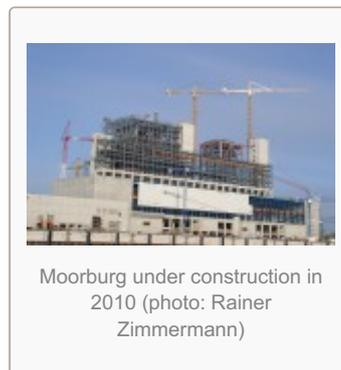


# Hamburg commits to fossil fuel beyond 2050

Jeffrey Michel

*Hamburg was the “European Green Capital of 2011”, but its climate ambitions are overshadowed by a new Vattenfall coal power plant, which will lead to three times higher CO<sub>2</sub> emissions than the city has targeted. The case of Hamburg illustrates the difficulties Germany has in making the transition to a low-carbon economy.*

Visitors to the city of Hamburg may be surprised to learn that this “European Green Capital of 2011” now hosts Germany’s second largest hard coal power station. The 1,640 megawatt (MW) Moorburg plant on the Elbe River will be commissioned in autumn 2014 by Vattenfall Europe to generate 12 billion kilowatt-hours (12 TWh) of electricity per year, nearly equivalent to the city’s total power demand.



The new power station is intended to remain in operation past 2050, when Hamburg has committed to reducing carbon dioxide emissions to 4 million tonnes (Mt). Moorburg will release twice that amount of CO<sub>2</sub> – up to 8.7 Mt annually. Hamburg’s total greenhouse gas emissions by mid-century could therefore reach three times the level originally targeted. That prospect was not taken into consideration when the city was selected for the 2011 Green Capital Award. There was no mention of Moorburg in the Expert Panel evaluation report, while the city’s Municipal Climate Act was specifically commended.

Industrial-scale installations may justifiably qualify as phantom facilities when municipal policies are compared, but Hamburg once had far greater climate ambitions. In Germany’s Upper House of parliament, its government voted in support of carbon capture and storage (CCS) under EU Directive 2009/31/EC. At that time, Moorburg neatly meshed with prevailing aspirations for a trans-European CO<sub>2</sub> pipeline network.

At the beginning of 2010, the regional newspaper Hamburger Abendblatt reported that the plant would be equipped for carbon capture after completion of CCS pilot testing in eastern Germany. While an implementation date was not set, Vattenfall declared that 60 million tonnes of CO<sub>2</sub> emissions from fossil fuel generation would be reduced by half within twenty years, and eliminated entirely by 2050. Moorburg had clearly been intended as a capture-ready plant under EU “decarbonisation” objectives. It was later determined, however, that no adjacent land had been reserved for an installation as large as an airplane hanger, which is needed to extract and compress flue gas CO<sub>2</sub>.

## Uprooting trees

The failure of the CCS installation is not the only problem the new plant has run into. Repeated scheduling delays and cost overruns have been compounded by environmental restrictions.

Dissipating the heat of combustion imposes immense cooling water demands. Original planning called for sluicing 64 cubic metres of water per second through the Moorburg plant, constituting about half the flow of the Elbe River. To avoid overheating aquatic ecosystems, restricted water withdrawal hours were imposed. Vattenfall ultimately redesigned the plant to use self-contained cooling towers. These closed-cycle evaporation systems diminish net plant power by about one per cent compared with flow-through cooling.

A CCS retrofit could boost cooling requirements by another 25 per cent, however. The grid output capacity would be diminished by nearly a third due to the power demands of CO<sub>2</sub> capture and pipeline compression. But the Elbe cannot be used anymore for cooling in any case. Elbe water withdrawal by the plant was prohibited by court order at the beginning of 2013. The increased temperatures of cooling system discharges would have diminished the survival rates of microscopic organisms within aquatic food chains.

Additional revenues had originally been expected from dedicating 650 MW of thermal capacity at Moorburg for heating 180,000 dwellings in the city of Hamburg. Deploying dissipated thermal energy would have raised coal utilisation from 46.5 per cent, solely for power generation, to 61 per cent for combined heat and power. Since the Moorburg site is on the southern Elbe shore, however, a 4.4 kilometre tunnel beneath the river – extolled by the chamber of commerce as the “artery” of the plant – would have been required to connect with the borough of Altona. Excavation would have necessitated uprooting 300 trees in greenway parks. Public opposition to the loss of city landscapes motivated Vattenfall to cancel the project. Instead, the company has now committed to building a new gas-fired plant in Wedel, to the west of Altona.

