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Renewable energies making the electricity mix more climate-friendly

CO₂ emissions per kilowatt hour of electricity sank in 2006

Every kilowatt hour of power consumed in Germany during 2006 produced an average 596 grammes of carbon dioxide, which is 20 grammes less than in 2005. The lower carbon dioxide emissions per kilowatt hour are mainly due to the increasing share of power produced from regenerative sources. However, preliminary calculations for 2007 done by the Federal Environment Agency (UBA) indicate the emission factor will once again climb to over 600 grammes per kilowatt hour. This is because energy suppliers used more lignite and brown coal to produce electricity in 2007.

The carbon dioxide emission factor is an indicator of how climate-neutral the electricity produced in Germany is and illustrates the CO₂ emissions per kilowatt hour of power. The statistic is steered by the share of fossil fuels and renewable energies used to produce electricity. The lower the share of coal and other fossil fuels and the higher the share of CO₂ -neutral energy sources (i.e. renewables and nuclear energy), the lower the CO₂ emissions per kilowatt hour of electricity. However, the waning share of nuclear energy in the electricity mix was compensated by increased use of coal, but the associated rise in specific CO₂ emissions was balanced by the disproportionately greater share of renewable energies.

The average degree of efficiency of conventional power plants also influences specific emission factor. A conventional power plant with a higher level of efficiency requires smaller volumes of carbon-based fuels to produce a kilowatt hour of electricity. The emission factor also accounts for line and transmission losses of some eleven percent; i.e. for every kilowatt hour of electricity at the user end, power plants must produce about 1.1 kilowatt hours of electricity.

The specific emission factor of the German electricity mix dropped from 727 to 596 grammes per kilowatt hour between 1990 and 2006, which corresponds to a reduction of carbon dioxide emissions of 18 percent per kilowatt hour of electricity. The reduction of emission factor achieved during the 1990s owed largely to increases in efficiency in the power plant park

traceable to the construction of newer, more efficient plants on the one hand, and the decommissioning of inefficient plants on the other. Starting in 2003 this continuing downward trend has been due to the increasing market share of renewable energies.

This positive development is offset, however, by the commissioning of new fossil fuel-based power plants in 1999-2001. The influence of (coal's) conversion into electricity on emission factor becomes evident once again, for even modern lignite power plants emit nearly three times as much carbon dioxide as a modern natural gas plant to generate one kilowatt hour of electricity.

Despite continuously declining specific emissions, absolute carbon dioxide emissions from the production of electricity have gone down only relatively little since 1990. This is mainly traceable to a constant rise in power consumption.

It is key to a further reduction of CO₂ emissions from the electricity sector that more efficient use of electricity take effect, f.e. minimising idling losses, definition of efficiency standards for electrical appliances. At the same time the share of renewable energies must rise along with efficiency in the production of electricity, perhaps by expanding the network of combined heat and power cogeneration plants.

An overview of the development of the CO₂ emission factor in Germany's electricity mix from 1990-2006 is available at <http://www.umweltbundesamt.de/energie/archiv/co2-strommix.pdf>. The study is available for free on the Internet at <http://www.umweltdaten.de/publikationen/fpdf-l/3195.pdf>.

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