

Bioenergy in Germany

OVERVIEW

Germany covered 8.1% of its entire primary energy consumption of 13,550 PJ in 2018 by bioenergy from biomass and biogenic waste. With about two-thirds, bioenergy represents the majority of the renewable energy sources in Germany. In 2050, more than a quarter of the primary energy demand in Germany could potentially be met by domestic biomass (FNR, 2015). The biggest share would come from agricultural crops (such as energy crops) and residues such as straw and manure.

Only one third of the potential from this source is currently exhausted. In second place is energy wood, including forest and industrial waste wood and reclaimed wood. Already two-thirds of this potential are being used today. The energy potential of organic residues and waste materials, e.g. from household waste or from green space maintenance, is comparatively low and already almost exhausted (Figure 1).

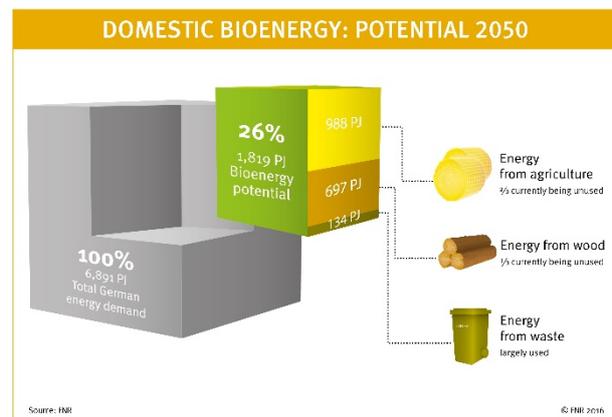


Figure 1: Domestic bioenergy: Potential 2050

HEAT GENERATION

Biomass is the most important renewable energy source for the supply of heat from renewable energies. In 2018, the share of heating and cooling in relation to the overall final energy consumption amount to 13.9%. Bioenergy accounts for more than 86% of renewable heat. It includes the supply of heat from solid fuels (e.g. wood), liquid (e.g. vegetable oil) and gaseous fuels (e.g. biogas from manure and energy crops, as well as sewage and landfill gas) (FNR, 2020). Energy production from the biogenic part of the waste is also included (Figure 2).

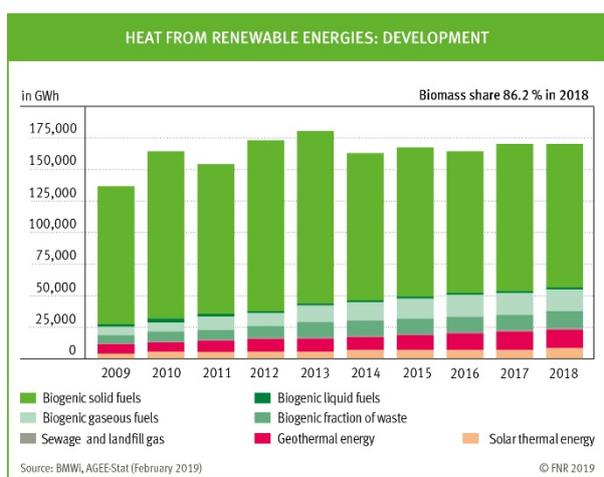


Figure 2: Heat from renewable energies

ELECTRICITY GENERATION

In 2018, 37.8% of Germany's gross electricity consumption came from renewable energy sources. Although the largest share of renewable electricity generation is now supplied by wind turbines, the contribution of bioenergy is also very significant. Electricity from biomass is also available when wind and sun do not supply electricity (FNR, 2020). At 51.3 billion kWh, biomass delivered 22.7% of renewable electricity in 2018 (Figure 3).

