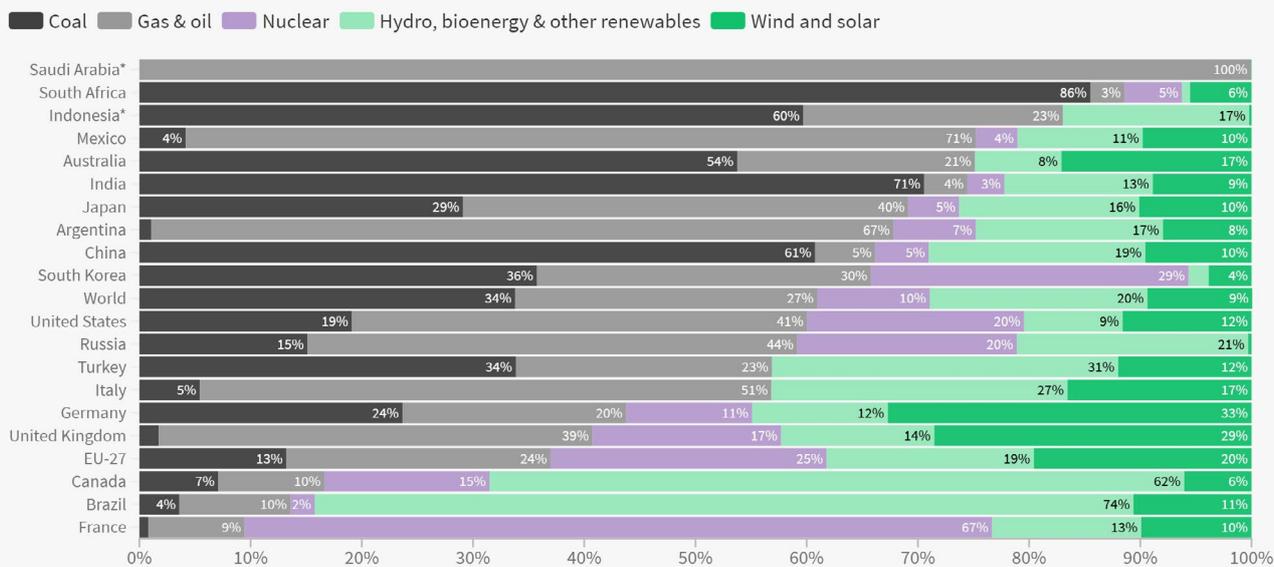


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

Since 2015, renewables and nuclear together captured a 12% market share from fossil fuels. However, much of the fall in share of fossil fuel is as a result of gas generation falling from 39% in 2015 to 31% in 2020. Coal's electricity market share in Japan fell only 3% points since 2015. This is modest compared to many G20 countries like Germany, UK and Australia where the transition from coal to wind and solar in the same time span was much quicker with more than 10% market share gain for wind and solar.

Japan had the seventh highest fossil generation share of all G20 countries in 2020

Electricity production mix in 2020, for G20 countries



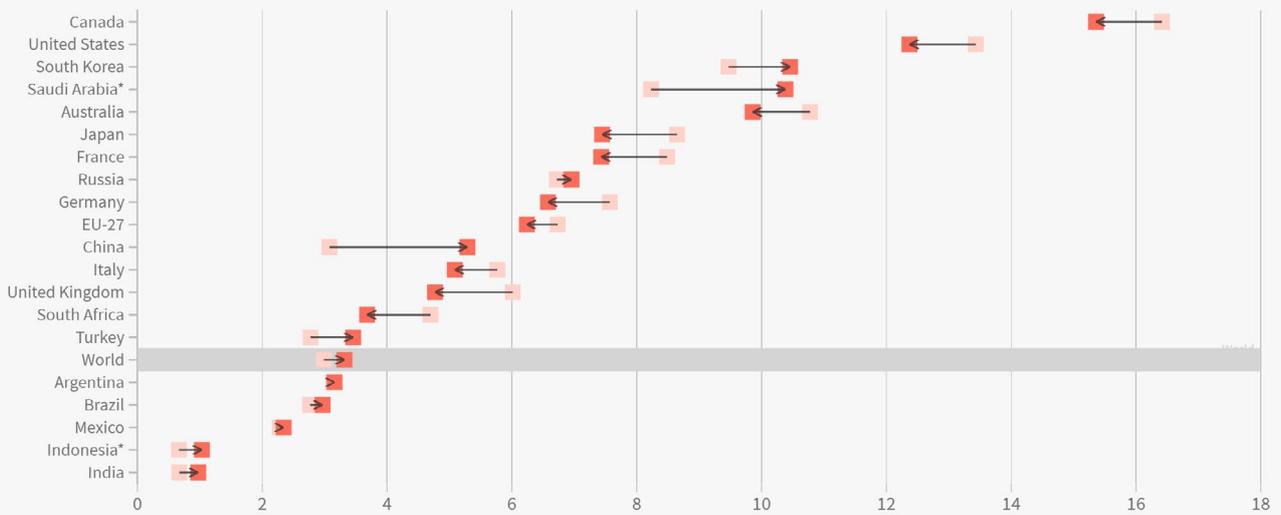
*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

With fossil fuels generating 69% of Japan's electricity in 2020, Japan's fossil-fuel generation share is higher than thirteen other G20 countries. Japan is some way off on this metric from other G20 countries like France (10%), Brazil (14%) and Canada (17%), who relied on fossil fuels to only generate less than 20% of their electricity.

