

The role of fossil energy sources

Phasing out coal:

In 2019, in Germany, lignite coal supplied 19.7% of net energy generated, and hard coal another 9.4%. Coal-fired power plants accounted for over two-thirds of Germany's energy sector carbon emissions in 2019. Therefore, in order to attain the mid and long-term target of the German energy transition, it is inevitable to reduce the share of coal power and finally phase out coal power completely. As a simultaneous and too sudden phasing out of nuclear power (until end of 2022) and coal power would be a serious threat to security of supply, a gradual phase-out path needed to be determined.

A government-appointed commission – the so-called coal commission - has proposed phasing out all coal power by 2038 the latest, a target the government will implement in close coordination with the federal states. The government's plan includes support and compensation payments for structural changes in the coal mining regions and for job opportunities for coal miners and other employees in the sector.

This means, Germany will give up 43.87 GW of installed total capacity of coal power plants: 21.11 GW of lignite coal and 22.76 GW of hard coal. This equals 21% of today's total installed capacity. Today's coal capacity will be reduced to 17 GW by 2030 and then finally be phased out by 2038.

In 2019, Germany already shut down 1.02 GW of hard coal.

Lignite coal is still mined in Germany in open-pit mines with detrimental effects to the environment and small communities. Hard coal mining was terminated by the end of 2018.

Many experts argue that a natural phase-out of coal might happen even earlier, as rising CO₂ prices will make coal more and more expensive and technological progress will make RES cheaper and cheaper, therefore RES will just push coal out of the market.

As of today, production of hard coal energy costs between 6.27 and 9.86 Euro Cent (EuroCt/kWh) and of lignite coal between 4.59 to 7.98 EuroCt/kWh plus very high external

costs due to GHG emissions and pollution. Depending on the location, onshore wind costs between 3.99 and 8.23 EuroCt/kWh and offshore wind between 7.79 and 13.79 EuroCt/kWh, with extremely low added environmental and other external costs.

While coal power plants provide a stable and reliable base load supply, they are highly inflexible and cannot be adjusted to actual energy demand at short notice. This leads to the absurd situation, that on very windy days, wind parks have to be shut down as the power grid is blocked by inflexible fossil power.

Germany's lignite coal power plants are amongst the biggest GHG emitters and polluters in Europe. The coal exit will reduce Germany's CO₂ emissions significantly.

At the same time, the phasing out of will reduce hard coal imports, and thus reduce dependence on fossil fuel imports.

The government promised to enshrine the proposed coal exit into law by the end of 2019, but discussions on assistance for structural change in the four lignite coal mining regions are yet to be finalized. The law is scheduled to be passed in early 2020.

The future role of gas power plants

In order to maintain security of supply, (natural) gas will play an important role as bridging and back-up technology. Modern gas power plants boast relatively high efficiency rates, emit relatively less CO₂ and may adjust the output according to energy demands. By the end of 2019, Germany had 29.85 GW of installed gas capacity which produced 10.3% of all electricity generated.

Energy produced by gas costs between 7.78 and 9.96 EuroCt/kWh. The modern high tech gas power plants with highly flexible turbines are still a bit more expensive: up to 11.03 EuroCt/kWh. Environmental costs are less than half compared to coal. Germany has little gas reserves and imports 90% from the Netherlands, Norway and Russia.

With the development of efficient power-to-gas technology, Germany has already started to produce gas from renewables and the existing gas infrastructure will play an important role in storing and using gas produced by renewables.

The diversification of natural gas supply is currently ongoing. However, two opposing supply routes are subject to intensive geopolitical debates: The second direct gas pipeline to Russia (NorthStream II) is challenged for reasons of increased dependence on Russia, and the announced “alternative” import of liquified natural gas from the United States is challenged due its considerable negative environmental impacts due to the highly polluting way of its extraction in the US. Besides an entire new LNG infrastructure has to be set up in the first place, primarily in Northern Germany.

Further reading:

Net power generation in Germany (Fraunhofer-ISE), 2019, https://www.energy-charts.de/energy_pie_de.htm?year=2019

Energy Charts, Annual increase and decrease of net installed electricity generation capacity in Germany in 2019 (Fraunhofer-ISE) 2019, https://www.energy-charts.de/power_inst.htm?year=2019&period=annual&type=inc_dec

Commission on Growth, Structural Change and Employment (Coal Commission), Phasing out coal in the German energy sector. Interdependencies, challenges and potential solutions (BMU) 2019, <https://www.bmu.de/en/download/commission-on-growth-structural-change-and-employment>

Agora Energiewende 2019, https://www.agora-energiewende.de/fileadmin2/Projekte/2019/Kohlekommission_Ergebnisse/168_Kohlekommission_EN.pdf

Which type of power is the cheapest? Welche Art von Strom ist am günstigsten? 25 March, 2019 (available only in German), <https://www.quarks.de/technik/energie/welche-art-von-strom-ist-am-guenstigsten/>

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