
# Jänschwalde/Cottbus-Nord opencast mines

Lusatian lignite is extracted, free of subsidies, in opencast mines. It is converted into electrical energy in the nearby power plants, in a safe, efficient and environmental friendly way.

**Lignite from the Jänschwalde and Cottbus-Nord opencast mines**

The Jänschwalde/Cottbus-Nord deposit lies in the federal state of Brandenburg and extends to the north-east of the city of Cottbus. At present, the second Lusatian lignite seam is being mined. In the Cottbus-Nord opencast mine, it is 10 up to 12 metres thick and in Jänschwalde up to 12 meter.

Approximately 9 million tons of run-of–mine coal is mined in Jänschwalde per year. The phasing out of Cottbus- Nord opencast mine to 2015 is running according to plan. Extraction capacities will fall from 7 to 4 million tonnes raw coal per year. Both mines supply the Jänschwalde power plant with a total of 60,000 tonnes lignite.

**Mining preparation and water management**

It is a prerequisite for safe opencast mining that the coal deposit is kept free from water. Hundreds of filter wells in the forefield of the opencast ensure that there is sufficient dewatering.

On the principle, minimum volumes are pumped out with a parallel feedback of water into the natural water cycle. In order to stabilise the regional water balance, a part of the pumped up water is cleaned and fed into the Spree and Neiße rivers as well as recognised valuable wetlands. To retain the natural the water table as much as possible in the vicinity of the opencast mine a subterranean wall was built which runs along the mine's southern and western borders of Cottbus-Nord and on the eastern side of Jänschwalde.

**Overburden removal and dumping**

The second Lusatian seam is covered by layers of sand, rock and clay. In the mining terminology, this is called overburden.

In Cottbus North the coal seam is only 45 m deep under this layer. In Jänschwalde opencast mine the overburden is up to 95 m thick. A bucket wheel excavator operates in the so-called in forefield of the overburden bridge (OBB) by pre-excavating.

A conveyor belt system is used to transport the masses of earth to the side of the opencast mine where the coal has already been extracted. Here a spreader deposits and shapes the relief for the future postmining landscape. More fertile soils are deposited on the upper layers.

Lignite is exposed with an overburden conveyor bridge, type F 60 – an equipment complex consisting of three highly efficient bucket-chain excavators, type Es 3750, and a more than 600-metre-long belt conveyor bridge. Conveyor bridges are among the biggest mobile technical equipment systems in the world. They enable the transport of overburden over the shortest route across the mine directly to the dump side where it is deposited.

Due to the relatively thin overburden layer, an overburden conveyor bridge of the type F 34 with an overall length of 300 metres is used at the Cottbus-Nord opencast mine.

A pre-cut operation is not required at the Cottbus-Nord opencast mine.

**Raw coal extraction and transport**

The coal excavators work directly underneath the overburden conveyor bridge. This is where lignite is actually mined using bucket-wheel and bucket-chain excavators in high- and deep-cut. In Jänschwalde opencast mine, the lignite, once mined, is transported over conveyor belts to the coal loading station and to the wagons of the Vattenfall-owned railways. Each train transports about 1,000 tons to the neighbouring Jänschwalde power plant.

**Postmining Landscapes**

Mining claims land and at the same time creates new land. Mining of lignite is always followed by recultivation of the mined- area. A great expanse of the area is afforested with indigenous tree species such as pine, oak, maple, alder and beech. Agricultural areas are cultivated by local agricultural companies.

In the postmining areas of Jänschwalde a renatured area is beeing created that is striking, new floodplains of the Malxe and a project "Restoring the Malxe to its original river course".

According to the plan the residual pit of Cottbus-Nord mine will be flooded.

The future „Cottbus Ostsee" – directly at the foot of „Bärenbrücker Höhe" – with its 1,900 hectare, will be the largest lake in Lusatia.

## Facts

**Jänschwalde opencast mine**

| | |
|---|---|
| 1976 Beginning of run-of-mine coal extraction | |
| 1978 Commissioning of the F 60, | |
| Overburden-to-coal ratio [m³/t]: | 9:1 |
| Recultivated until now: | 1,840 ha |

**Cottbus-Nord opencast mine**

| | |
|---|---|
| 1981 Beginning of run-of-mine coal extraction | |
| 1983 Commissioning of the F 34, | |
| Overburden-to-coal ratio [m³/t]: | 3:1 |
| Recultivated until now: | 400 ha |

### Run-of-mine coal quality in the Cottbus mining area

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| Calorific value: | 8,400 kJ/kg |
| Water content: | 52 % |
| Sulphur: | 1 % |
| Ash: | 12 % |

