

German Trends and Targets

Electricity supply in Denmark is closely connected to the neighbouring countries and to Germany in particular.

Steady use of coal and lignite

Germany has defined ambitious targets on reduction of CO₂ emissions and on closing its nuclear power stations. These targets seem to be conflicting.

Fig. 1 shows the changing pattern of energy carriers in the electricity industry since 2007.

The main falls since 2010, when the nuclear decline began:

- Nuclear: -92 TWh
- Gas: -32 TWh

The main increases are:

- Onshore wind: 40 TWh
- PV¹: 27 TWh
- Bio: 15 TWh
- Lignite: 9 TWh
- Offshore wind: 8 TWh

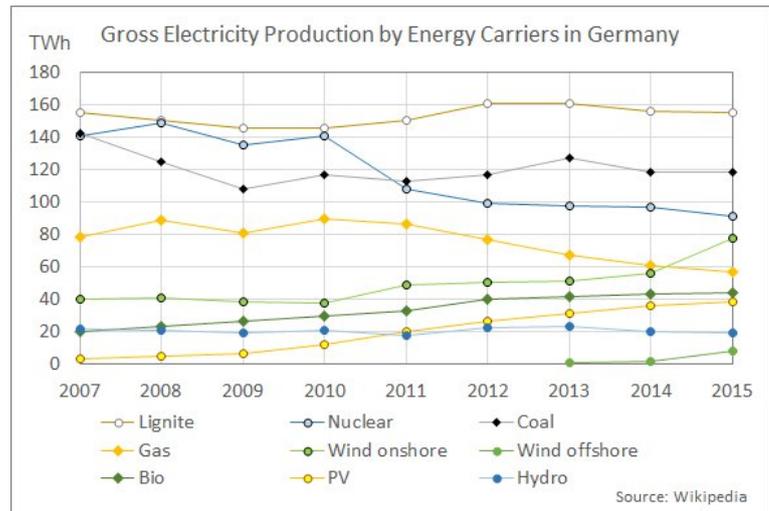


Fig. 1 - German electricity production by energy carriers. A few less essential energy carriers have been left out.

The use of coal and lignite has been rather stable for several years, while the use of gas is declining. The balance between gas and lignite is another dilemma. Lignite is a domestic fuel with a high emission of CO₂. Gas is an imported fuel with a lower CO₂ emission. The market conditions seem to favour coal and lignite.

Will Germany meet the CO₂ targets in 2020?

The German Environmental Protection Agency (Umweltbundesamt or UBA) has published energy related CO₂ emissions for the period 1990 to 2012 (fig. 2). The power industry is responsible for about a third of this emission.

The average annual decrease for that period was about 1%.

Targets have been set for the total emissions of greenhouse gases:

- 2008-2012 (Kyoto): 975 mill. t CDE²
- 2020: 750 mill. t CDE
- 2050: max 250 mill. t CDE

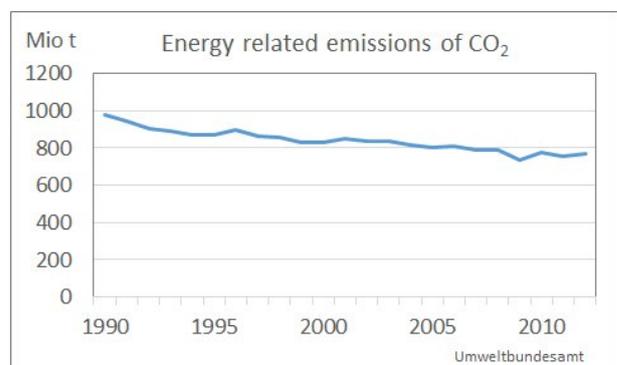


Fig. 2 - Energy related emissions of CO₂ 1990 to 2012

¹ PV: Photovoltaics

² CDE: Carbon dioxide equivalent

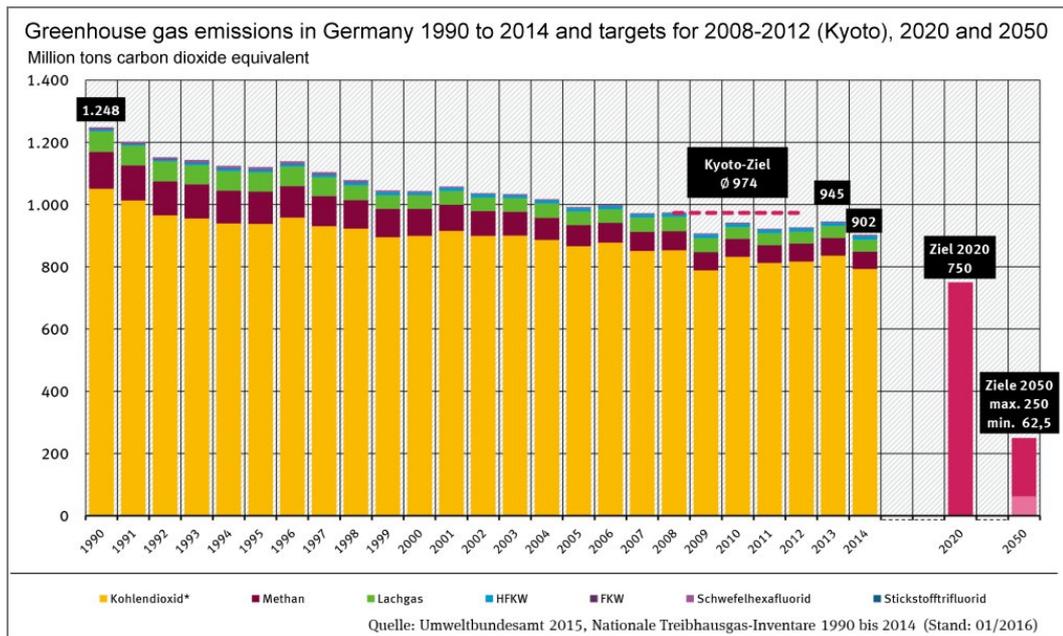


Fig. 3 - Total greenhouse gas emissions and targets for Germany (Source: UBA)

The average annual decrease for the years 1990 to 2014 was 1.3%. It will take an annual decrease at about 3% from 2014 to reach the target for 2020.

In order to estimate the effect of a different fuel mix, I made the following assumptions:

Fuel	Fuel CO ₂ emission kg/kWh	Assumed efficiency	Electricity CO ₂ emission kg/kWh
Gas	0.20	55%	0.36
Coal	0.34	44%	0.77
Lignite	0.36	40%	0.90

The gap from 2014 to 2020 is 152 mill. tons CO₂. Replacing 10 TWh lignite by wind energy (or nuclear energy) would save 9.0 mill. tons CO₂. Replacing it by gas would save 5.4 mill. tons CO₂.

Closing down more nuclear power stations will make the challenge greater.

Meeting the emission targets to 2020 is not only a challenge to the electricity industry. Efficiencies must be improved for both supply and demand for all energy sectors, and 2020 is quite soon.