But this plan has run into another big obstacle: a city referendum in September 2013 revoked Vattenfall’s power grid concession, restoring municipal ownership of the grid at a price of about half a billion euro. The heat distribution network may also be taken over by the Hamburg Senate as late as 2019 for an additional 1.15 billion euro charge.

## **Monument**

The future of Moorburg is now highly uncertain. When first proposed, the Moorburg power station represented an advanced technological realisation. The necessary substitution of Elbe water withdrawal by hybrid cooling towers has since lowered plant efficiency. Water vaporisation from these structures now raises the danger of airborne Legionella microbes being wafted over nearby residential areas.

Moorburg will also not be used anymore for municipal heating. The abandonment of heat production has reduced coal utilisation and contradicted the environmental arguments originally made for constructing the plant. (A similar 533 MW power station in the Baltic city of Rostock achieves a coal utilisation figure of 62 per cent using combined heat and power.)

Decentralised power and heating plants could hypothetically be situated throughout the city to eliminate the plant entirely. However, this concept would only be cost-effective if heating services from Wedel could also be precluded. Under present circumstances, by contrast, additional greenhouse gases will be emitted from Wedel to the detriment of climate strategies. From that perspective, the city referendum has been a Pyrrhic victory.

The company now writes on its website that the plant output can be varied from 35% to 103% in response to varying amounts of renewable electricity on the transmission networks. The impression is conveyed that the plant is intended to serve as a backup power source for the increasingly wind-oriented northern power grid. It appears questionable whether the plant could pay for itself if it delivered considerably less electricity than originally planned, since it will not be delivering any – very lucrative – district heat at all.

Presumably, Moorburg will effectively be supplying a good deal of electricity to other places in Germany formerly drawing their power from local nuclear plants. Even if that takes place, however, power trading prices are now much lower than when the plant was designed. A study commissioned by Friends of the Earth (BUND) Hamburg predicted in 2007 that the Moorburg project would not be competitive under the EU Emissions Trading Scheme. Vattenfall has relinquished the two essential options – CCS and district heat – capable of lowering the climate risks of coal generation. If carbon emissions are heavily taxed in the future, and if renewable energies continue to diminish the market share remaining for conventional generation, the economic viability of Hamburg’s Moorburg power station will be seriously degraded.

For the present, however, the plant endures as a monument to the incompatibility of coal power with municipal climate strategies.

## **Editor’s Note**

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*He recently published on Energy Post an in-depth analysis of the challenges faced by the German Energiewende: [Can Germany survive the Energiewende?](#)*

*Michel, a graduate from MIT in the US, has also published extensively on the problems facing Carbon Capture Storage (CCS), see for example his report for the Air Pollution and Climate Secretariat in Sweden, [Lost Hopes for CCS](#), and this article on Energy Post: [CCS: Why the high hopes cannot be fulfilled](#).*

*This article was published originally [here on Acid News](#), a publication of the Air Pollution and Climate Secretariat in Sweden, and is republished on Energy Post in a slightly different form with permission from the author and the original publisher.*

*Michel notes that it is not clear yet where the coal will come from to be used in the Moorburg plant. Although the United States is increasing coal exports to Europe, most shipments consist of Appalachian metallurgical grades used for steelmaking. The 12,000 tonnes of steam coal required each day by Moorburg may be imported from Poland, Indonesia, South Africa, and Australia according to the Vattenfall website. Local environmental advocates suspect Columbia instead, where working conditions may be irreconcilable with German mining standards.*

*According to this [market analysis](#) from Merrill Lynch, global coal prices are expected to fall this year, possibly leading to greater use of coal in Europe's power sector. Last year according to the Fraunhofer Institute, German coal-fired power generation rose slightly – by some 7.7 TWh as against total German power production of some 630 TWh. Gas-fired power generation declined by 10.5 TWh.*