

Key Facts about the Energy Transition in Germany

Shaping the second phase

Renewable energy in Germany is a success story. In 2020, wind, solar, biomass, hydro and geothermal energy reached a market share of 45.4 % in power consumption. This is a huge opportunity to modernize Germany's economy. Transforming the energy system is a driver of progress, innovation and jobs.

The first phase of the energy transition was mainly about adding renewable energy capacities and substituting fossil fuels and nuclear energy. Now we are at the start of the second phase, which expands investments in sector coupling technologies – like battery storage systems, electric cars, heat pumps, green hydrogen and power-to-heat.

Quantitative targets in Germany's climate plan (decrease of CO₂ emissions compared to 1990):

	2030	2050
Energy sector	61-62 %	
Buildings	66-67 %	
Transport	40-42 %	
Industry	49-51 %	
Agriculture	31-34 %	
Total	55 %	80-95 %

Energy efficiency – Twin pillar of the energy transition

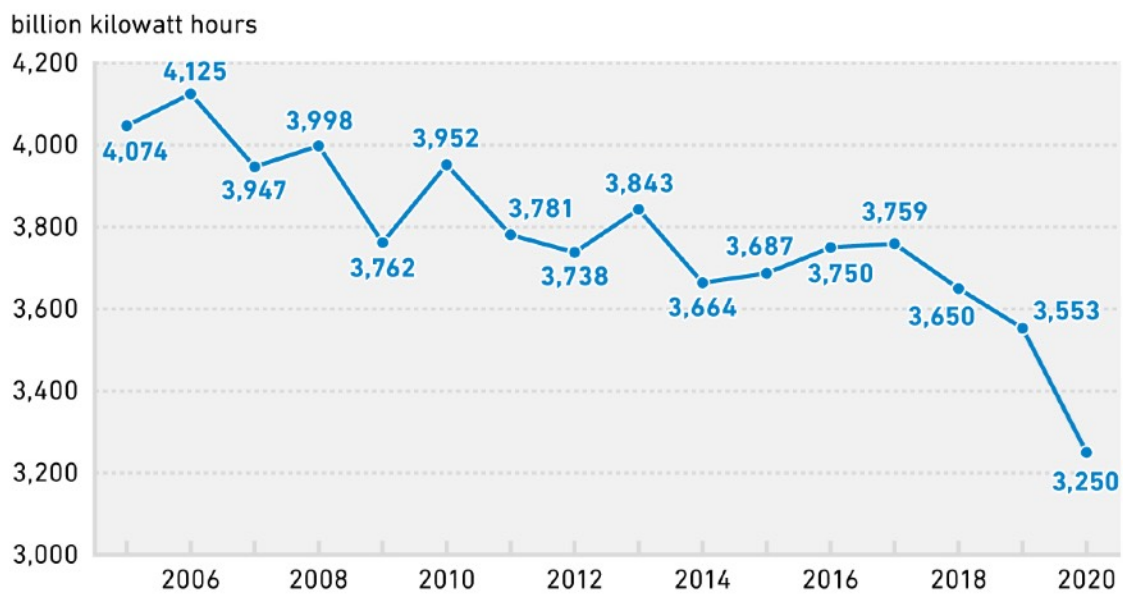
Switching to renewable energy and reducing energy consumption need to go hand in hand. Efficiency reduces costs and the environmental impacts caused by the energy system. Germany's target to reduce primary energy consumption by 20 % until 2020 from 2008 levels has been reached. However, the COVID-19 pandemic played a significant role in meeting this goal. Primary energy consumption in Germany dropped by 8.7 % to 11,691 PJ in 2020. From 2019 to 2020, significant achievements were reached in curbing energy consumption from hard coal (-18.3 %), lignite (-18.2 %), nuclear energy (-14.4 %) and mineral oil (-12.1 %). On the other hand, energy production from renewable energy increased by 3 %.

Germany's energy efficiency policy relies on a broad range of instruments: financial incentives, efficiency standards as well as information and consulting. Financial incentives

are given by low-interest loans or investment grants. External effects, such as environmental impacts of energy consumption, are partly internalized into energy prices through an energy use tax, through the European Emissions Trading System and, since 2021, through a new carbon price for buildings and transport. The Energy Saving Ordinance (EnEV) sets minimum requirements for efficient energy use in new buildings and for large-scale renovations of existing buildings. EU-wide provisions on energy labeling of products enhance transparency and provide incentives for consumers to choose devices with high efficiency standards. Requirements to ecodesign set binding minimum standards for the environmentally friendly design of energy-related products.