### Overburden removal

**Jänschwalde opencast mine**

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| Overburden conveyor bridge F 60: | 34,200 m³/h |
| Bucket-wheel excavator SRs 2,000: | 6,000 m³/h |

**Cottbus-Nord opencast mine**

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|---|---|
| Overburden conveyor bridge F 34: | 8,100 m³/h |

### Mining output Coal extraction

**Jänschwalde opencast mine**

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|---|---|
| Bucket-wheel excavator SRs 1,300: | 3,500 m³/h |
| Bucket-chain excavator ERs 710: | 1,400 m³/h |

**Cottbus-Nord opencast mine**

| | |
|---|---|
| Bucket-wheel excavator SRs 702/704: | 2,500 m³/h |
| Bucket-chain excavator ERs 500: | 830 m³/h |

Production
Lignite Mining & Generation
Vom-Stein-Straße 39
03050 Cottbus

**P** +49 355 2887 3050
**F** +49 355 2887 3066

info@vattenfall.de
www.vattenfall.de
**Vattenfall Europe Mining AG**

On site contact:
Astrid Hobracht
**P** +49 35601 5 7216
astrid.hobracht@vattenfall.de

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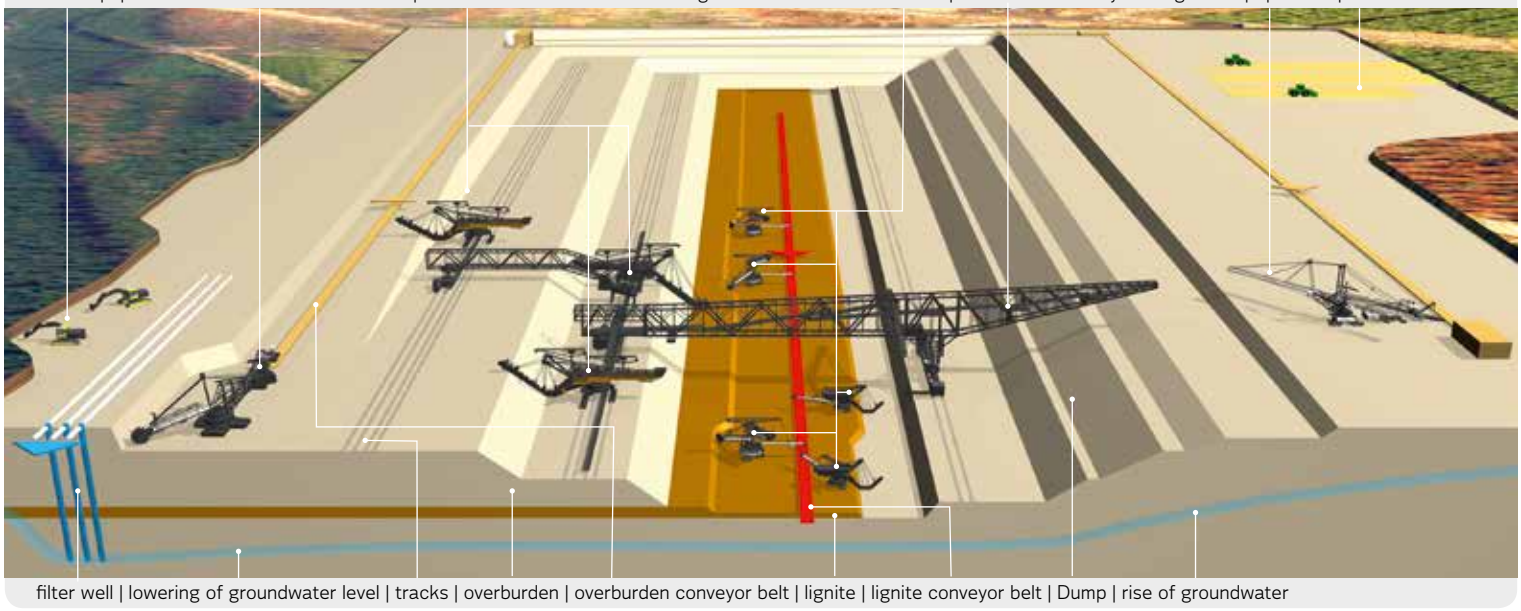
forefield | opencast mine forefield excavators | overburden excavators ◂ mining direction coal excavators | overburden conveyor bridge F 60 | Spreader | recultivation



filter well | lowering of groundwater level | tracks | overburden | overburden conveyor belt | lignite | lignite conveyor belt | Dump | rise of groundwater

# Energy from lignite

Jänschwalde Cottbus-Nord Energy Site

Jänschwalde
lignite-fired power plant

VATTENFALL

# Jänschwalde lignite-fired power plant

Energy means life. About a quarter of the electricity generation in Germany is based on lignite – the most important domestic energy source which is supplied directly to the nearby power plants.

