

The Knapsack I gas-fired power plant blazes with light against the evening sky. An impressive sight, but the power plant, which was commissioned in 2007, is not in operation.



Costly RUINS of the energy transition

Modern gas-fired power plants can play a useful role in Germany's future energy mix. But more and more *power plants* are standing idle and risk becoming ruins of investment.

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Photo: Oliver Tjaden Illustration: KircherBurkhardt Infografik

The problem:

- 1. For energy suppliers** it is often no longer worth operating their modern gas-fired power plants. While electricity from natural gas is causing losses in the millions, electricity from environmentally harmful coal is currently bringing in profits.
- 2. New gas-fired power plants** are hardly being built at all anymore, the investment is too uncertain. But renewables need flexible and environmentally friendly power plants as partners to balance out fluctuations in supply.
- 3. Some unprofitable** power plants are classified by the Federal Network Agency as important for the system. If decommissioning applications are rejected, plants must not be switched off. Operators are left with the costs.
- 4. Paradox:** To prevent a shortfall in supply, by 2040 an additional 50 gigawatts or more of guaranteed power plant capacity must be built. And emit as little CO2 as possible to meet climate targets.

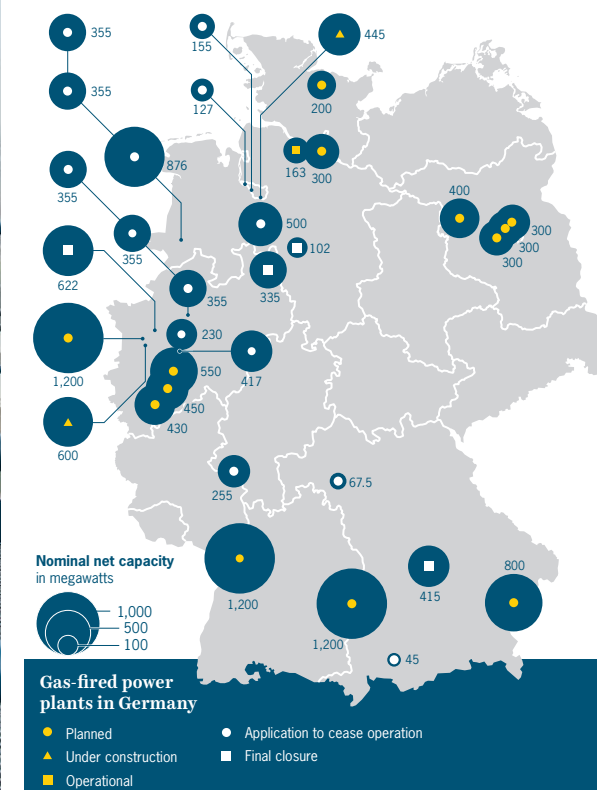


One of the cleanest power plants in Germany is not on the grid. Still, the team at Knapsack I keep it ready for operation.



Current gas-fired power plant projects and possible closures

Development of generation capacity: Additional gas-fired power plants in the near future with a secured electricity output of over 100 megawatts, and announced plant closures of at least 45 megawatts.



Source: energylitics, Bundesnetzagentur

We are no closer to the real aim of the energy transition, which is to reduce the carbon dioxide that is destroying the climate.

To get a picture of the situation faced by gas-fired power plants in Germany, you can study the statistics and pore over pages and pages of reports. Or you can climb up to the top of the 60-meter high chimney at the Knapsack II gas-fired power plant, which is standing idle in Köln-Hürth, and gaze westwards. Just a few hundred meters away, clouds of steam rise from the Goldenberg lignite-fired power plant, whose cornerstone was laid a century ago. In the foreground, the two chimneys of the Knapsack I gas-fired power plant tower up into the sky – without emitting a single puff of steam. Commissioned in 2007, the power plant is clearly not in operation. Knapsack II, which was connected to the grid only in June 2013, is also being put in “wet reserve.” This is the term used “when a power plant is not producing any electricity, but uses a lot of it,” says Thomas Krumm, technical director of the Knapsack power plant. Krumm says this with a bitter smile.

Photos: Oliver Tjaden (3) Graphics: KirchnerBurkhardt/Infografik

Despite the situation, the 24-strong plant team carry out their inspections in three shifts and monitor the processes in the control center.

The combined cycle gas turbine (CCGT) plants are kept ready for operation in order to be connected to the grid at short notice if they are needed. In the current year, this happened just once, for 14 days: in January and February the state-of-the-art Siemens turbine was running in Knapsack II. The plant has a capacity of 430 megawatts, “enough to supply a city like Düsseldorf with clean electricity. And Cologne, too,” says the engineer gesturing towards Knapsack I, which would have a capacity of 800 megawatts – if it was operating.