Energy efficiency is a lucrative business model. Investments in energy efficient buildings reached €43.2 bn in 2018. 529.000 people were employed in modernizing buildings.

Primary Energy Consumption in Germany Development 2005–2020



Source: AGEB; as of: 12/2020

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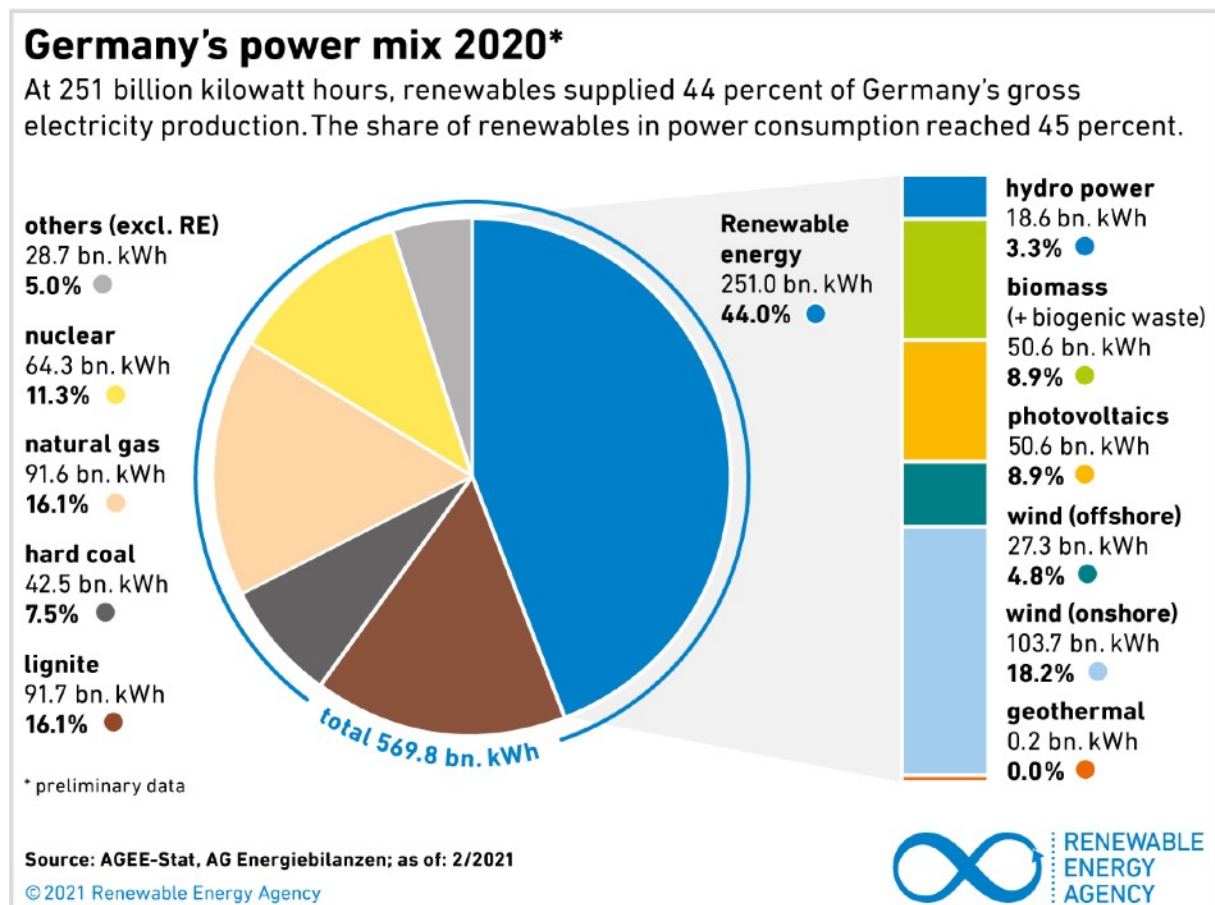


Renewable energy – the transition continues

The power sector: Rise in renewable power generation

In 2020, the renewable share in German power consumption rose by nearly four percentage points to 45.4 %. Wind, solar, biomass and hydro power generated 251.0 bn kWh – 9 bn

kWh more than in 2019 (+4 %). The growth of renewable power production for the year 2020 was mainly due to a windy February, a sunny year and the addition of more photovoltaic and offshore wind capacities. The number of sunshine hours (1.901 h) was about 20 % higher than average. Photovoltaics (PV) contributed 50.6 bn kWh (+9 %) to clean electricity generation. Wind power production rose to 131.0 bn kWh (2019: 125.9 bn kWh). Onshore wind power production reached 103.7 bn kWh, offshore wind power 27.3 bn kWh. Hydro power generation fell to 18.6 bn kWh (2019: 19.7 bn kWh). Power production from biomass remained stable at 50.6 bn kWh.