**Site and overview**
The Jänschwalde power plant is located about 15 kilometres north of the city of Cottbus. As early as 1976, the foundation-stone for the lignite-fired power plant was laid in the immediate neighbourhood of the town of Peitz. Almost five years later, in 1981, the power plant with its first of the six blocks already started continuous operation and was completed with an installed total capacity of 3,000 megawatt in 1989. In the period from 1991 to 1996, all power plant blocks were refurbished with state-of-the-art environmental technology and thus prepared for an efficient continuation of their operation. The ongoing modernising program of all the steam turbines in the power plant will be completed by 2014. Thus the efficiency will be increased and the specific $CO_2$ emissions will be lowered.

**Coaling within the power plant**
At the Jänschwalde power plant, run-of-mine lignite from the nearby Lusatian opencast mines is converted into electricity. Lignite is transported by rail from the opencast mine to the power plant. Roughly 80,000 tons of lignite per day is needed to run the power plant at full capacity. As a reference about one kWh of electricity is generated from 1 kg of lignite.

**Combustion in the steam generator**
After the lignite is crushed and ground into fine pulverised lignite in coal mills it is fed into the combustion chamber of the steam generator in a pre-dried condition. The pulverised lignite is blown into the furnace through special burners in the presence of precisely dosed airflow. The heat generated during the coal combustion process is taken up by the feed water. This water is in kilometres of convoluting pipelines that are in the steam generator. After the steam generated from the water has been overheated, it is fed into the turbine under high pressure.

**Energy conversion in the generator**
At one end of the turbine shaft, electricity is produced using a generator. In this case the motion energy is transferred to the generator which converts it into electricity like the dynamo of a bicycle
Steam expands as it travels across each blade of the turbine. Its energy is converted into kinetic energy. As both the turbine and the generator are mounted to one single shaft; the rotating motion is transmitted to the inductor of the generator, which – like the dynamo of a bicycle – converts kinetic into electrical energy. The 3,000 revolutions per minute of the turbine are equivalent to 50 Hertz, the frequency of alternating current. The electrical energy is transmitted via overhead lines and at a voltage of 380 kilovolt from where it is fed into the high-voltage grid of the company 50 Hertz Transmission GmbH Regional energy providers and public utilities and distributes the electricity on to the consumers.

**Safe, reliable, flexible and according to the demand**
The power plant Jänschwalde operates predominantly at base load and thus guarantees the stability of the high-voltage grid. It also balances the fluctuations resulting from electricity generated from wind and sun. Each of the six power plant units can be operated flexibly and rapidly within an output range of 180 MW to 500 MW. With this the renewable energy act can be implemented that gives feed- in preference into the grid to the renewable sources.

**And what about the environment?**
A multitude of technical measures in the power plant are installed so that no matter what load the plant is operated at it emission always remains below the limits stipulated to protect the environment. Some of these measures are for instance electrical filters that remove dust by working on the principle of electrostatic loading. There is flue gas scrubbing in the desulphurisation plant where sulphur dioxide is transformed into gypsum using lime. The steam generators are also equipped with low nitric oxide combustion.

## Facts

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|---|---|
| Net efficiency | approx. 35-36 % |
| Live steam temperature | 535 °C |
| Reheat steam temperature | 540 °C |
| Live steam pressure | 169 bar |
| Reheat steam pressure | 43 bar |

## District heating from lignite

Part of the heat produced in the process of generating electricity is extracted from this process and used for district heating at the site, and for the cities of Cottbus and Peitz. This raises the fuel utilisation ratio in the power plant and separate heat generation for the consumers is no longer necessary.

## Environment

Environmental protection reduction of emissions by environmental technology on site (based 1990)
- by 95 % for dust
- by 94 % for sulphur dioxide
- by 48 % for nitrogen oxide

The specific emission (g/kWh) refers to net work including the equivalent for heat generated.

## Water and fish-farming in the power plant

More than 250,000 $m^3$ water per day from the opencast mine is treated in a state-of-the-art pit water purification plant. Once purified, the power plant keeps half of this water for industrial purposes. A high water quality has made it possible for years to farm fish here. The other half is fed into the Spree River to improve the regional water balance.


Production
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**F** +49 355 2887 3066

info@vattenfall.de
www.vattenfall.de
**Vattenfall Europe Generation AG**

On site contact:
Martina Weiß

**P** +49 35601 9 46 15
martina weiß@
vattenfall.de


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