



**Global Electricity
Review 2021**
G20 Profile

EMBER
COAL TO CLEAN ENERGY POLICY

GERMANY

Germany tops the G20
for wind and solar

March 2021



Author

[Sarah Brown](#)

Peer Reviewer

[Philipp Litz](#) - Project Manager, Agora Energiewende

Published date

March 2021

**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

Disclaimer

The information in this report is complete and correct to the best of our knowledge, but if you spot an error, please email info@ember-climate.org

**Creative
Commons**

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

Document design & layout by Designers For Climate

Contents

Key findings	1
Germany's electricity transition in the spotlight: 2015-2020	2
What happened in 2020?	4
Germany's transition in comparison with G20 countries	5
Germany tops the G20 for wind and solar electricity	5
Wind and solar are pushing out coal in Germany	6
Germany still produces a quarter of its electricity from coal	7
Germany's per capita demand is double the global average but less than Russia	8
Germany has seen the fifth largest decrease in coal in the G20 since 2015	9
Concluding remarks	10

GERMANY

Germany tops the G20 for wind and solar

But Germany still generates 44% of its power from fossil fuels, more than the UK and Canada.

“Germany is doing a great job of showing the world how a huge amount of wind and solar can be quickly built and integrated into the electricity system. This is paying dividends, as coal generation collapses. But there’s still a long journey ahead and Germany urgently needs a strategy to transition to completely fossil-free electricity.”

Sarah Brown

Senior Electricity Analyst - Europe, Ember

Key findings

1 Germany tops the G20 for wind and solar

Wind and solar delivered a third of German electricity in 2020. This is over three times the global average and puts Germany ahead of any other G20 country. The nearest challenger is the UK with 29%.

2 Wind and solar's market share has almost doubled in Germany since 2015

Wind and solar produced 33% of Germany's electricity in 2020 compared to 18% in 2015. Although the global average has risen to almost a tenth of electricity production from wind and solar, Germany is continuing to pull away.

3 Germany's coal generation has halved since 2015, the fifth largest fall in the G20

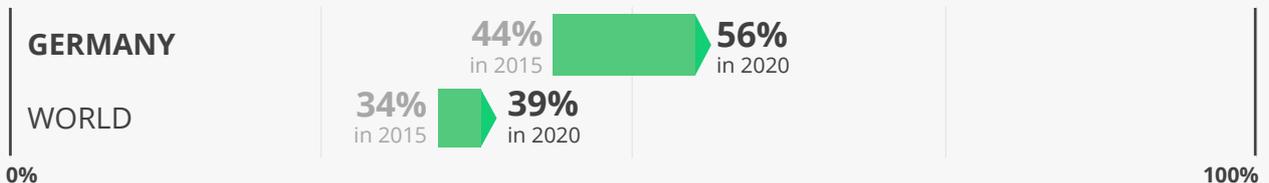
Electricity produced from coal dropped by 51% (-138 TWh) between 2015 and 2020. Wind and solar generation increased by 66 TWh to replace almost half of this. Coal now accounts for 24% of Germany's electricity. However, this still places Germany ninth in the G20 for dependency on coal and is higher than both the US and Russia. Germany's coal generation has also declined at a much slower rate than in other countries such as the UK (-93%) and Italy (-65%).

4 Germany still generates 44% of its power from fossil fuels, more than the UK and Canada

Despite the decline in coal, Germany remains reliant on fossil fuels. Fossil gas has increased its share by 67% since 2015 and currently makes up 16% of Germany's electricity mix. While coal generation has declined by 51% since 2015, total fossil generation has fallen by only 31%.

