LIGNITE – THE ENERGY TO LEAD

The Garzweiler opencast mine
RWE is an international leader among energy utilities. Its core business is the generation, sale and distribution of energy and heat. Under the umbrella of the subsidiary RWE Power AG, it has a workforce of more than 15,300 in power plants, opencast mines and factories producing the energy that Europe needs. RWE Power secures some 30% of Germany’s electricity supplies. On top, RWE Power builds and operates power stations to provide tailored-to-suit electricity and steam supplies for industrial customers.

Environmental compatibility, sparing use of resources, plant and industrial safety are crucial components in our corporate philosophy.

RWE Power backs the highest quality standards in operating its power plants. This is true not only of the ongoing improvement in efficiencies at existing power stations, but also of the development of modern, climate-sparing technologies. At our Grevenbroich-Neurath location, RWE Power is building another lignite-fired power station with optimized plant technology (BoA); commercial operations are set to start in 2011.

One of RWE Power’s focuses is on the Rhenish lignite-mining area, where we extract about 100 mill. tons of lignite every year. Most of this goes into the generation of electricity.
A FIELD FULL OF ENERGY

The Garzweiler opencast mine lies south of Mönchengladbach and measures a good 30 square kilometres. It has a headcount of over 1,750, including 150 apprentices. In the entire Rhenish mining area, RWE Power employs 11,000 people. To this total must be added many thousands of jobs in supplier companies and in the firms that benefit from the spending power of this workforce. The contribution made by lignite to tax revenue and to the economy is indispensable for the region.
If Rhenish opencast-mine technology has one symbol, it must be the bucket wheel excavator: the world’s biggest movable machine. Such colossi are just under 100 metres high and 240 metres long, weigh 13,500 tons and are operated by a crew of four.

The bucket wheel has a diameter of nearly 22 metres, which is equivalent to an eight-storey building. The excavator uses it to move 240,000 bank cubic metres of coal and soil a day – enough to fill up a football stadium 40 metres high.

The performance of this large-scale equipment is one reason why lignite has relatively low mining costs, so that lignite mining gets along without any subsidies.
Lignite can only be mined in opencast operations. This is because the earth layers above the coal seams consist in the main of gravel and sand, meaning loose soil. This does not permit the safe underground operations we know from pits in the Ruhr region.

On each of the six benches or levels in the opencast mine, a bucket wheel excavator is at work extracting the covering layer and the lignite. Kilometre-long conveyor belts transport the material and converge at a central collection point. From there, the lignite reaches the coal bunker, i.e. in the direction of the train-loading station and the power plant. The overburden – meaning sand, gravel and loess – is used to backfill already excavated sections of the mine. There, it is discharged by spreaders and forms the basis for the high-quality recultivation that follows next.
The opencast lignite mines in the Rhenish mining area secure around half of North Rhine-Westphalia’s electricity supplies. The coal is used in the nearby lignite-fired power stations and, starting next year, also in the new-build power plant BoA 2&3 at Grevenbroich-Neurath, the most modern and climate-friendly system of its kind in the world. It will exploit lignite’s energy content some one third better than the legacy power stations that are now being shut down. This means that the power station, with a price tag of over 2 billion euros, will save up to 6 mill. tons of CO2 while producing the same amount of electricity – a sound contribution to climate protection.
Before the lignite can be mined, the groundwater level must be lowered in the mine. Otherwise, its slopes would collapse under the pressure of the water.

This has next to no impact on the vegetation, however. Nearly everywhere in the Rhenish mining area, the groundwater has been so low that plants could not reach it anyhow. The plants draw their water from the loess soil, which stores it like in a sponge. Precautionary measures against drying out are only needed in one per cent of the surfaces, as in the meadows of the Schwalm-Nette nature reserve. To this end, RWE Power delivers many millions of cubic metres of well water every year. Infiltrations and discharges safeguard the water regime and preserve the wetlands worthy of protection. These measures are closely watched by the environmental authorities and conservationists and are regarded as an unparalleled success.

Much well water is also used to prevent dust from swirling up or to contain any dust blow-off in the opencast mine and on the mine rim.
TEN FACTS: LIGNITE ...

... is low-cost

Lignite is the only domestic energy carrier that is available in large amounts, needs no subsidies and can be supplied at competitive costs. Germany’s deposits will last for generations to come.

... makes for more independence

Secure supplies – a central theme for private and commercial or industrial energy customers. Today already, we are covering nearly three quarters of our energy needs with imported hard coal, natural gas and oil. Lignite goes a long way to make us less dependent on imported energy.
... sets standards

Lignite mining has set standards around the world in the recultivation of former opencast-mine areas. The Rhineland’s recultivation record is regarded as exemplary by the experts worldwide.

... is productive

Some 90% of the Rhenish lignite is used to produce electricity and district heating. All power plants have highly effective systems for the desulphurization, denoxing and dedusting of the flue gases.

Some 10% of the lignite is upgraded to make solid fuels for home and industrial customers, as well as filter coke.
... is secure

Thanks to the close ties between opencast mine and power plant, lignite-based stations offer an utmost in the way of security of supply. There are no transport risks.

... is a top performer

Lignite-fired power plants secure about one quarter of Germany’s power supplies. Rhenish lignite alone currently covers 13% of electricity needs. This makes it an important element in Germany’s energy mix, which also includes nuclear energy, natural gas, hard coal and renewable energy sources.
... secures jobs

Over 50,000 jobs directly and indirectly depend on lignite in Germany. RWE Power employs some 11,600 people in the Rhenish mining area, including 650 apprentices. On top of this come the workforces of the firms RWE employs and others that benefit from the spending power of these employees. The contribution made by lignite to tax revenue and to the economy is indispensable for the region.
... protects workers

Industrial safety is highly developed: the sector as a whole, including RWE Power’s operations in the Rhineland, reports 4.8 work accidents involving at least one lost shift per million hours worked, which is well below the average of German industry. All the same: each accident is one too many, and RWE Power is working in depth toward even better prevention.

... is becoming more efficient

Lignite-based power generation must become more climate friendly. To this end, RWE Power is investing billions in power plants for new-builds, modernization and research projects. This steadily increases the efficiency, i.e. the exploitation of the lignite. And the emissions of CO2 per kilowatt hour produced are falling.
... is working on its future

At the Coal Innovation Centre, the company is working on the components for future, more climate-sparing power stations: RWE Power is using a trial plant at the BoA unit in Niederaussem to bring the technology for CO2 flue-gas scrubbing up to market maturity, so that modern, commercial-scale power stations can be retrofitted after 2020.

The high-performance scrubber REAplus optimizes the capture of dust and sulphur dioxide from the flue gas. This helps keep the air clean and boosts environmental protection as well. In an algae-breeding plant, CO2 from flue gas is bound in biomass which, in a next step, is to be used as energy raw material or as point of departure for chemical products.
MAP OF THE MINING AREA
Rhenish lignite mining area

- Operational area
- Former operational area under recultivation
- Agricultural recultivation
- Forestry recultivation
- Water bodies
- Resettled sites
- Lignite upgrading plants
- Lignite-fired power plants
- Approved mining boundaries

Position: 01/2010
**FACTS AND FIGURES**

**Lignite mining and deployment**

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<tr>
<td>Germany</td>
<td>169,9 mill. t</td>
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<td>RWE Power</td>
<td>92,0 mill. t</td>
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<td>of which</td>
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<td>for power generation</td>
<td>81,8 mill. t</td>
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<td>for upgrading</td>
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**Recultivation (RWE Power’s share)**

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<tr>
<td>Total surface</td>
<td>213.2 sq km</td>
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<td>for agriculture</td>
<td>112.1 sq km</td>
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<td>for forests</td>
<td>81.5 sq km</td>
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<td>for water surfaces</td>
<td>8,0 sq km</td>
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<tr>
<td>other</td>
<td>11.6 sq km</td>
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Power generation in Germany (596.0bn kWh in 2009, source: BMWi, Arbeitsgemeinschaft Energiebilanzen)
Lignite (Rhineland)

Reach approx. 350 years
Overburden-to-coal ratio 5:1 (m³/t)

Research and development – Focuses

Boundary layer recognition for overburden/coal
Sensor-based diagnostic systems at conveyor belts
Online measurement process for quality assurance
Fluidized-bed drying with internal waste heat utilization (WTA)
High-performance scrubber REAplus
CO₂-flue-gas scrubbing
Utilizing biomass-bound CO₂
IGCC/CCS: combined-cycle power plant for virtually CO₂-free electricity generation with integrated lignite gasification, CO₂ capture and storage

Power from lignite

Installed capacity of the power plants¹ > 10,000 MW
Production¹ about 65.3bn kWh

¹) Gross
FURTHER INFORMATION

Paffendorf castle information center

Bergheim-Paffendorf, Burggasse

T: +49 / 2271 / 75120043

Permanent and temporary exhibitions as well as castle park with arboretum (Saturdays, Sundays and holidays 10 am-5 pm), bistro (daily)

www.rwe.com/schloss-paffendorf

Info material

Map of the „Energy Trail“ (the stages in energy production and recultivation, by bicycle and car), maps of trails, how to find the viewpoints, and brochures on opencast mines, power plants and research projects on T: +49 / 2271 / 75122010

Downloads at www.rwepower.com/mediencenter and www.rwepower.com/schulinformationen
Useful links

www.braunkohle-forum.de
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