BAFFLING PHENOMENON

Thomas Krumm went to work for Statkraft, the Norwegian operator of the power plants, five years ago. He did this out of conviction. “We are a green company, and that makes me proud.” Krumm was there to experience the plant’s last few

Thomas Krumm, technical director of the Knapsack site, looks out from the 60-meter chimney of the Knapsack II gas-fired plant, which is currently in “wet reserve.”

good years. Between 2008 and 2010, Knapsack I was operated with up to 5,500 full-load hours per year, making it unquestionably profitable. In the fall of that year, the decision to build a second power plant seemed perfectly logical. “In retrospect, we have to concede that this was the wrong decision,” says Malte Schwoon, an economist at Statkraft. In the six months following its opening in June 2013, Knapsack II operated for just 410 full-load hours. “We underestimated the exponential growth of solar energy production,” says Schwoon. It’s the same story with many energy companies. Last year, the capacity utilization of German gas-fired power plants was just 17 percent.

The industry is thus left shocked and helpless in the face of a phenomenon that is perpetuated *ad*

“We are a green company, and that makes me proud.”

Thomas Krumm, technical director of the Knapsack power plant

COSTS

€64m

per year is lost by a modern gas-fired power plant with 400 MW and 5,000 operating hours.*

€60m

is generated by a comparable hard-coal power plant with 5,000 operating hours per year.*

67%

of companies do not consider it worth investing in high-efficiency gas-fired power plants due to the current framework conditions of the energy industry**



Block Fortuna, the future combined cycle gas turbine plant of public utility Stadtwerke Düsseldorf, will also have a visitor platform.



Block Fortuna construction site: The combined cycle gas turbine is scheduled to commence operations in 2016. The facade will feature a glass front (top).

absurdum by current climate policy, and which no one saw coming. Gas-fired power stations appeared to be the ideal way to bolster renewable energies. When the wind isn't blowing or the sun isn't shining, and to balance out daily peak loads, flexible gas-fired power plants are perfect for supporting the transition to renewable energy. They can be started up and connected to the grid in just a short time. According to the target announced by the federal government in 2010, by 2020 a total of 35 percent of Germany's electricity will come from renewable energy and greenhouse gases will be reduced by 40 percent.

The first part of the target is close to being achieved – in 2013, 23.9 percent of electricity produced in Germany came from renewable sources. Incentives and subsidies have already fulfilled their purpose: green electricity, subsidised by the state, can succeed in claiming its share of the market. This alone should be reason enough to celebrate. Yet we are no closer to achieving the real aim of the transition to renewable energy – to reduce the carbon dioxide which is

destroying the climate. On the contrary, carbon dioxide emissions have grown continually over the last three years. Lignite-fired power plants, the dirtiest and least efficient of all energy producers, accounted for a market share of 25 percent in 2013 – the highest it has ever been since 1990. Emissions trading should make this dirty electricity more expensive, but the market is flooded with emission rights. And the economic downturn in 2008 caused certificate prices to fall even further. To have any real effect on the situation, the price per ton of CO₂ would need to be between €30 and €40. Instead it is bobbing around at €3 to €6. As a primary energy source, gas is more expensive than lignite, whose true costs for the environment are impossible to calculate. Clean energy from gas is becoming increasingly unprofitable, while at the same time Germany is exporting more cheap electricity from coal than ever before. To make climate-friendly gas competitive again, the certificates need to become more expensive. “A low CO₂ price also calls into question the credibility of Germany's commit-

* Calculation based on EEX assumptions:
Base/Peak = €41/MWh, gas price = €26/MWh, EUA 10 €/t, amortization: 20a, interest rate: 8%
** Association of Municipal Utilities (VKU) survey among members in 2013.

ment to protecting the climate,” says Niklas Schinerl, energy expert at Greenpeace.

OPERATORS APPLY TO MOTHBALL PLANTS

Gas-fired power plants accounted for only a 10.5 percent share of the electricity mix last year. As a consequence, operators have applied for 18 units, with a total capacity equating to that of four nuclear reactors, to be mothballed. Hagen-based energy company Mark-E also applied to the Federal Network Agency to mothball its power plant in Herdecke, which was commissioned in 2007. However, in view of the security of supply in the regional grid, so far the application has not been approved. Günter Kleine, who is in charge of plant management at Mark-E, currently sees no prospects for the Siemens system from an economic point of view. The task, he says, is now to come to an agreement with the Federal Network Agency about the conditions under which it can continue to be temporarily operated – a protracted process which is especially

Photos: Stadtwerke Düsseldorf AG (3)

unsatisfactory for engineers. Kleine wants to see the high-performance turbine working at full steam. This has a capacity of 400 megawatts and produces electricity with an efficiency of 59 percent. State-of-the-art lignite power plants typically manage no more than 44 percent – not to mention the environmental costs. A large power plant that isn't being operated obviously rips a huge hole in the operator's finances. This situation causes losses of around €20 million per year for his company alone, not to mention the losses for partner Statkraft. Instead of working on the construction of newer, even cleaner power plants, Kleine is busy thinking about how he can keep the old charcoal kiln in the power plant park in good

“Feeding heat into Düsseldorf's district heating network plays a key role in the profitability of Fortuna.”