Progress to 100% clean electricity

Percentage of all renewables & nuclear in total generation



Progress on phasing out coal

Percentage of coal in total generation

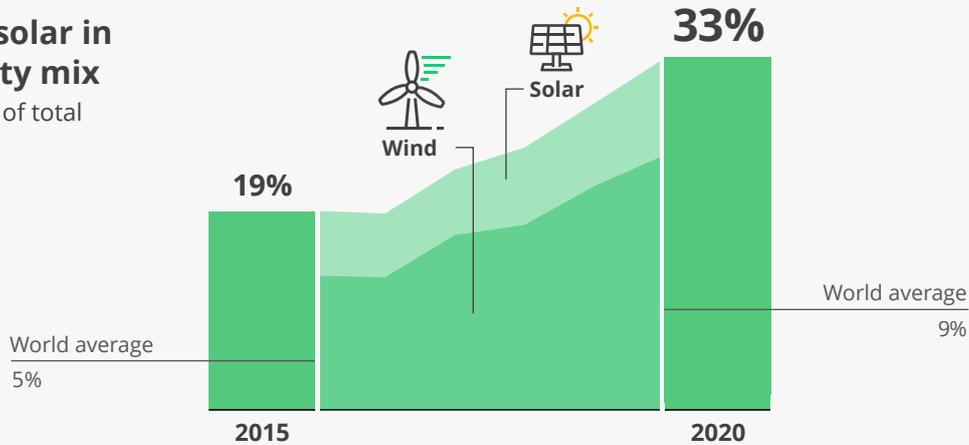


Germany's electricity transition in the spotlight: 2015-2020

Germany has a world-leading share of wind and solar

Wind & solar in electricity mix

Percentage of total generation

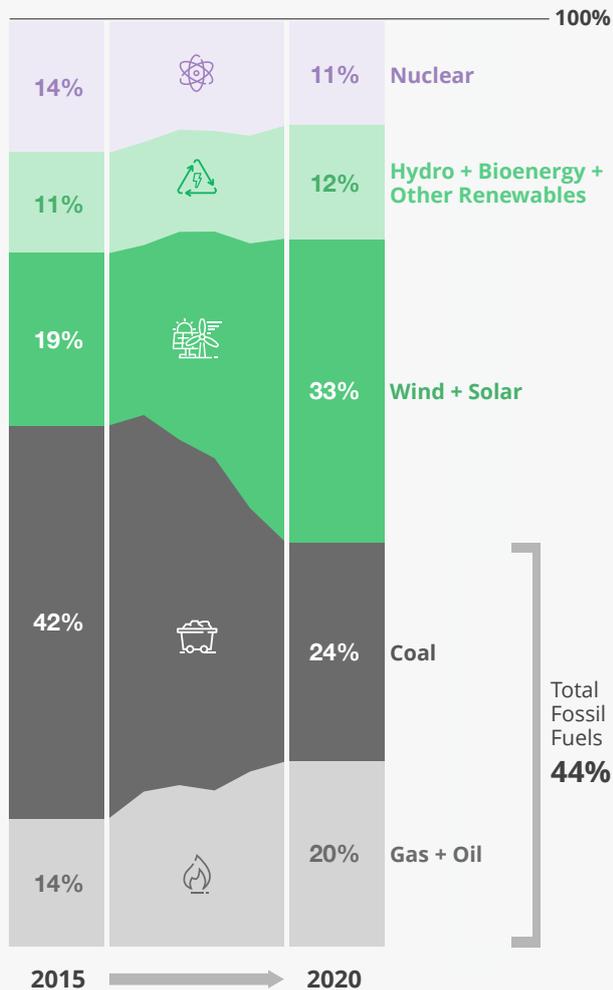


Wind and solar, but also gas, took market share from coal

Coal generation has halved in five years

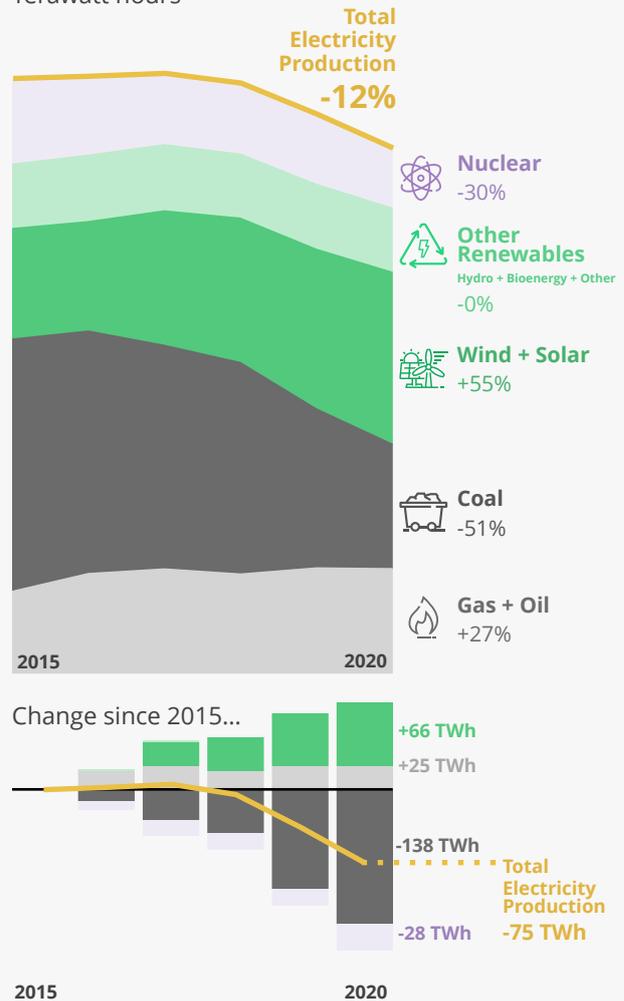
Electricity mix

Percentage of total generation



Electricity generation

Terawatt hours



Renewable generation has doubled since 2015 and now accounts for 45% of Germany's electricity. This resulted in a landmark moment in 2020 as renewables overtook fossil fuels for the first time. Fossil generation was 44% in 2020. This shift is predominantly due to coal being replaced by wind and solar. Whilst coal's share of production fell by 19 percentage points, wind and solar's share increased by 14 percentage points.

Wind and solar generation jumped by 66 TWh (+55%) between 2015 and 2020 to account for 33% of electricity production. 33 GW of new wind and solar capacity has been installed in this period to bring the total to 116 GW, a 40% gain since 2015. This total capacity is split into 62 GW wind and 54 GW solar. Hydro has remained stable, generating around 19 TWh from 6 GW of installed capacity. Bioenergy has also remained flat at 50 TWh from 9 GW of capacity.

The proportion of Germany's electricity produced by coal has tumbled by 43% since 2015 to 24%. 6 GW of coal-fired plants have come offline in this period. However, a brand new hard coal unit was commissioned in 2020—Datteln 4 (1.1 GW)—despite the fact that Germany has a coal phase-out date of 2038. Generation from fossil gas has increased from 62 TWh to 92 TWh (+50%) since 2015 and now accounts for 16% of Germany's electricity production, up from 10%.

Nuclear production decreased from 92 TWh to 64 TWh (-30%) between 2015 and 2020. Installed capacity is currently 10 GW, generating 11% of Germany's electricity, but all remaining nuclear plants must close in 2022 under legislation introduced in 2011.