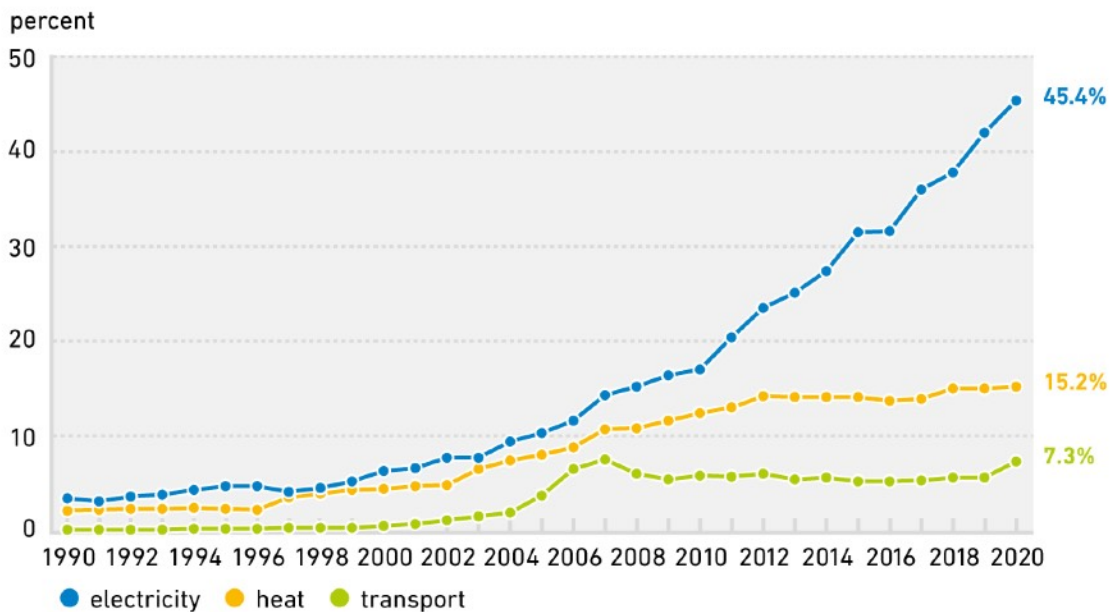


By the end of 2020, 131.1 GW of renewable energy capacity were installed. Wind power onshore and offshore rose by 1,446 MW to 62 GW (onshore: 54 GW, offshore: 8 GW), which was a significant drop in newly added capacity compared to 2019 (2,000 MW). On the other hand, solar power is on the rise again. Solar capacity rose by 4,801 MW (2019: +3,889 MW). By the end of 2020, total solar power capacity reached 54 GW. In the biomass sector, 328 MW in new capacity was added. In total 10 GW of biomass plants were installed. Hydro power adds 6 GW to the mix.

In the heat and transport sectors more progress is needed to reach Germany's climate goals. In 2020, renewable energy contributed 179.9 bn kWh (15.2 %) in heating and cooling. In

transport, the renewable share is still relatively small with 7.3 %. However, it rose by 1.7 percentage points compared to 2019 due to a higher greenhouse gas reduction quota.

Share of renewable energy in Germany's final energy consumption 1990–2020



Source: AGEE-Stat; as of: 2/2021
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Multiple benefits

Effective climate protection

The use of Renewable Energies avoided 227 million tons (mt) of greenhouse gas (GHG) emissions (CO₂-eq.) in 2020, compared to 219 mt of saved emissions in 2019. Renewable power generation contributed 181 mt of GHG savings, 36 mt were attributable to heating and cooling. Due to the use of biofuels and power in the transport sector GHG emissions of 9 mt were avoided.

Investments strengthen the economy

The successful expansion of renewable power production goes hand in hand with investment in renewable capacities, storage systems, electric transport and heat as well as hydrogen. Investment in the energy transition in Germany amounted to 26 \$bn in 2020. With the upcoming nuclear and coal phase outs, investments are expected to increase in the coming years.

Driver of innovation

The massive cost reduction in solar and wind power generation is one indicator of the innovative potential in the renewable energy sector. In good locations in Germany, wind power and PV already have lower costs than new coal or natural gas power plants. In 2020, the average price resulting from onshore wind energy auctions was about 6 €_{Cents}/kWh, in solar energy tenders only about 5 €_{Cents}/kWh.

