Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08999, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08999
EGU General Assembly 2008

UCG-CCS - An economic and sustainable Approach for future Energy Generation?

T. Kempka (1), R. Schlüter (2), E. Kunz (2), N. Golz (2) & T. Fernández-Steeger (1)

(1) Department of Engineering Geology and Hydrogeology, RWTH Aachen University, Germany (kempka@lih.rwth-aachen.de, fax +492418092280)
(2) DMT GmbH, Essen, Germany (ralph.schlueter@dmt.de, fax +492011721971)

Due to the continuous decrease of coal production and envisaged phasing-out of subsidized hard coal mining in 2018, the management and possible utilization of unmined coal seams will be a major task in Germany. The same applies to many other countries world-wide. Especially for countries with limited resources of other fossil fuels and in particular hydrocarbons, sustainable utilization of available deposits must be a continuous concern and aim. Substantial benefits can be gained from a system which provides economical, safe, controlled and environmentally friendly energy production combined with reduction of greenhouse gas emissions.

In-situ coal conversion, generally addressed as underground coal gasification (UCG), is a technique that has been investigated and tested for several decades. While UCG was considered an environmental risk due to potential groundwater contamination for a long time, in recent years the advantages have come into the focus: no hazards from mining, no disposal of ash or slurry, emission reductions and maximum utilization of resources that cannot be mined economically. Scientists have learned to constrain environmental hazards by new methods of UCG process control and an improved site selection. A current development is the connection of UCG with CO_2 storage into the newly generated cavities. In recent years, both ideas UCG and CO_2 capture and storage (CCS) have led to intensified research work and political activities in many countries.

Remarkable hard coal reserves are available in most Middle-European countries, but

their excavation is uneconomic resulting from deep deposits or low coal quality. In consideration of deposit depths, about 50 % of German coals are located below 1200 m and therefore not economically mineable with currently known excavation techniques. Application of UCG in coal deposits below these unmineable depths could offer additional 300 years of supply at the current level of consumption in the United Kingdom (UK) and increase the total coal reserves of the United States (US) up to 400 %.

Especially emerging countries depend on utilization of coal to ensure energy supply for their growing industries. This will lead to a doubling of CO_2 emissions resulting from emerging industries in China, India and other developing countries between 1990 and 2050. The substitution of fossil fuels by non-emissive renewable energies will not be possible in the near future. Their share in the global energy market will only achieve 22 % in 2050. Here, a combined UCG-CCS technology can provide a promising long-term option.

Applying the methodologies and procedures addressed in this study therefore can foster several major economic and environmental benefits:

- Reduction of greenhouse gas emissions resulting from energy generation by coal combustion.
- Economical production of environmentally friendly energy from unmineable coal seams.
- Reliable evaluation of options for sequestration of CO_2 in gasified seams.
- Optimized management and utilization of coal deposits.
- Additional revenues from CDM (Clean Development Mechanism) projects.

Both, present UCG and related CCS technologies, require further investigation in order to achieve an economic and sustainable implementation.