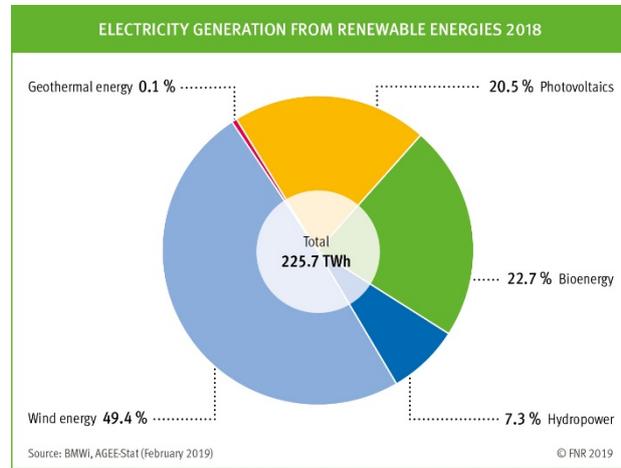


Figure 3: Electricity generation from renewable energies 2018

BIOFUEL

In 2018, 56 million tonnes of fuel were consumed in Germany. In addition to diesel fuel at 63% and petrol at 31%, the share of biogenic fuels was 5% in terms of energy content (Figure 4). Biodiesel remains the most important biofuel in Germany, at around 2.3 million tonnes. It is used as admixture to normal diesel. Some 1.2 million tonnes of bioethanol are sold in Germany. This is done by admixture to petrol. Biomethane can replace natural gas as a fuel. At 400 GWh, sales are currently still at a low level (FNR, 2020).

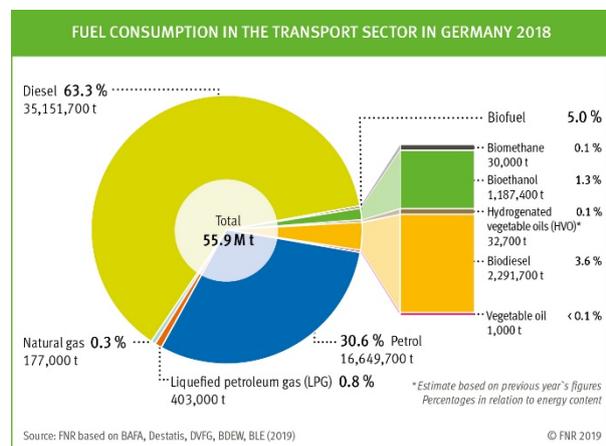


Figure 4: Fuel consumption in the transport sector 2018

GHG SAVINGS BY BIOENERGY

Bioenergy makes a significant contribution to climate protection. Biomass releases only about the amount of CO₂ that the plants previously absorbed during the period of growth. The use of renewable energies has reduced CO₂ emissions by 183.7 million tonnes in Germany in 2018, of which around 64.3 million tonnes were generated by the use of biomass (Figure 5).

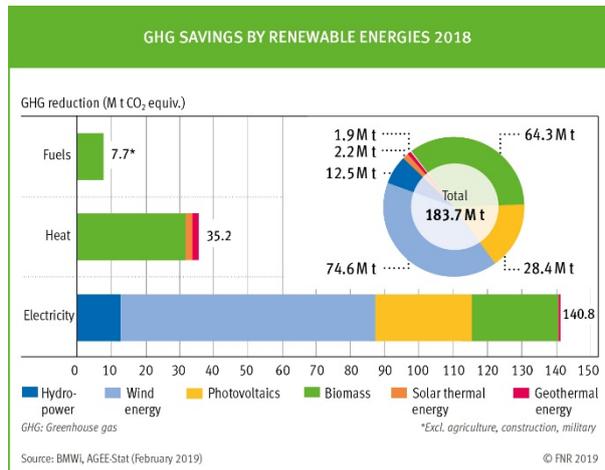


Figure 5: GHG savings by renewable energies in Germany in 2018

EXAMPLES OF DEMOPLANTS

Operator: Clariant
Location: Straubing
Process: Fermentative alcohol production facility
TRL: 6-7
Start-up year: 2012
Installed capacity [t/y]: 1,000

Operator: Karlsruhe Institute of Technology (KIT)
Location: Eggenstein-Leopoldshafen
Process: Gasification
TRL: 6-7
Start-up year: 2014
Installed capacity [t/y]: 360
Product: Renewable gasoline

Operator: Verbio
Process: Lignocellulosic biogas production
TRL: 9
Start-up year: 2019
Installed capacity [t/y]: 5,570

Operator: Susteen technologies
Process: Pyrolysis oil production
TRL: 6-7
Start-up year: 2018
Installed capacity [t/y]: n.a.

SOURCES

- FNR, 2015: Biomassepotenziale von Rest- und Abfallstoffen – Status Quo in Deutschland (Band 36). Link: <https://mediathek.fnr.de/broschuren/bioenergie/band-36-biomassepotenziale-von-rest-und-abfallstoffen.html>
- FNR, 2020: Nutzung Bioenergie. Link: <https://bioenergie.fnr.de/bioenergie/biomasse/nutzung-bioenergie/>

FURTHER INFORMATION

- FNR, 2020: Bioenergy in Germany – Facts and Figures 2020. Link: https://www.fnr.de/fileadmin/allgemein/pdf/broschueren/broschuere_basisdaten_bioenergie_2020_engl_web.pdf