HELMHOLTZ KLIMA INITIATIVE

FACTSHEET

№ 05

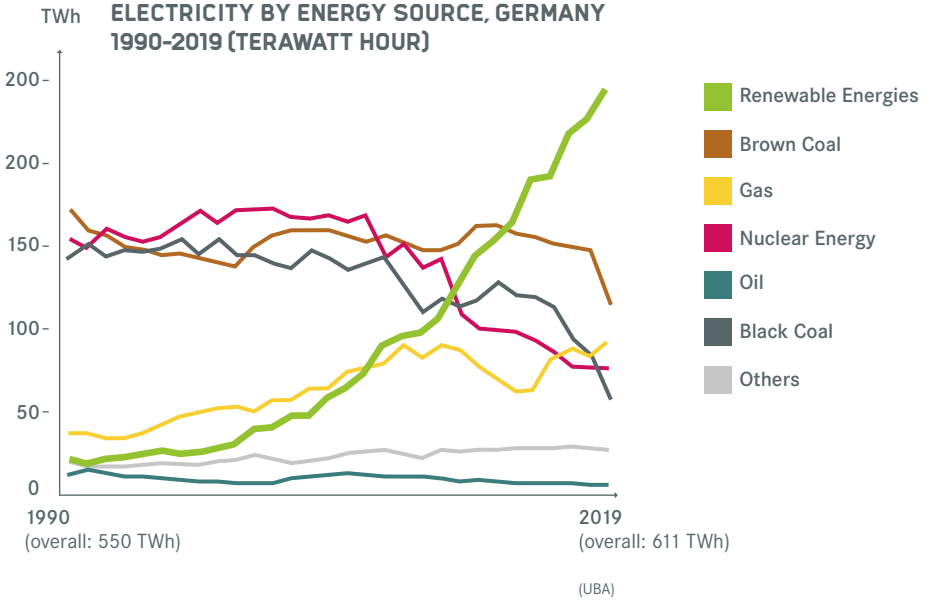
TOPIC: PHOTOVOLTAICS

In photovoltaics (PV), solar cells convert sunlight directly into electricity. This enables electrical devices to be operated without emitting harmful greenhouse gases.

PV AS RENEWABLE ENERGY

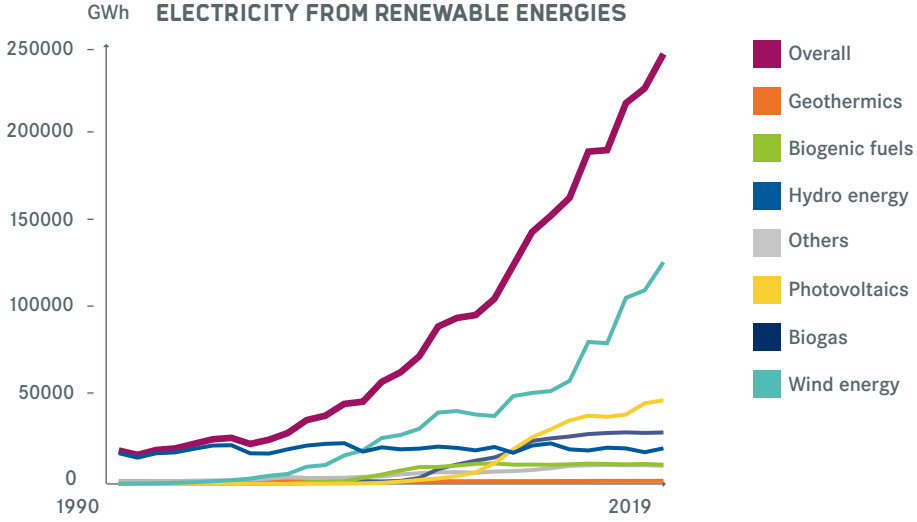
Photovoltaics is one of the renewable energies (RE). These use natural elements such as wind, water or sun as well as renewable raw materials such as wood, straw or plants to generate energy. They can make a significant contribution to climate protection.