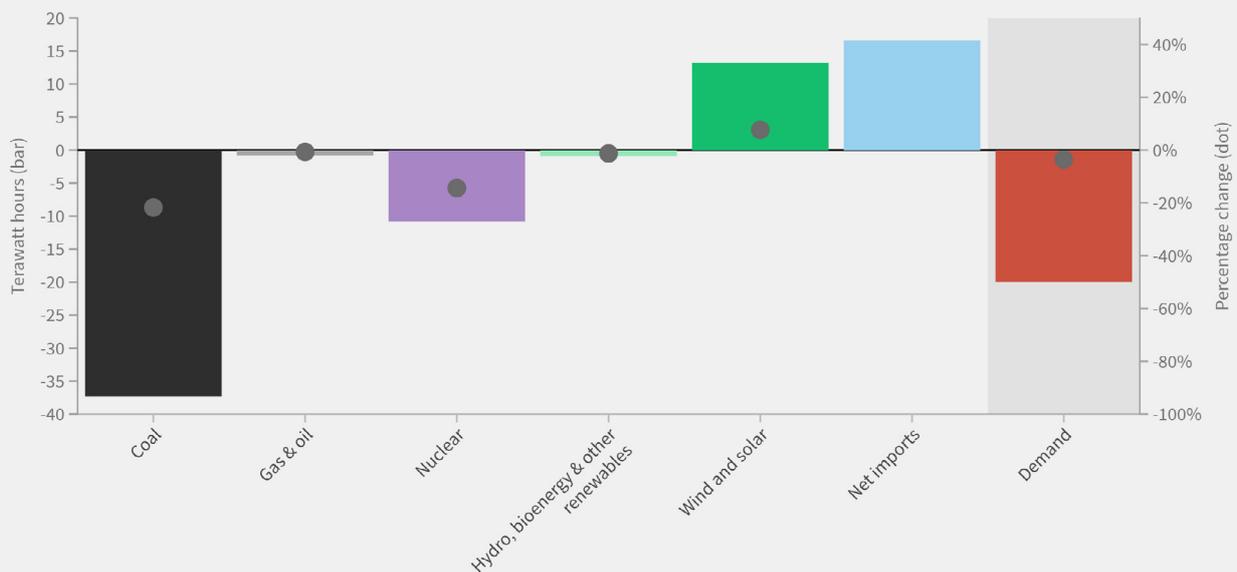
Germany's demand is 6.6 MWh/capita, double the global average, but it has been falling over the last decade.

Electricity demand declined by 7% between 2015 and 2020 to 551 TWh, placing it eighth amongst the G20 countries.

What happened in 2020?

Germany - Electricity changes in 2020 by source

Year-on-year change



German coal generation fell by 22% (-37 TWh), which enabled the milestone of wind and solar generating more than coal for the first time.

Wind and solar generation increased by 8% (+13 TWh) in 2020 to account for a record 33% of electricity produced. Installed wind and solar capacity rose by 6 GW to 116 GW. There was actually 17% less wind capacity installed in 2020 compared to 2019, partly due to lawsuits over on-shore wind construction permits. However, solar installations increased by 25% year-on-year.

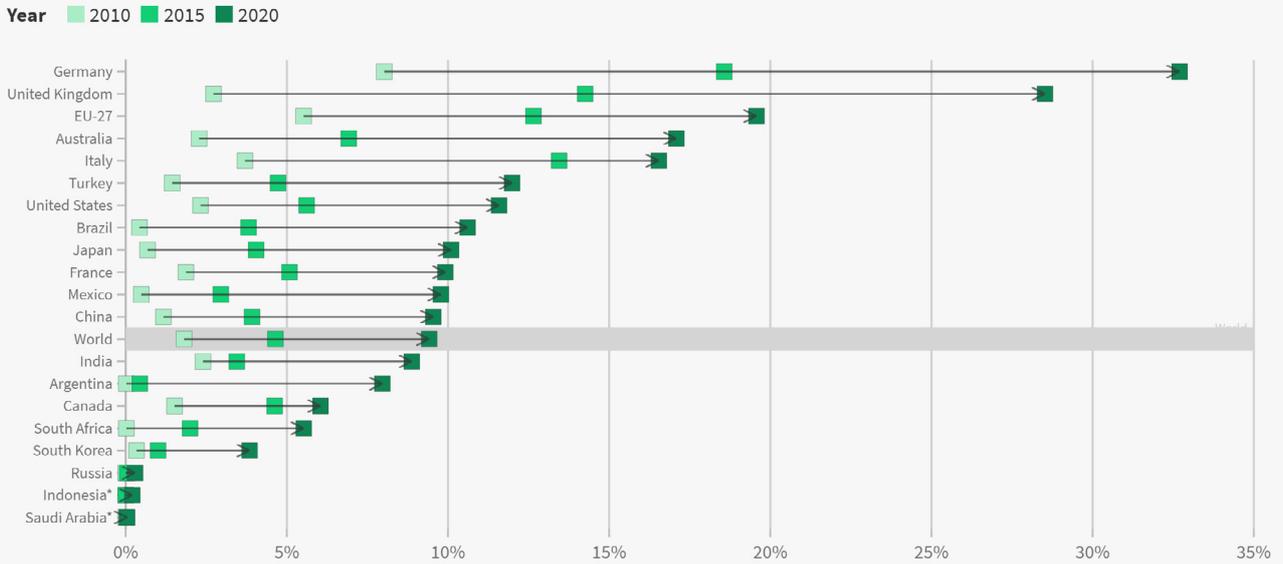
Covid-19 impacted electricity demand, which fell 20 TWh (-3.5%). This was responsible for a proportion of the decrease in coal generation, but coal was also pushed out by wind and solar and a 17 TWh (+51%) increase in imports. Fossil gas was not affected by the drop in demand. Demand had recovered to pre-Covid-19 levels by September.

