Innovative Process Technology for Refining Lignite – R&D needs

IBI
Innovative Braunkohlen Integration in Mitteldeutschland
(Innovative Lignite Integration in Middle Germany)

17th European Round Table on Coal
Horizon 2020: best use of fossil fuels
Brussels, June 6th 2012
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Topics

Opportunities for Refining Lignite

- Stable price for lignite
- Increasing national added value in Europe
- Using carbon footprint method, lignite seems to be better than natural gas with regard to CO₂ – equivalents
- Value chains show higher efficiency than one technique alone
- The conversion of lignite to chemicals enables reasonable integration of renewables

Needs

- Development of value chains with new technologies
- Chemical parks as technology bases for testing (demonstration plants)
- Guaranty in planning
In the Long Term only Lignite will be a price stable and available Feedstock

Ref.: www.kohlenstatistik.de
Increasing National Added Value in Europe has an Effect on Growth and Employment

Naphtha-Cracker

Propylene

Lignite to Olefines

Ref.: BASF
CO₂ Emissions for the Production of Hydrogen from Lignite and Natural Gas

The comparison is based on a 100 % conversion from lignite or natural gas to hydrogen.
ibi-Value Chain and Projects
Possible reduction from about 4.4 to < 2.1 kg CO₂/kg hydrocarbon (using the whole value chain instead of only gasification)

Lignite is too precious just to be burnt!
Innovative concepts for making the most of lignite.
Need to develop new integrated Technology Parks at Chemical Sites for testing Value Chains

- **lignite**
  - Expert system deposit exploration: €5 m
  - Demonstration plant lignite mining: €10 – 15 m

- **media**
  - Demonstration plant lignite processing: €25 m

- **CO**
  - Small-scale plant catalytic cracking and reactive extraction: 2x €15 m

- **H₂**
  - Demonstration plant gasification: €10 m
    - HP-Pox small-scale plant: €5 m
    - SNG*1: €10 m

- **CO₂**
  - Oxo-synthesis: €5 m
  - Coal liquefaction: €15 m

**Total sum**: €160 m

*1 Synthetic Natural Gas
Future Needs for Research

- Development of value chains in lignite conversion to enhance process efficiency (small-scale and demonstration plants)
- Integration of renewable energies
- Development of flexible power plants, gasifiers and downstream processes considering fluctuating renewable energies
- Use of chemical parks as technology bases for investigating the synergies of value chains with integration of renewables (system of building blocks of small-scale and demonstration plants)
- Development of value chains for coal to chemicals as a part of Horizon 2020
- Bundling of lignite research and development in the EU
Lignite is too precious just to be burnt! Innovative concepts for making the most of lignite.

Thank you very much for your attention!
The use of lignite for chemicals enables the integration of renewable energies!

The use of lignite produces CO$_2$. Renewable energies show different capacities (wind, solar). How can excess energy be used? How can a lack of energy be balanced out?

Examples:
1.) Inverse SOFC: Production of H$_2$/CO from CO$_2$ and H$_2$O
   - Integration in methanol production
   - Syngas chain and chemical usage is necessary

2.) Electrolysis of H$_2$O: H$_2$ use for hydrogenation reactions
   - e.g. aromatics to cycloalkanes

3.) Combined cycle produces electrical power if renewables are weak or it produces syngas in the case of a low electrical power demand
   - Syngas chain and chemical usage is necessary