

## Energy consumption and renewable energies in private households

### Energy consumption in a four-person household

Municipal utilities and other energy companies calculate both the output of electrical energy and the output of thermal energy (for example, natural gas for heating purposes) in kilowatt-hours (kWh).

In Germany, a four-person household “consumes” approximately 4,000 to 6,000 kWh of electrical energy and approximately 20,000 to 40,000 kWh of thermal energy per year.

One kWh is equivalent to  $3,600 \text{ kJ} = 860 \text{ kcal}$ .

Example: With 1 kWh you can operate a hair dryer with a wattage of 1,000 W for one hour or heat 10 liters of water from 14°C to 100°C.

Energy values: 1 m<sup>3</sup> of natural gas or 1 liter of heating oil corresponds to approximately 10 kWh.

### How much energy do renewable energy systems yield?

#### Photovoltaic system (PV system)

The power output of a PV system (under standard conditions) is indicated as kilowatt-peak (kWp). Depending on the materials used and available sunlight, you need approximately 6 to 10 m<sup>2</sup> of solar cell surface area to achieve 1 kWp.

The electrical energy yield depends on the respective location and is indicated as kilowatt-hours per year (kWh/a). A PV system with 1 kWp can yield about 1,000 kilowatt-hours per year (1,000 kWh/a).

Example: If you need around 10,000 kWh of electrical energy per year, you should install a PV system with a surface area of 60 to 100 m<sup>2</sup> for a power output of 10 kWp.

#### Solar thermal system

The amount of thermal energy yielded by flat plate solar collectors is approximately 500 kilowatt-hours per square meter per year (500 kWh/m<sup>2</sup>a).

The more powerful, but also more expensive, tube collectors achieve a value of about 700 kWh/m<sup>2</sup>a.

In Germany, a properly dimensioned solar thermal system (tube collectors) can generate approximately 60% of the required heating energy on average during a year.

#### Geothermal systems

Geothermal systems extract thermal energy from the ground via a heat pump. The electrical energy needed to drive the heat pump is approximately 25% of the generated thermal energy.

Example: Approximately 2,500 kWh of electrical energy must be used to generate 10,000 kWh of thermal energy.