Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

Nuclear Power's Share in Electricity Generation Continues to Fall

In 2023, for the first time, renewable energies represented 30 percent of electricity generation in the world, with particularly strong growth in solar power output: +23 percent, thirteen times the increase in nuclear power production with its less than +2 percent.

Nuclear power plays a marginal role in the global energy sector. Five out of six UN member states get their electricity entirely from other sources. Just a handful of countries account for three quarters of global nuclear electricity generation. The U.S., China, and France alone, account for 58 percent.[1]

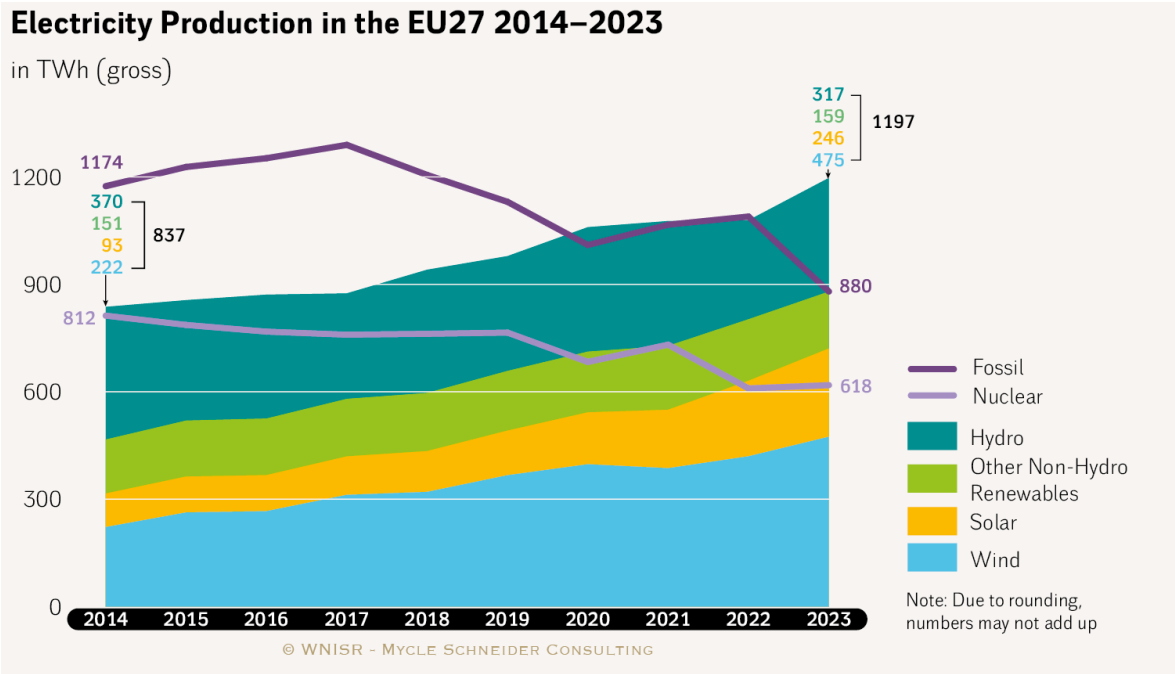
Nuclear power plants generate around 9 percent of the world's commercial electricity. After 20 years of decline, their share – still at 17.5 percent in 1996 – has remained constant at best over recent years. But things develop quickly. In 2019, for the first time ever, electricity generation from 'new renewables' – primarily wind, solar and biomass – outstripped nuclear power. In 2022, solar and wind combined had already generated 28 percent more than nuclear plants, and by 2023 that gap had increased to 88 percent. And this calculation does not even include hydropower plants. These alone produce close to 60 percent more electricity than nuclear fission.

[1] All global numbers are from Ember, "Global Electricity Review 2024", May 2024, see ember-climate.org/insights/research/global-electricity-review-2024/supporting-material/.

Nuclear Power Generation at All-time Low in Four Decades in the European Union

In 2022, nuclear power generation in the EU27 plunged to its lowest level since Chernobyl-year 1986. It did not recover in 2023. Over the past decade, nuclear production in the EU27 dropped by 24 percent while wind and solar output combined grew by close to 130 percent. In 2023, solar and wind generated 721 TWh, 17 percent more than nuclear's 618 TWh. Wind alone outpaced natural gas. If other renewables like biomass are added to solar and wind, for the first time, non-hydro renewables' production was equivalent to the output of all fossil fuels.

Figure 1: New Renewables Outpace Nuclear AND Fossil Fuels in the EU27, Source: EMBER, 2024, see ember-climate.org/insights/research/european-electricity-review-2024/#supporting-material.



The electricity mix on the national level varies greatly from one country to another. Only two countries in the world – France and Slovakia – generate more than half of their electricity with nuclear plants. The share is less than 20 percent in the U.S., and below 5 percent in China. Austria has never had its own functional nuclear power plant; instead, renewable energy sources (including hydropower) contribute about three quarters of the electricity generated there today.

Do Not Confound Electricity and Energy

The terms electricity and energy are often confounded or incorrectly used as synonyms. When speaking of energy, it is also important to distinguish between primary and final energy. Even in most industrialised countries, electricity makes up less than one quarter of final energy consumption, and at the global level, the power share is around one fifth. Biomass, natural gas, coal, and oil are primary energy sources directly burnt for heat or electricity generation or for use in the transport sector. Solar, wind, water, and uranium are mainly used to produce electricity. Nuclear power plants are very energy inefficient machines. Two thirds of the primary energy generated is lost as waste heat. Losses are also incurred in the transmission and distribution system. The 'final energy' ultimately made available to the consumer – the electricity from the sockets – is only a fraction of the 'primary energy' originally introduced.

Around four fifths of commercial primary energy is still provided by fossil fuels. The share of heat generated by fission in nuclear power plants makes up only about 4 percent of the world's primary energy consumption.[2] Its proportion in terms of global final energy can only be estimated, since a substantial share of energy sources are not commercialised, predominantly biomass in Africa and Asia, or the countless standalone solar systems around the world that generate electricity for auto-consumption but are not included in any statistics.

Even France Gets Over 80 Percent of Final Energy from Other Sources Than Nuclear

With a share of around 40 percent of final energy, oil comes out on top by far in such estimates, and there has been little change over the past 30 years. Once natural gas and coal are factored in, fossil fuel sources still account for three quarters. Nuclear power plants provide less than 2 percent of final energy.

Even in nuclear France, power from fission reactors only covers one sixth of final energy[3]. At 43 percent, oil remains the French market's dominant energy source. On that account,

[2] Energy Institute, "2023 Statistical Review of World Energy", 2023, see energyinst.org/statistical-review.
[3] In 2022, electricity accounted for just under 25% of final energy in France. Nuclear power plants generated 64.6% of these 25% in 2022, i.e. around 16% of final energy.

the share of oil in the final energy balance of nuclear power's stronghold is higher than in Germany with its 36 percent, and higher than the global average.

The negligible share of final energy consumption begs the question: why nuclear electricity and fossil fuel use have not already been replaced by cost-effective or free sufficiency measures, energy efficiency, and electricity from other, available, cheaper and sustainable energy sources? As France demonstrates, even the biggest nuclear power programme does not lead to independence from climate-disrupting fossil fuels.

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