The amount of electricity produced by nuclear also fell by 11 TWh (-14%) due to the 2022 nuclear phase-out law causing generation to come offline. Bioenergy and hydro generation were flat year-on-year.

Germany's transition in comparison with G20 countries

Germany tops the G20 for wind and solar electricity

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

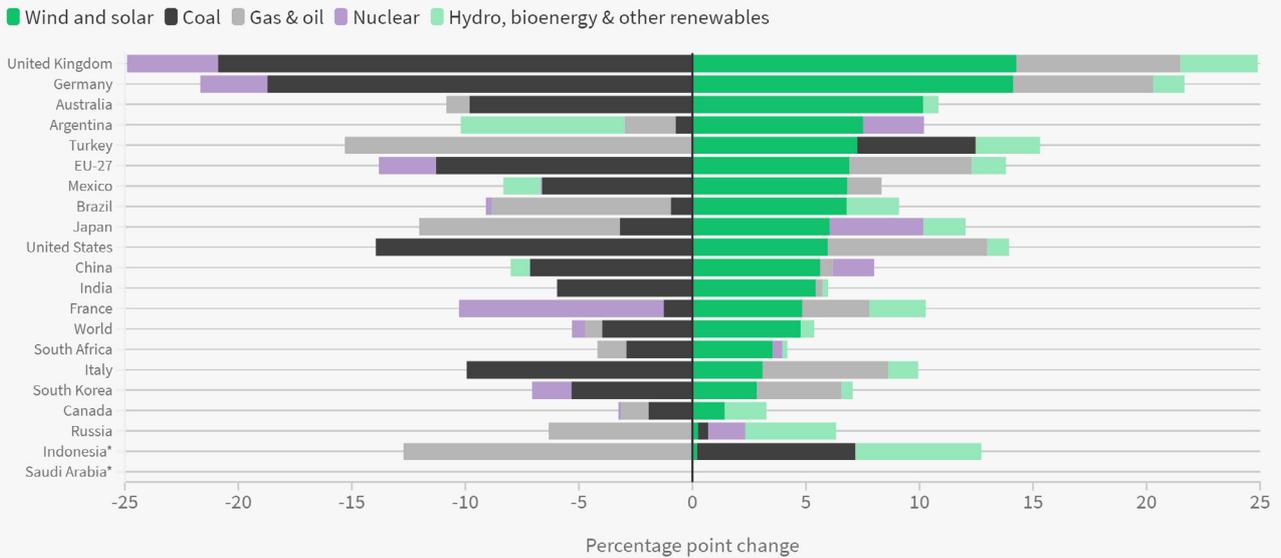


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists
Ember's Global Electricity Review, March 2021.