Rainer Träger, lead project coordinator of Block Fortuna, Stadtwerke Düsseldorf

TO OPERATE OR NOT

16

gas-fired power plants have been requested for full or partial mothballing by operators.

1,000

kg of CO₂ is emitted by a lignite-fired power plant per megawatt of electricity. A hard-coal power plant emits 700 kg and a modern CCGT emits only 350 kg.

43

gas-fired plants out of 294 were classified as system-relevant last year, and are not allowed to be taken from the grid.

working condition. When it decided to build the gas-fired power plant, Mark-E was following national policy, which championed electricity produced from gas as the ideal way to support the transition to renewable energy. Experts and expensive consultancies greenlighted its construction. However, given the resulting negative development of the energy market, “after two years, studies are usually not worth the paper they are written on,” says Kleine. Does this mean the dream of clean energy from gas is over?

CONFIDENCE BY THE RHINE

Not quite. The Knapsack I and Knapsack II plants will be put in “wet reserve” until further notice. The assumption is that EU policy will counteract the current development, and CO₂ certificate prices will rise again in the medium term. “Flanked by a cheaper gas price, we will then be able to get back into the market,” says Malte Schwoon. Around 50 kilometers down the Rhine, at public utility Stadtwerke Düsseldorf, they are quietly confident. Block Fortuna is the name of the “world champion of

power plants,” which is currently being built. It has been dubbed with this title because, with a power generation efficiency level of 61 percent, the combined cycle gas turbine plant will be the most efficient and powerful of its kind when it is connected to the grid in the fall of 2016. There is no doubt that it will be put in operation, as the Block Fortuna plant not only generates electricity (600 megawatts), but also produces district heating (300 megawatts). By combining the production of heat and electricity, the total efficiency of the power plant is increased to up to 85 percent. Feeding heat into Düsseldorf’s district heating network plays a key role in its profitability. Likewise, the ultra-modern combined heat and power plant (CHP) operated by WINGAS in Lubmin is also only profitable

“A low CO₂ price also calls into question the credibility of Germany’s commitment to protecting the climate.”

Niklas Schinerl, energy expert at Greenpeace

Employee Oliver Luda working in the pre-heating area of the Mark-E Herdecke gas-fired turbine power plant, which may be mothballed.

because it utilizes the waste heat created in the gas turbine. The plant is located exactly where the Nord Stream pipeline emerges from the Baltic Sea. Up to 55 billion cubic meters of natural gas arrives here annually, and must be heated before it can be transported any further. “The focus is on utilizing large quantities of heat,” says project manager Ralf Diez. Gazing from Knapsack towards Düsseldorf and Lubmin, the scene is tinged with melancholy. “We would have also preferred to build a combined heat and power plant,” says Malte Schwoon. “With our energy we could have supplied the entire neighboring chemical park.” But it already has a supplier, the lignite-fired power station Goldenberg.

The legislation is complicated and designed to promote CHP plants because their efficiency level is better for the climate. That’s the idea. At the same time, however, the legislator wants to prevent new CHP plants from being built purely for the purposes of pocketing the coveted subsidies. As a result, lignite is once again finding favor. The real aim – climate protection – is meanwhile being left by the wayside. ■

Photos: Rüdiger Nehmsow, Daniel Kurtzfeld



“We need market-based solutions”

Ludwig Möhring, managing director of WINGAS responsible for sales, says that the importance of gas-fired power plants in Germany’s transition to renewable energy must be recognized.

Mr Möhring, high efficiency gas-fired power plants are turning into unprofitable headaches for their operators. What’s going wrong?

Coal is currently driving out environmentally friendly natural gas. This is really a paradox when we think that we started the transition to renewable energy in order to protect the climate. The reality looks very different at the moment. CO₂ emissions in Germany have now risen for the second year running. If natural gas had been used instead of coal, we would have made far more progress with cutting our CO₂ emissions.

What has to change?

We need a clear commitment from politics stating that climate protection is at the heart of the energy transition. There is then no alternative to high-efficiency gas-fired power plants as the answer to supporting renewable energy. Unfortunately, the recent decisions by the government provide no indication of this commitment.

Could a capacity market be the answer?

I am not a supporter of state intervention. If it is not absolutely essential

for maintaining the security of supply, we should be very cautious about this. In the gas sector we are not fighting about a few additional operating hours per year during peak load times. Rather it is a question of enabling natural gas to once again make a major contribution to protecting the climate.

What could help the operators of gas-fired power plants?

There needs to be a return to the original aim of the energy transition, which is to protect the climate. If we are to place the focus on climate protection and competition on the market, then the necessary framework conditions have to be created. This could mean changes to emissions trading, or stricter emission regulations for the operation of power plants. At the present time, the United States is showing us how emissions can be effectively reduced by proactively setting emission limits. We can learn a lot from this. As natural gas is the only traditional climate-efficient energy source that can be sustainably used in the electricity supply, I am optimistic that politics will act accordingly in the medium term.