The Role of Coal: How to Overcome Challenges for Innovation

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Coal as integral part of future EU energy mix: 80% reduction of CO$_2$-emissions of electricity generation by 2050 achievable*  

- Coal and nuclear cost-effective  
- Wind with largest potential of renewable energies  
- CCS, Nuclear and Renewables as low-CO$_2$ options for generation  
- Reliable supply of coal and uranium  
- Integration of intermittent generation into electricity system  

* Compared to 1990
First Challenge: support an increasing share of fluctuating renewables by coal-fired power plants

⇒ Ensure sufficient and flexible reserve capacity

In a 2050-scenario with 80% RES, 270 GW conventional reserve capacity are needed to bridge calms.

Economic incentives indispensable to ensure sufficient capacity.

Energy storage systems can only serve as short-term buffer.

Load gradients of new-built coal-fired power plants are high enough to provide the flexibility needed to support intermittent generation.

Source: ECF, Roadmap 2050: A practical guide to a prosperous low carbon Europe 80%-RES Scenario, 1) In 2050 incl. CCS
New coal-fired power plants are flexible partners for renewable energies: support new-builts

Comparison of flexibility between new and old lignite-fired power plants

Graphs are showing how fast different types of lignite-fired power plants can decrease active power: the faster a generation facility can decrease its active power and increase it again, the more flexible it is
RWE Power’s Goal for CCS Development
Efficiency enhancement

Specific CO₂ emission

- Past - without lignite pre-drying -
  - 150 MW
  - 300 MW
  - 600 MW

Status quo:

- 40%
- > 90%

Goal:

TBK with CCS

Future
Power plant with WTA-technology

- 43%
- 47 - 49%
Efficiency increase through RWE's fluidized-bed drying process with internal waste heat utilization (WTA®)

WTA prototyp at Niederaussem:
- WTA technology (fluidized-bed drying with internal waste heat utilization)
- Efficiency increase in new lignite-fired power plants by some 10% (+ 4%points)
- Own development of RWE
- Internationally successful marketing
- Dry lignite-fired power plant with > 47%

Performance data of the prototype:
- Raw-coal throughput 210 t/h
- Dry-coal production 110 t/h
- Fuel share of BoA 1 ~ 28%
- Efficiency increase of BoA 1 ~ 1.4%-pts
CO₂ scrubbing pilot plant: making coal-based power generation more climate-friendly

- Development targets:
  - Applying known gas-scrubbing technologies to power plant flue gas
  - Reducing energy requirements to efficiency losses <10% points in the power plant

- CO₂ capture rate: > 90% (app. 300 kg CO₂/h)

- Project partners: Linde and BASF

- RWE Power budget: €9 mill.

- Funding by the Federal Ministry of Economics and Technology (BMWi)

- In operation since July 2009
Research and Development - Coal Innovation Centre:
Join forces for the sake of climate protection

**High-performance scrubber**
REAplus: optimized flue gas desulphurization and dust collection (test plant; since 2009)

**WTA plant**
Predrying of lignite with waste heat utilization, resulting in higher efficiency and lower CO2 emissions of electricity generation (prototype; since 2008)

**Algae plant**
CO2 binding by microalgae (pilot plant; since 2008)

**Biomass stove**
Distribution of 30,000 wood-saving, climate-sparing cookers in Zambia (sponsorship project; since 2009)

**CO2 scrubbing**
Capture of the CO2 contained in the flue gas using a scrubbing solution (pilot plant; since 2009)

**White biotechnology**
Conversion of CO2 to biomass or feedstock by microorganisms (laboratory; since 2010)

**Catalysis**
Use of CO2 from flue gas cleaning for the production of synthetic material (laboratory; since 2010)
Coal is an integral part of a broad and balanced energy mix in Europe - Summary

- Coal can cost-efficiently contribute to EU objectives for climate protection:
  - As back-up capacity for renewables
  - With power plant renewals/modernization and increases in efficiency
  - By R&D for and implementation of Clean Coal technologies (CCS/CCU)

- To support innovation in coal technologies, political promotion is needed in the EU and its Member States:
  - Non-discrimination of coal in legislation on climate protection
  - No exclusion of coal in R&D programmes
  - Extension of Member States’ option to 2020 to cover 15% investment costs of capture-ready plants
  - Promotion of CCS demonstration programme and CCS infrastructure, also by including it in the energy infrastructure package
  - Joint action for public acceptance of coal