Germany produces 33% of its electricity from wind and solar. This is more than three times the global average, placing it ahead of any other G20 country. The UK is second with 29%, which in turn is significantly ahead of Australia at only 17%.

Wind and solar are pushing out coal in Germany

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

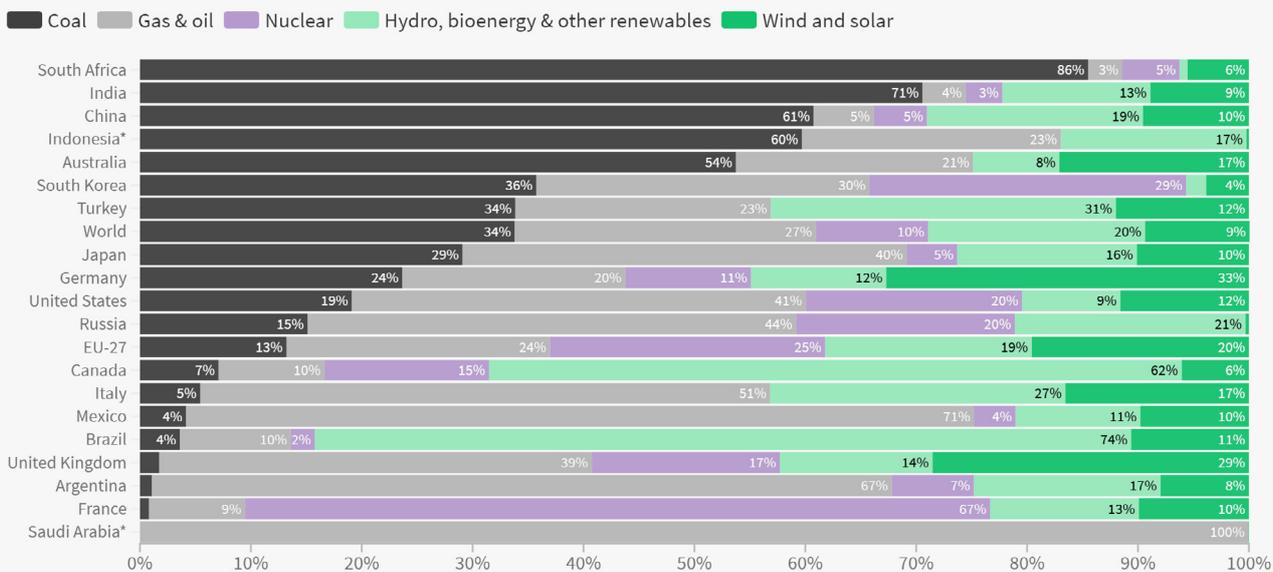


*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

Germany is ranked second in the G20 behind the UK in terms of coal being replaced by wind and solar. A majority of coal's 19% fall in market share (-138 TWh) since 2015 was replaced by wind and solar, which saw an increased share of 14 percentage points (+66 TWh). However, fossil gas is also playing a notable role, replacing a third of the decline in coal.

Germany still produces a quarter of its electricity from coal

Electricity production mix in 2020, for G20 countries



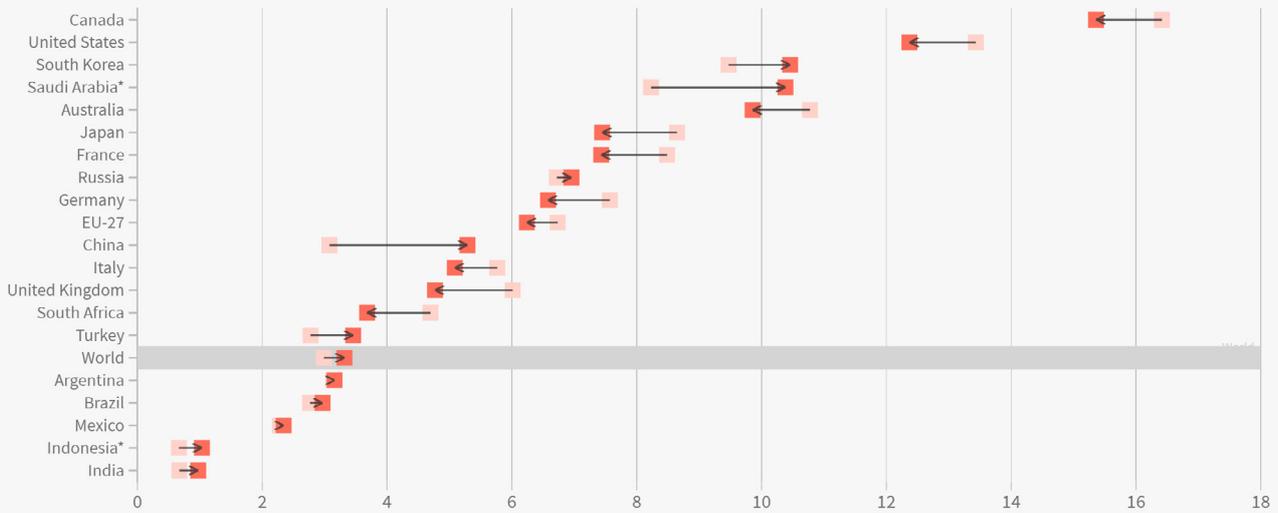
*For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists.
Ember's Global Electricity Review, March 2021.

Coal generation may have significantly declined in Germany since 2015, but it continues to make up 24% of the electricity mix. This is below the global average of 34%, but Germany is still ranked ninth in the G20 ahead of the US and Russia. Due to the upswing in fossil gas usage, 44% of Germany's electricity generation comes from fossil fuels.

Germany's per capita demand is double the global average but less than Russia

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

Year ■ 2010 ■ 2020

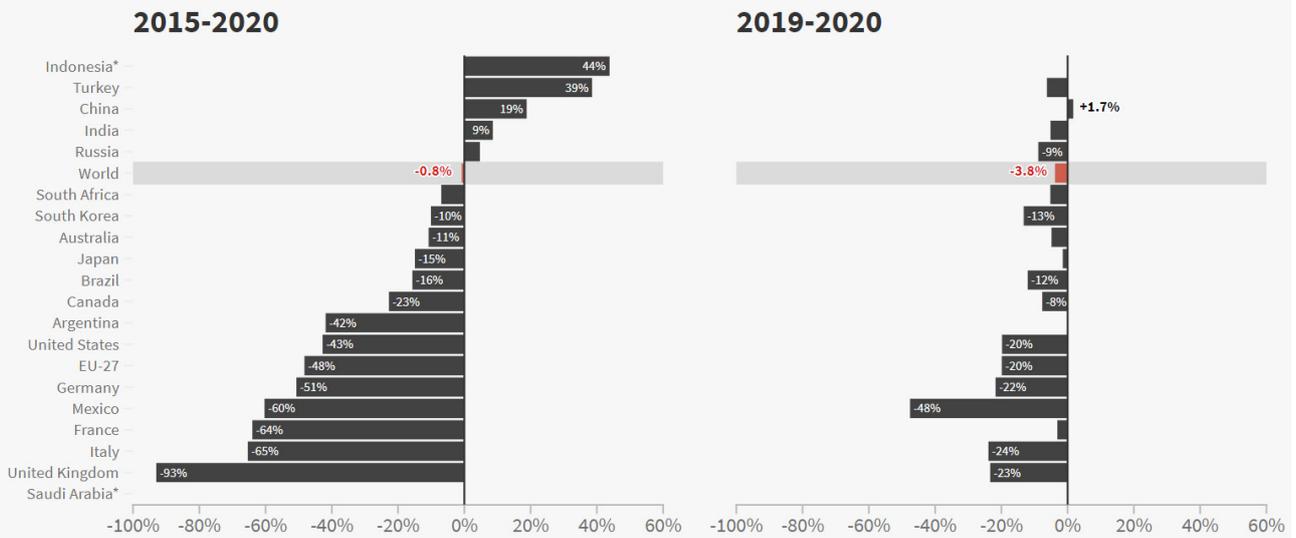


For Indonesia and Saudi Arabia, 2019 is used as no 2020 data exists. • Population sourced from United Nations. Ember's Global Electricity Review, March 2021.

Germany's demand currently sits at 6.6 MWh/capita compared to the global average of 3.3 MWh/capita. However, this is less than both Russia (6.9 MWh/capita) and France (7.4 MWh/capita). The global average per capita demand has increased by 10% since 2010 while Germany's has decreased by 13%.

Germany has seen the fifth largest decrease in coal in the G20 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.

Germany's coal generation declined by 51% (-138 TWh) from 2015 to 2020 compared to a global average fall of less than 1%. Similarly, Germany had the fourth highest drop in coal generation year-on-year at 22% (-37 TWh) compared to a global average of only 4%. However, Germany is lagging behind the UK and Italy in terms of phasing out coal.

Concluding remarks

Germany has an inadequate coal phase-out date of 2038, which is not aligned with the EU's targets of a 55% reduction in emissions from 1990 levels by 2030 and Net Zero emissions by 2050. To achieve these objectives, all of Germany's coal-fired power plants must be [shut down by 2030](#).

[Ember's analysis](#) of Germany's National Energy and Climate Plan (NECP) reveals that Germany will have one of the dirtiest electricity grids and account for almost a third of all EU-27 power sector emissions by 2030. This is due to continued reliance on fossil fuels and only average levels of renewables deployment as the remaining nuclear plants are decommissioned in 2022.

The NECP stipulates that Germany intends to cover 65% (380 TWh) of its electricity demand from renewable sources by 2030, with wind and solar accounting for just over half of this. The other 35% will be from fossil fuels. By 2030, Germany will still be generating 104 TWh of electricity from coal and 101 TWh from fossil gas. This represents only a 34 TWh (-25%) reduction in coal production and an actual increase in fossil gas of 9 TWh (+10%).

Germany plans to reach a total of 100 GW of solar and 91 GW of wind by 2030. The current levels are 54 GW and 62 GW respectively. However, the majority of recent government tenders for new onshore wind farms have been undersubscribed over concerns about lawsuits and the approval processes.

It is encouraging to see Germany leading the G20 in wind and solar generation but it still faces real challenges to achieving the required decarbonisation of its electricity system. Germany must accelerate both its coal phase-out and its rate of wind and solar deployment now if it is to meet its emissions reduction targets and remain one of the leaders in the G20 for renewable generation.

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](#)

[Australia](#)

[English](#)

[Brazil](#)

[English](#)

[Português](#)

[Canada](#)

[English](#)

[China](#)

[English](#)

[中文](#)

[European Union](#)

[English](#)

[France](#)

[English](#)

[Français](#)

[Germany](#)

[English](#)

[Deutsch](#)

[India](#)

[English](#)

[Indonesia](#)

[English](#)

[Bahasa Indonesia](#)

[Italy](#)

[English](#)

[Italiano](#)

[Japan](#)

[English](#)

[にほんご](#)

[Mexico](#)

[English](#)

[Español](#)

[Russia](#)

[English](#)

[русский](#)

[Saudi Arabia](#)

[English](#)

[عربى](#)

[South Africa](#)

[English](#)

[South Korea](#)

[English](#)

[한국어](#)

[Turkey](#)

[English](#)

[Türk](#)

[United Kingdom](#)

[English](#)

[United States](#)

[English](#)

The information in this report is complete and correct to the best of our knowledge, but if you spot an error, please email info@ember-climate.org