ELECTRICITY BY ENERGY SOURCE, GERMANY 1990-2019 (TERAWATT HOUR)



(UBA)

ELECTRICITY FROM RENEWABLE ENERGIES



PHOTOVOLTAICS IN GERMANY 2019:

47,5 K
Gigawatt hour power

49 K
megawatt electric capacity

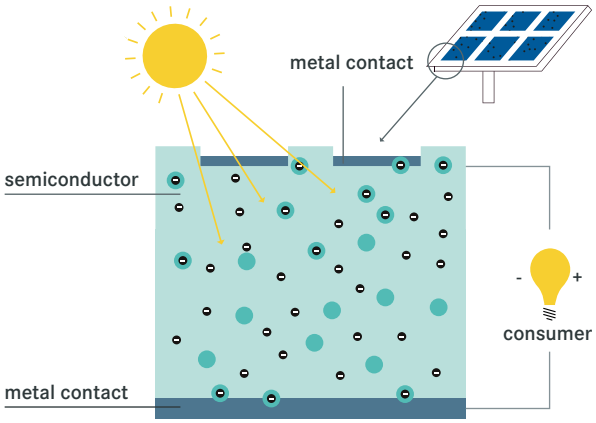
29 M TONS CO_2
avoided greenhouse gases

1000 watt hour = 1 kilowatt hour (kWh)
1000 kilowatt hour = 1 megawatt hour (MWh)
1000 megawatt hour = 1 gigawatt hour (GWh)

In 2021, the Renewable Energies Act will be extended by an amendment: ab 2050 soll der gesamte Strom in Deutschland treibhausgasneutral sein und bis 2030 sollen 65 % aus Erneuerbaren Energien stammen.

LAYOUT PV-MODULES

A PV-module consists of several solar cells that are serially connected. They can convert for example sunlight into electricity. The light generates free charge carriers such as electrons in the solar cell via a so-called semiconductor. An electric field in the cell carries them to external contacts - electricity is generated. As with a battery, electrical devices can now be connected to these contacts. Via a converter, the electricity can also flow into the power grid.

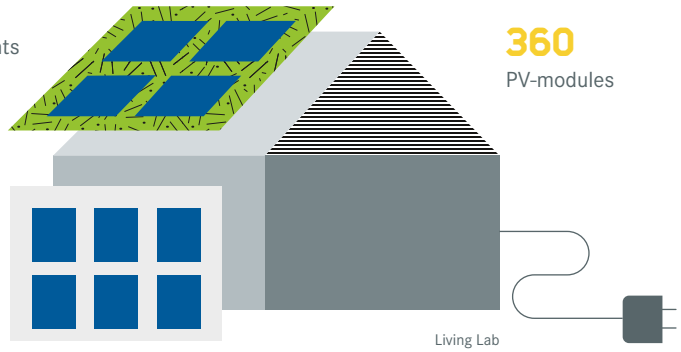


HELMHOLTZ' RESEARCH:
PHOTOVOLTAICS ON BUILDINGS

BUILDING INTEGRATED PHOTOVOLTAICS (BIPV)

So far, PV-modules have mainly been installed on house roofs or large open spaces. In order to use the potential of the entire building envelope in the future, the Helmholtz Center Berlin is researching the special challenges for BIPV. Solar modules as structural elements must be integrated into the design and take on additional functions, such as weatherproofing, light or sound protection and heat insulation. In Germany there is 37,700 km2 of building envelope, PV-modules can be used on roofs, on the facade, as door and window elements. BIPV could cover 30% of Germany's current electricity consumption.

120
measuring points and sensors



360
PV-modules

380 M² PV
on the front
~27.600 kilowatt hours per year

PROJECT 1

Living lab at the Helmholtz Zentrum Berlin
At the site in Adlershof, a living lab for BIPV is being built. PV-modules are integrated into the front of the building. Together with various sensors, they form a living lab for the long-term investigation of BIPV under real conditions.

PROJECT 2

Renewable energy for DAC
Technologies such as Direct Air Capture (DAC) can actively remove CO2 from the atmosphere. For the Helmholtz Climate Initiative, the Helmholtz Zentrum Berlin is researching how BIPV can provide enough "clean" energy for this technology.

INFO

Dr. Björn Rau heads the Consulting Office for Building-Integrated Photovoltaics (BAIP) at the Helmholtz-Zentrum Berlin für Materialien und Energie. Here he is researching how new and existing buildings can be upgraded with PV so that they are almost climate-neutral by 2050. BAIP advises stakeholders from architecture, urban planning and the construction industry on available technologies, design options, products, technical feasibility and legal framework. The aim is to lower the barriers to the building-integrated use of photovoltaics and thus to help ensure that the technology is used more widely.

Would you like to learn more?

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