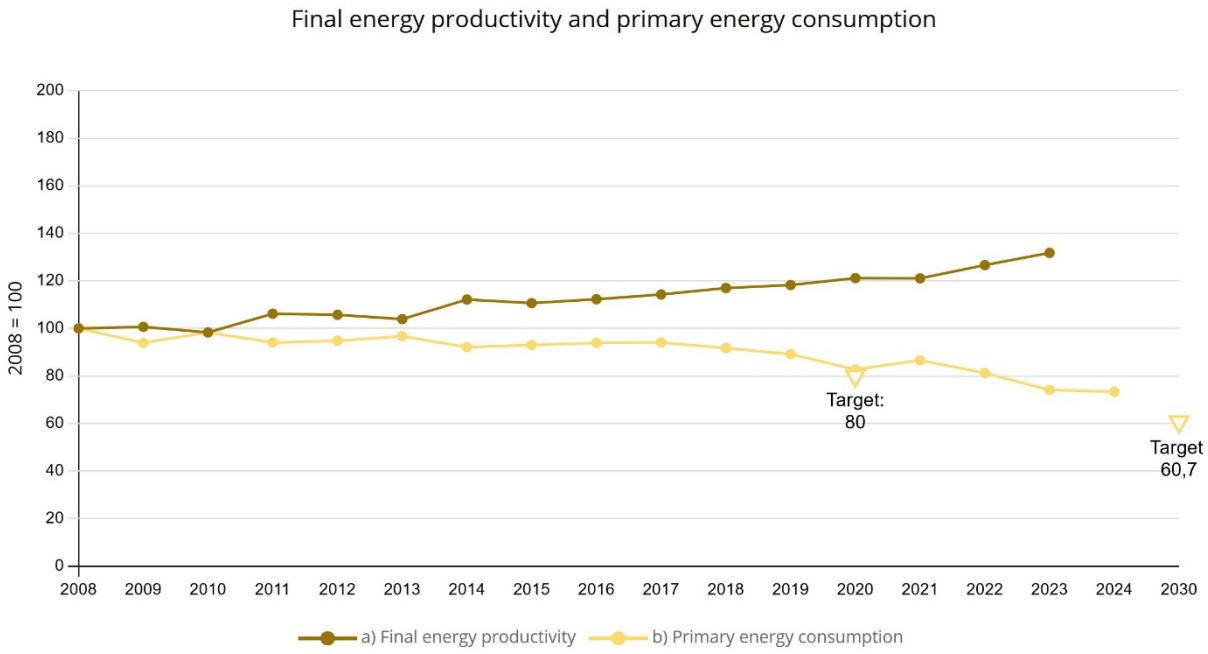
Resource conservation – *Using resources economically and efficiently*

7.1.a, b Final energy productivity and primary energy consumption



Note(s):
• 7.1.a: 2023 provisional data.
• 7.1.b: 2024 provisional data.

Data source(s):
AG Energiebilanzen e.V., Federal Statistical Office

Definition

The final energy productivity indicator (7.1.a) shows the development of value added per unit of final energy used compared to the base year 2008. The term final energy refers to the portion of energy that is available as thermal or electrical energy for the production of goods or for use in private households. Indicator 7.1.b shows the development of primary energy consumption compared to the base year 2008. Primary energy consumption is calculated as the sum of final energy consumption, non-energy consumption and the balance in the transformation balance. In the transformation balance, the transformation of energy sources is shown as input and output. Own consumption in the transformation areas and flaring and distribution losses are also recognised in the transformation balance.

Intention

Reducing energy consumption by increasing energy efficiency is the second main pillar of the energy transition alongside the expansion of renewable energies. The aim is to achieve a high level of economic performance with as little energy as possible. Saving energy protects the climate and the environment, contributes to improving security of supply and the competitiveness of industry.

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Targets
7.1.a: Significant increase
7.1.b: Reduction by at least 39.3% by 2030 compared to 2008

Content and progress
When analysing energy consumption, a distinction is made between primary energy and final energy:

Primary energy refers to the energy contained in natural energy resources such as natural gas, crude oil, coal or uranium prior to a transformation. Energy obtained from renewable sources also qualifies as primary energy.