Japan's per capita electricity demand is now more than double the global average

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

Year ■ 2010 ■ 2020

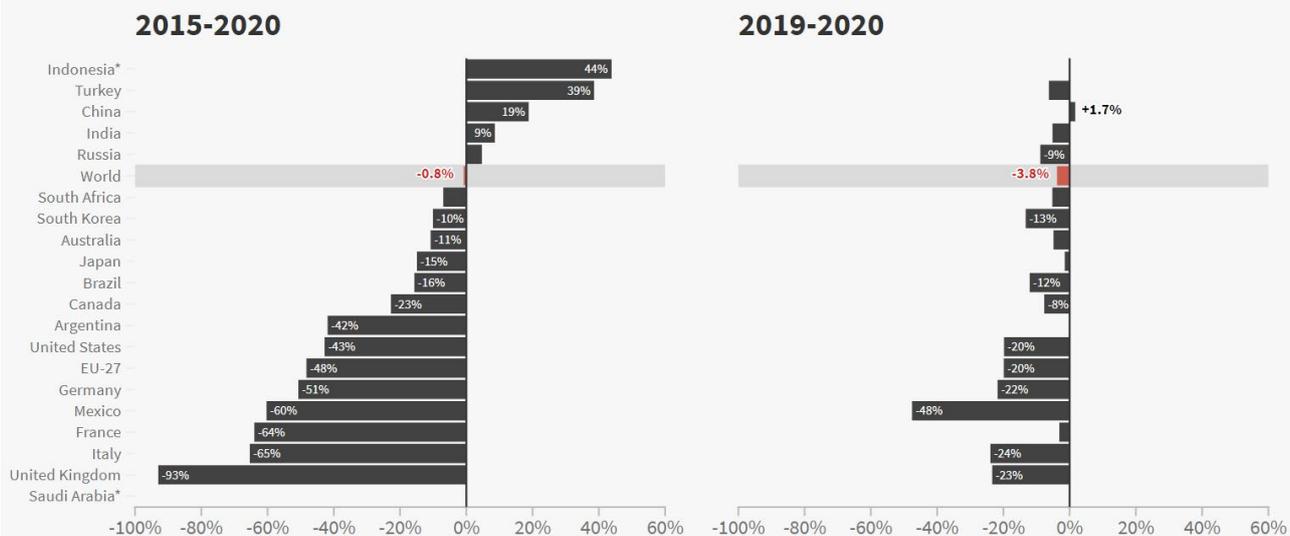


For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists. • Population sourced from United Nations. Ember's Global Electricity Review, March 2021.

With Japan's electricity demand declining since 2010, its per-capita electricity demand reduced from 8.6 MWh in 2010 to 7.4 MWh in 2020. However, this is more than double the world's average of 3.4 MWh in 2020 and is much higher than thirteen G20 countries, most notably Mexico (2.3 MWh) whose population size is similar to Japan's.

Japan's coal generation falling much slower than the US and the EU-27

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.

In 2020, Japan was able to reduce its coal generation by just 1% (4 TWh) year-on-year, which is lesser than the average coal generation decline that the world saw in 2020 (-4%). Between 2015 and 2020, Japan's coal generation fell by 15%, which is better than the 1% fall in the global average but much less than falls seen in many G20 countries like the UK (-93%), the US (43%) and the EU-27 (48%).

Concluding remarks

Although Japan is increasingly producing its electricity from renewables, it's still heavily reliant on fossil fuels. In October 2020, Japan committed to achieve net zero emissions by 2050. In order for Japan to position itself well to deliver on this target, it is important to now accelerate its transition to a clean electricity system. However, it is proving to be difficult for Japan to break its reliance on coal power and the country lagged behind the most G20 countries in moving its power system away from coal in 2020. In July 2020, Japan's Ministry of Economic, Industry and Trade, announced a policy to phase

out 100 inefficient coal power plants by 2030. But, 9.1 GW of coal power plants are currently under planning or construction and it has also been [projected](#) by [multiple organizations](#) that more than 30 GW will likely remain operational post 2030. This means that the speed of the electricity transition in Japan will slow down even further compared to other G20 countries. One option for Japan to avoid this and shed the tag of being the fifth largest carbon emitter is to consider a complete phase out of coal as it builds up its solar and wind capacities further.

More information about the Global Electricity Review 2021

Global Electricity Review 2021

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

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