Member Country Report 2021

Germany

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Agenda

• General
• Market
• Policy
• R & D
• Summary
General

- **Germany is a federation.** The federation and the 16 Länder (states) each have areas of responsibility of their own.
- **357,340 km²**
- **83.1 mio. Inhabitants**
- **41.506 mio households**

42.3 % 1-person  33.2 % 2-persons  11.9 % 3-persons  9.1 % 4-persons  3.5 % 5+ persons

Almost 50 % of people live in rented accommodation, this is the highest level on a EU comparison.
Germany

- Coastline: 2,442 km
- Sun (h/y): 1,800
- Surface area: 357,340 km²
- Forested area: 114,191 km²
- Longest river: Rhine (865 km)
- Capital: Berlin (891.70 km²)
- Highest mountain: Zugspitze (2,962 m)

10 neighbouring countries

Source: Facts

Land of Diversity
General

• Germany enjoys a moderate climate. In July, the mean temperature is 16.9 °C, and in January -0.5 °C. The most recent winters in Germany were particularly mild, and the summers particularly hot. With a mean temperature of 10.5 °C, 2018 was the warmest year since records began.

• Germany is the most populous country in the EU and one of the most densely populated; around 77% of its inhabitants live in densely and highly populated areas. Around 30% of the population resides in big cities with more than 100,000 inhabitants, of which there are 80 in Germany, four with more than one million inhabitants, Berlin, Hamburg, Munich and Cologne.

Source: Facts
The 10-year overview shows that there is a clear trend towards renewables, with heat pumps and district heating each gaining 10% and natural gas/biomethane losing roughly 15% over the last decade.

Source: BDH
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Sales of heat pumps

Source: bwp
Sales of domestic hot water heat pumps

Source: bwp
House-building permission

# authorized new buildings

gas

misc.

heat pumps

Source: bwp

www.heatpumpingtechnologies.org
Total Sales of heat pumps

- Domestic hot water
- Ground water
- Ground coupled
- Air

Source: bwp
Total amount of central heat generators 2020

- **Biomass boilers**: about 0.9 million
- **Heat pumps**: about 1.1 million
- **Low-temperature oil boilers**: about 4.6 million
- **Oil condensing boilers**: about 0.7 million
- **Low-temperature gas boilers**: about 6.7 million
- **Gas condensing boilers**: about 7.2 million

- ~ 21.2 million heat generators in stock
- Installed collector surface solar thermal systems
  Approx. 21.3 million m²
  ~ 2.5 million systems

Source: BDH

www.heatpumpingtechnologies.org
Efficiency structure of installed heating systems 2020

Only 21% of the 21.2 million heat generators are efficient and use renewable energy.

Source: BDH
Industrial heat

300,000 systems with outputs ranging from 100 kW and 36,000 kW in the commercial sector in Germany

Only 17% of the systems are state of the art

Saving 2% of the total German final energy consumption

Source: BDH
Comparison for heat pumps in selected European countries

- **Norway**
  - Heat pump market share: 97%
  - CO₂ price: up to €53/tonne
  - Price of electricity relative to oil: 1.4

- **Sweden**
  - Heat pump market share: 90%
  - CO₂ price: €110/tonne
  - Price of electricity relative to oil: 1.3

- **Denmark**
  - Heat pump market share: 47%
  - CO₂ price: €23.50/tonne
  - Price of electricity relative to oil: 1.3

- **Germany**
  - Heat pump market share: 9%
  - CO₂ price: €25/tonne from 2021
  - Price of electricity relative to oil: 3.3

- **France**
  - Heat pump market share: 16%
  - CO₂ price: €45/tonne
  - Price of electricity relative to oil: 1.5

- **Italy**
  - Heat pump market share: 12%
  - CO₂ price: ~
  - Price of electricity relative to oil: 1.3

Source: bwp
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Roadmap Dekarbonisierung
Strategies
Leitpapier
Climate change act
Bundesförderung
Green Deal
Impulse paper
Förderprogramm
Climate protection act
Energiepreisreform

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Germany to achieve climate neutrality earlier

- Greenhouse gas emissions
  → By 2030: 65% less CO2 (current target 55 %)
  → By 2040: 88% less CO2
  → 2045: Climate neutrality (current target 2050)

- Permissible annual CO2 emissions for individual sectors such as energy, industry, transport and buildings to be reduced.
Policy

• Climate Change Act 2020 2021 (amendment)
• Film: The German government’s Climate Action Programme  Link
• Germany is to cut its greenhouse gas emissions by 65 % of the 1990 levels by 2030.
• Since the start of 2020, a government scheme has rewarded property owners replacing older oil-fired central heating.
### Grants for "Heating with Renewable Energy"