Final energy is the portion of primary energy that is made available to the final consumer in the form of, for example, electricity, district heating, gas, or fuels. It is derived from primary energy, minus the losses incurred during transformation, transmission, and storage.

7.1.a Final energy productivity

Final energy productivity describes the ratio between economic output – measured by Gross Domestic Product (GDP) – and the amount of final energy consumed. It serves as an indicator of energy efficiency in the production of goods, the provision of services, and energy consumption in private households. As the indicator is based on final energy, losses occurring during transformation, transmission and storage are not taken into account. Consequently, it does not provide information about the efficiency of energy transformation processes – such as the efficiency of power plants – or about advances in energy transmission and storage technologies.

Between 2008 and 2023, final energy productivity increased by 31.8%, according to preliminary figures, with 10.8 percentage points of this growth occurring in 2022 and 2023 alone. Thus, the politically defined target of a continuous increase was achieved both in the most recent year and on a multi-year average. Until 2019, the development of the indicator was primarily driven by an increase in GDP (+14.7% compared to 2008), while final energy consumption remained relatively stable (–3.0%). Between 2021 and 2023, GDP rose only slightly, while energy consumption declined significantly – from 94.2% to 87.5% of the 2008 level. As a result, final energy productivity continued to rise despite stagnating GDP.

Clear regional disparities are observable: in 2022, final energy productivity in Sachsen-Anhalt stood at 0.90 euros per kilowatt-hour – an increase of just 4.6% compared to 2008. Sachsen-Anhalt thus recorded the lowest absolute value and the weakest growth in final energy productivity among the Länder. The highest values were observed in the city-states of Berlin (3.34 euros per kilowatt-hour) and Hamburg (3.54 euros per kilowatt-hour). Berlin also recorded the largest increase among all Länder, with a 72.8% rise compared to 2008.

Total final energy consumption in 2023 amounted to 8,163 petajoules, down from 9,327 petajoules in 2008. Of this, approximately 14% was attributable to the commerce, trade and services sector, 28% each to households and industry, and 31% to transport.

7.1.b Primary energy consumption

Primary energy consumption refers to the total energy content of all energy carriers used domestically. This includes primary energy carriers such as lignite and hard coal, mineral oil, natural gas, and energy from renewable sources. These are either used directly or converted into secondary energy carriers such as electricity, district heating, petrol or diesel. The calculation is based on the sum of domestically produced energy carriers, plus the balance of imports and exports and changes in stock levels, minus the supply of fuels and lubricants to national and international maritime shipping in German ports. The basis for this is the energy balances of the Working Group on Energy Balances (AGEB), supplemented by additional data sources.

Unlike final energy productivity, this indicator does not incorporate any economic reference figures and focuses solely on consumption. Since it is based on primary energy, improvements in the efficiency of fossil fuel transformation – particularly in electricity generation – are taken into account. However, it is not possible to clearly determine whether changes in the indicator result from changes in energy consumption or from developments in energy generation, transformation and transmission. In the case of electricity generation from renewable sources, the energy produced is counted as primary energy, which means that efficiency gains in these systems are not directly reflected in the indicator.

Between 2008 and 2024, primary energy consumption declined to 73.3% of the 2008 baseline, according to preliminary data. If the trend of recent years continues, the politically set target – a reduction in primary energy consumption of at least 39.3% by 2030 compared to 2008 – is likely to be achieved ahead of schedule.

Here too, pronounced regional disparities are evident: while primary energy consumption in Sachsen rose to 102.8% of the 2008 level in 2022, it fell to 73.5% in Schleswig-Holstein and 66.5% in Saarland.

Type of targets
7.1.a: Directional target
7.1.b: Target with specific target value

Assessment
7.1.a: Final energy productivity should be increased.

According to the target formulation, indicator 7.1.a is assessed as sun for 2023, as the indicator value showed an increase both in the most recent year and on average over the past six years.

7.1.b: Primary energy consumption should be reduced to a maximum of 60.7% of the 2008 value by 2030.

For indicator 7.1.b, a specific target value for 2030 has been set, which would already be achieved by 2028 if the average trend of the past six years continues. Indicator 7.1.b is therefore assessed as sun for 2024.

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7.1.a: 

7.1.b: