Welcome to Niederaußem Power Station and Coal Innovation Centre

Tilman Bechthold
Power Station Manager
Niederaußem Power Station

- Gross power capacity: 3,949 MW
- Net power capacity: 3,680 MW
- Net efficiency: 31% to 43%
- Net generation: 27 TWh/a
- Consumption of lignite: 30 Mio. t/a
- Number of units:
  - 150 MW: 2
  - 300 MW: 4
  - 600 MW: 2
  - 1,000 MW: 1
- Start of operation: 1963 - 2003
- No. of employees (FTE): ca. 750

Located in Bergheim-Niederaußem

1 after completion of retrofit of units G/H
2 based upon an average of 7,500 h/a
Exit from Nuclear Power in Germany results mid-term in even higher Need for Imports and New Built

Forecast of Electricity Generation by Fuels after Exit Decision

- Imports up to 25 TWh
- Δ45 GW

Source: RWE Power
CO₂-balance of gas-fired P/S deteriorates significantly taking into account indirect emissions

Indirect emissions mainly result from:

- Upstream business / gas production
- Transport

Source: Calculations by RWE; Wuppertal Institute; Gemis 4.2 (Öko-Institute 2002) Fichtner (2001)
RWE’s Strategy for CO₂-Reduction

Today

- P/S-Renewal
  - Continuous renewal of existing power station fleet

Tomorrow

- Efficiency Improvement through new Technology (WTA¹, 700°C-Techn.)

The day after tomorrow

- CCS (Carbon Capture & Storage) Pre- and Post Combustion

Implementation of a CO₂-Infrastructure

Replacement of Oil and Gas;
“Secondary-Energy” to support Flexibility in Electricity Market

¹ WTA = fluidized-bed drying with internal waste heat utilization
Innovation Projects linked to Unit K (BoA)

- **WTA®-Prototype Plant**
  - in operation since 2008
  - Improvement of Efficiency

- **CO₂-Scrubber Pilot Plant**
  - in operation since 2009
  - Basis for CCS/CCU

- **REAplus Pilot Plant**
  - in operation since 2009
  - Reduction of SO₂-/Dust

- **Dream Production**
  - Operation started in 2011
  - Synthetics made from CO₂

- **Algae Production**
  - In operation since 2008
  - CCU (biological)

- **R&D-Cooperation / BRAIN**
  - In operation since 2010
  - CCU (Biotechnology)

*Further project „CO₂RRECT“ will be implemented in autumn 2012*
WTA\(^1\) Pilot Plant at Niederaußem PS

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Raw lignite throughput:</td>
<td>210 t/h</td>
</tr>
<tr>
<td>Dry lignite output:</td>
<td>110 t/h</td>
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<tr>
<td>Fuel portion of BoA:</td>
<td>~ 25%</td>
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<td>Increase in efficiency:</td>
<td>~ 1 %-pt</td>
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<tr>
<td>Investment volume:</td>
<td>€ 45 mill.</td>
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<tr>
<td>Commissioning:</td>
<td>mid 2009</td>
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\(^1\) WTA = fluidized-bed drying with internal waste heat utilization

CO\(_2\)-emissions of the BoA-Unit can be reduced by some 300,000 t CO\(_2\) per year by operation of the WTA-prototype plant.
**CO₂-scrubbing pilot plant in Niederaußem**

### Key data of pilot plant:
- **Location:** Niederaußem Power Station, BoA-Unit
- **CO₂ capture rate from flue gas slipstream:** 90 %, ~ 300 kg CO₂/h
- **Height:** ~ 40 m, area: ~ 15 m x 5 m
- **Commissioning:** mid-2009
Main components:

Countercurrent module: Coarse spraying level for pre-separation

REAplus module: Turbulent reaction bed for the main separation process

Spray tower module: Fine spraying level for fine separation

Mist-eliminator module: Coarse-droplet separation

Wet precipitator module: Fine-droplet separation and aerosol collection

Sump module: Gypsum formation reactions (oxidation und crystallization)
Options for utilisation of CO₂ (CCU)

- Direct Utilisation
- Chemical Products
- Chemical Energy Storage
- Biology
- Biotechnology

Power Station

CO₂-Srubber

Flue gas

CO₂

Flue gas

CO₂

CO₂

CO₂
Project „Dream Production“ – a first milestone of chemical CO₂ utilisation

Partner: RWE Power, Bayer, RWTH Aachen
Budget: Total budget 8.7 mio. €, thereof 4.7 mio. € by BMBF
Duration: 3 years, start in May 2010
CO₂-Conversion with Mikroorganisms

Niederaußem Power Station

Flue gas

Microbial CO₂-Conversion

Direct utilisation of biomass
Conversion of biomass

Chemical raw products
Special Products

Production of Biomass

Production of Chemicals

Energy
Algae cultivation for utilization of CO$_2$

**Motivation**

- Micro-algae grow faster than land plants and therefore bind more CO$_2$.
- Micro-algae can be industrially cultivated in photo bioreactors. Locations can be used, where farming is not possible.
- The CO$_2$ needed for growth can originate from flue gas from power plants. Separation of the CO$_2$ from the rest of the flue gas is not necessary.
- The produced micro-algae biomass has to be converted into utilizable products (like fuels or biogas).
Lignite-fired power plant with optimized plant technology (BoA)