

Concept Note

Workshop on International Exchange of Experience in Underground Coal Gasification Technologies (UCG) and Sustainable Energy Development

Almaty, Kazakhstan
12-13 November 2007

1. Brief description

Coal will continue to be the largest energy source in many countries with economies in transition. Discussions at 15th session of the Commission on Sustainable Development (CSD-15) underlined the importance attached to clean coal technologies. One of these technologies is underground coal gasification (UCG) technology, which would enhance flexibility in the transition to a low-carbon energy economy. Some respects of UCG technology remain at an early stage of development, with further research and development required. Uncertainties remain with respect to technical, economic, and regulatory aspects.

The Division for Sustainable Development, DESA, together with the Joint Stock Company “TuranAlemBank” will hold a capacity building workshop in Kazakhstan, from 12-12 November, which will bring together the representatives of research institutes, industry organizations, and government agencies working to advance the knowledge of UCG options. The primary objective is to elaborate and explore the potential contribution of UCG to sustainable energy development in Kazakhstan and other Central Asian countries.

The capacity building and information exchange is intended to facilitate understanding of the potential of UCG to contribute to sustainable development goals, particularly in the areas of energy and climate change. Participants will discuss potential for development and adaptation of advanced UCG technologies to be introduced in the region with appropriate coal reserves.

2. Background

Combating climate change will require de-carbonizing the global economy, with a leading role assigned to clean energy technologies such energy efficiency and renewables. There is general agreement that for the foreseeable future – at least the next 40 years or more – fossil fuels will continue to meet around 80 per cent of global energy needs, even as the share of renewable energy grows rapidly, albeit from a low base (IEA, 2004).

Underground Coal Gasification (UCG) is a gasification process applied to non-mined coal seams, using injection and production wells drilled from the surface, which enables the coal to be converted in situ into product gas. Several existing in the world units have produced commercial quantities of gas for both chemical processes and power generation. The raw UCG gas contains CO₂ in concentrations that vary depending on process conditions and the choice of oxidant. The gas is produced under pressure and at a moderate temperature, and easily lends itself to CO₂ removal by a range of standard methods, with low energy penalty

and at a relatively low cost. Captured and removed, CO₂ can be permanently stored (or sequestered) in the underground storage zones created by coal extraction in the UCG operations. The energy penalty and relative cost of CO₂ re-compression and sequestering are comparatively low.

As in conventional Integrated Gasification Combined Cycle (IGCC), UCG gas can be used to generate electricity with a power island efficiency as high as 55%, and with the overall efficiency of UCG-IGCC process reaching 43%. These efficiencies translate into very low rates of greenhouse emissions per unit of net power generated.

Kazakhstan contains Central Asia's largest recoverable coal reserves, with 38-39 billion tons of mostly low quality bituminous coal. Almost 85 percent of the country's power generation comes from coal-fired plants located in the northern coal producing regions while in South Kazakhstan there is a lack of available own fuel resources and shortage of electricity. Significant air pollution results from the use of low quality coals, lack of emission control equipment at the thermal power plants, and overall technical inefficiency of the whole technological process. Reduction of the emissions can be achieved not only through the use of alternative sources of energy but also by the introduction of clean and energy-efficient technologies in power engineering, for example change from solid fuels to the more environmentally friendly gaseous ones.

In chemical manufacturing processes such as Fischer-Tropsch syntheses and production of synthetic methane or fertilizers, CO₂ removal is a routine unit operation. Permanent storage of CO₂ in the UCG-created permeable zones and the other sinks will significantly reduce greenhouse emissions of the overall process, from the initial coal conversion right through to the end product.

The Government of Kazakhstan formulated its new technical policy in the area of energy sector development, which includes the development of new advanced technologies and techniques to ensure sustainable energy sector development, including environmentally friendly coal power plants. Taking into account the deficit of electricity in the South Kazakhstan but at the same time availability in this region of Nizne-Iliyskiy coal basin, which cannot be mined by conventional methods, the Government of Kazakhstan is considering other possible ways to utilize Nizne-Iliyskiy coal. Against this background Joint Stock Company "TuranAlemBank" is prepared to conduct a study of potential implementation of UCG technology.

3. Capacity building and information exchange

Under this project it is proposed to co-organize a workshop to bring together representatives of research institutes, industry organizations, and government agencies working to advance the knowledge of UCG options for developing and countries with economy in transition. The primary objective is to elaborate and explore the potential contribution of UCG to sustainable energy development in Kazakhstan and other Central Asian countries. The issues to be addressed include:

- Economic and technological issues;
- Legal and regulatory frameworks for UCG;

- Addressing environmental and safety concerns;
- Development of UCG technologies and opportunities for technology implementation in Kazakhstan and other Central Asian countries.

The Workshop will be attended by 30 participants of Governments, Industry, Research Centers, Academia, and NGOs from Australia, Canada, China, India, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan and USA as well as representatives UN DESA, UNDP (Kazakhstan).

4. Expected project outcomes

The capacity building and information exchange is intended to facilitate understanding of the potential of UCG to contribute to sustainable development goals, particularly in the areas of energy and climate change. Participants will discuss potential for development and adaptation of advanced UCG technologies to be introduced in the region.

5. Beneficiaries

The immediate beneficiaries of the project will be the following:

- Senior Government officials who are responsible for strategic planning for energy for sustainable development, R&D of new clean coal technologies, formulation and implementation of national energy action programmes;
- Energy and environmental experts who will become acquainted with the latest developments of underground coal gasification technologies;
- Representatives from industry and other stakeholders who will gain information on the development and application of underground coal gasification technologies and insight into the technical, economical and regulatory challenges that still need to be overcome.