

Germany: real GDP grows while energy consumption declines

Mainz, May 31, 2023 | Dieter Wermuth

One popular assumption is wrong, especially in the case of Germany: that economic growth requires the input of more and more energy. Between 1990 and 2022, the country's real GDP had increased by about 50 percent whereas the consumption of primary energy had fallen (not increased!!) by 21 percent. Put differently, the energy intensity of producing GDP has come down from 6.58 (GJ/€1,000 of real GDP) to 3.61 over the course of those 32 years.

primary energy consumption in Germany, 1990 & 2022

by source, % shares

	1990	2022
natural gas and mineral oil products	50.5	59.0
stone and lignite coal	36.9	19.8
nuclear power	11.2	3.2
renewables	1.3	17.2
others*)	0.0	1.7
<i>memorandum items</i>		
primary energy consumption (PJ)	14,905	11,769
primary energy intensity (GJ/€1,000 of real GDP)	6.58	3.1
greenhouse gas emissions (mil. tons of CO ₂ equivalents)	1,251	746
CO ₂ emissions (mil. tons of CO ₂ equivalents)	1,055	666

*) non-renewable garbage and waste heat

sources: AG Energiebilanzen, Umweltbundesamt; own calculations

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The main reason for this well-established long-term trend has been the strong increase of absolute and relative energy prices. There has thus been, all the time, an incentive to be frugal about the use of energy. For economists this has been and still is a nice confirmation of one of their favorite "laws" – that the price mechanism works and can be put to work in economic policy making, for instance for the climate-friendly restructuring of demand and supply.

Another popular proposition is equally wrong: that a significant expansion of renewable power is not possible because there will soon be a lack of suitable land and space which in turn will prevent the total electrification of the economy as proposed by the present three-party-coalition government. Ulrike Herrmann uses this argument in her new best-selling

[book about the end of capitalism](#). The facts tell a different story: the share of renewables in primary energy consumption has arrived at 17.2% in 2022 and looks like being on a robust upward trend.

If I look around I see a large potential for much more electricity production from renewables. Only a small number of roofs are covered by solar panels and there are plenty of open spaces that could be used for wind turbines – and new, taller ones are significantly more efficient than existing ones. For the time being I see no reason why renewables are about to hit physical limits. At the same time the demand for energy is on a declining trend. Once again the market economy turns out to be impressively adaptable to new challenges and political requirements. The general standard of living can be, and will be improved with less and less energy input.

Another aspect which is somewhat neglected in the present discussion is Germany's dependency on energy imports. Net imports of energy still account for almost 70% of primary energy consumption. Not least because of the progressive switch to renewables the country is becoming increasingly self-sufficient – and thus less susceptible to extortions by Russia or the OPEC countries. For an economist like myself this is not such an unequivocally good thing because I continue to be convinced of the benefits of the international division of labor. Free trade and capital flows are more effective than development aid when it comes to improve the lot of poor countries. But security considerations take priority in the present conflict with Russia. This has to be accepted. I wonder whether the trend toward autarky and the declining costs of renewables will in the end make Germany and similar countries net energy exporters. Sounds far-fetched right now.

A final note: geothermal energy – which almost plays no role today, with a share of 0.7% in primary energy consumption – has the potential to shake up the present wind-solar mix of renewables, provided the cost of CO2 emissions goes up sufficiently to make deep drilling a feasible business model. The supply of heat, ie, clean electricity from the ground is de facto limitless.

To sum up: neither Germany nor the rest of the world need more and more energy to raise the standard of living. This also helps in the fight against climate change. A general belt-tightening is not necessary. A continuing shift to less energy-intensive goods and services will do.

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