Job engine

Suppliers of chemicals, glass, steel, copper and electronics highly benefit from the demand for renewable technologies made in Germany. The energy transition creates jobs in manufacturing, in the services industries and for the installation and operation of plants in many parts of the country. This includes remote areas which have been in need of a bright economic outlook for decades.

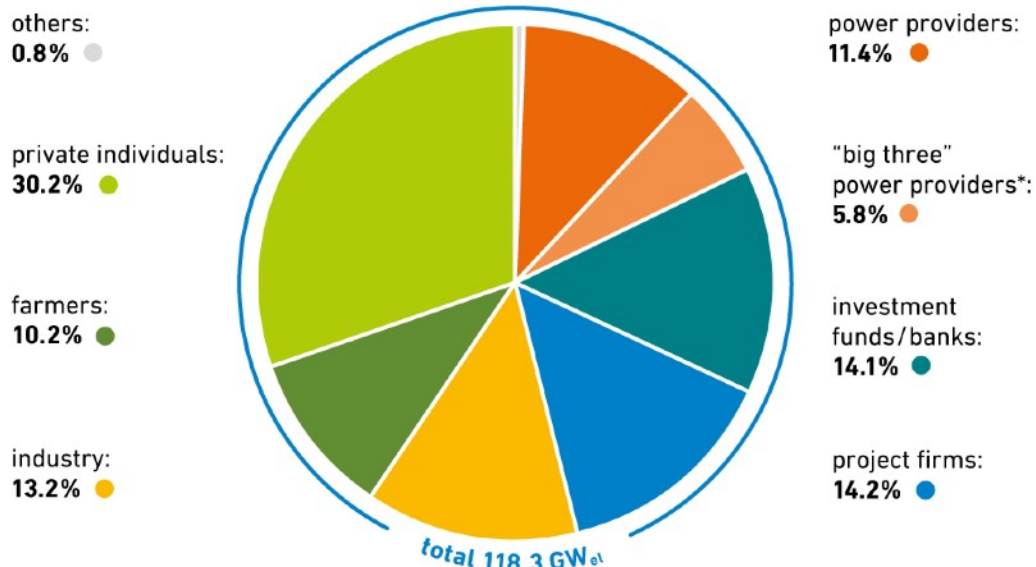
Unfortunately, employment in Germany's renewables industry has been on decline. In 2018, approximately 304,400 people were employed in the renewable energy sector in Germany.

Public participation

With renewable energy, every citizen can be a plant operator. Energy cooperatives give people the opportunity to invest in citizen-owned wind energy systems or citizen-owned solar energy plants – even with minor payments, starting with €500. According to a survey by the market research institute trend:research, more than 40 % of all renewable power capacity installed in Germany lies in the hands of private individuals and farmers.

Renewable energy in the hands of the people

Ownership distribution of installed RE capacity for power production in Germany in 2019



* Vattenfall and EnBW as well as RWE after takeover of the renewable energy division from E.on; including subsidiaries

Source: trend:research; as of: 12/2020

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The way ahead

Power production from wind and solar energy will dominate the energy system of the future. Integrating fluctuating power production into the energy system is a key challenge for the years to come. Biomass, hydro power, storage systems and load management can fill the gaps in times of low wind and solar power production. The coupling of all three sectors – power, heat and transport – is another crucial flexibility option. Excess power can be used in heating technologies like heat pumps and district heating networks. In the transport sector, power can be used directly in electric cars and trains or indirectly by converting it into hydrogen, methane or liquid fuels.

Entering the next phase of the energy transition, there is a growing need for coordination within the power system. A well-developed and intelligent electricity grid is an important companion to renewable energy sources. With a “smart home”, electricity consumers can manage their devices in a manner that they primarily operate when electricity prices are low. This way electricity consumers are rewarded for a more thoughtful use of energy.

This factsheet was prepared by:

Renewable Energies Agency

(Agentur für Erneuerbare Energien)
EUREF-Campus 16, 10829 Berlin, Germany

Email: kontakt@unendlich-viel-energie.de

Phone: +49 30 200 535 30

Web: www.renewables-in-germany.com

For BETD2021 related inquiries, please contact:

BETD-Press Team

German Solar Association
(BSW - Bundesverband Solarwirtschaft e.V.)
EUREF-Campus 16, 10829 Berlin, Germany

Email: press@energydialogue.com

Phone: +49 30 29 777 88 80