<table>
<thead>
<tr>
<th>Heating system</th>
<th>Building Stock</th>
<th>New Build</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subsidy rate</td>
<td>Subsidy rate/bonus</td>
</tr>
<tr>
<td>1. Biomass- or Heat pump system</td>
<td>35%</td>
<td>45%</td>
</tr>
<tr>
<td>2. Solar collector system</td>
<td>30%</td>
<td>-</td>
</tr>
<tr>
<td>3. Renewable energy hybrid heating (combination of 1. + 2.)</td>
<td>35%</td>
<td>45%</td>
</tr>
<tr>
<td>4. Gas hybrid heating, (combination gas-condensing boiler with 1. or 2.)</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td>5. Gas hybrid heating (combination gas-condensing boiler with subsequent</td>
<td>20%</td>
<td>-</td>
</tr>
<tr>
<td>addition of 1. or 2. within 2 years)</td>
<td></td>
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</tr>
</tbody>
</table>
Policy

Business associations:
**BDH, BDEW, BWP, BVF, B.KWK, Geothermie, FGK, BTGA, VDMA, ZVEI, ZVSHK ...**

Technical societies:
**DKV, FKT, IZW, VDI, VDE ...**

This paper is not intended to be complete or definitive.
The German heating industry occupies a world-leading technological position

Source: BDH

www.heatpumpingtechnologies.org
BDH  Heat Generators

**Gas condensing technology:** Modern gas condensing boilers are highly efficient and can make a decisive contribution to reducing your private energy consumption. [Read more]

**Oil condensing technology:** Modern oil fired condensing boilers make heating more environmentally friendly and efficient. [Read more]

**Heat pumps:** With a heat pump you can use the environmental heat that is present in the soil, in the ground-water and in the air for heating or cooling. [Read more]

**Hybrid Heat Pumps:** Hybrid HPs are suitable for use in new buildings as well as in existing buildings. [Read more]

**Solar thermal energy:** With a solar thermal system, sunlight is converted into heat. This can be used for heating and DHW heating. [Read more]

**Heat from wood:** Wood is a renewable resource that absorbs about as much CO₂ as it releases when burning. [Read more]

**Cogeneration of heat and power (CHP):** Heating which generates electricity, also known as decentralised CHP (cogeneration of heat and power), on the other hand, generates both electricity and heat at the same time. [Read more]
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Research

• The German government is aiming for a climate-neutral building stock by 2045. In order to achieve this goal, it is necessary to reduce the heat demand on the one hand and to achieve a climate-neutral heat supply on the other.

• The German government is therefore funding projects in the areas of research, development and demonstration as a part e.g. of the 7th Energy Research Program. (Link) Report 2020  Report 2019  Report 2018

Source: BMWi
Research

• Since 2010, research projects in the fields of heat pump and refrigeration technology have been funded with more than **71 million €**.

• In the past few years, development has focused mainly on HPs for buildings (single-family houses, multi-family houses, non-residential buildings) and the main areas of development are refrigerants, components, integration and demonstration. There are also some projects addressing HPs for industry.

• Currently, another main topic is the generation of cold at temperatures below 0 °C by water-based absorption and adsorption processes.  

Source: BMWi
Research

• In addition, a major project on the topic of heat pumps in district heating networks "Reallabor GWP" has been started as of 01.04.2021. The Federal Ministry of Economic Affairs and Energy is funding this project with 21 million €. 

Source: BMWi
R & D

• A large number of universities, research institutes and industrial companies are working on heat pump technologies in Germany.

• In particular, the Fraunhofer Institute for Solar Energy Systems (ISE), the Technical University of Dresden and the E.ON Energy Research Center at RWTH Aachen University on the research side and Vaillant, Viessmann, Stiebel Eltron and Bosch-Thermotechnik on the industry side are to be mentioned.

• New Institutes for large energy systems:
  German Aerospace Center’s (DLR) Institute of Low-Carbon Industrial Processes
  Fraunhofer Research Institution for Energy Infrastructures and Geothermal Systems (IEG)

This paper is not intended to be complete or definitive.

www.heatpumpingtechnologies.org
Summary

• Heat pumps as heating systems are dominant in new build.
• There is further a great potential in the building stock.
• A government scheme rewards property owners replacing older oil-fired central heating.
• Air to water heat pumps have ~80% market share.
• Great potential also in commercial + industrial applications
• High electricity prices in comparison to gas and oil are a strong barrier for HPs.
Sources

- Facts about Germany  https://www.tatsachen-ueber-deutschland.de/en
- BDH  https://www.bdh-industrie.de/en/
- bwp  https://www.waermepumpe.de/
- Bafa  https://www.bafa.de/EN/Energy/energy.html
- BMWi  7th Energy Research Programme
- BMWi  https://www.bmw.i.de/Redaktion/EN/Dossier/energy-transition.html