SUMMARY AND PROJECTS UNDER UCG

Conclusion: Today, high prices of oil and gas and uncertainties about political stability in most of oil producing countries, have renewed interest in all kinds of fuel. A renewed interest in coal gasification is therefore not surprising. Furthermore, hydrogen is now a welcome by-product because of the current interest in alternatively fueled vehicles. UCG is potentially the most important clean coal technology of the future with worldwide application. Ultimately, it could be a substitute for deep mining coal for power generation use.

Applying improved UCG technology to gasify deep, thin, and low grade coal seams could vastly increase the amount of exploitable reserves. The coal could be converted to gas for a variety of uses and emissions of sulphur, nitrous oxides and mercury could be dramatically reduced. UCG could increase recoverable coal reserves by as much as 300 to 400 percent. Another benefit of UCG is that hydrogen accounts for nearly half the total gas product which can be separated and actively used as automotive fuel or as feed-stock for the Chemical Industry.

Countries are turning to UCG to fully utilize their coal resources in an economically viable and environmentally acceptable manner. Using UCG technology even without a carbon-capture-and-sequestration plan could also be eligible for carbon credits.

10. Summary: Underground coal gasification (UCG) involves injecting steam and air or oxygen (O2) into a coal seam from a surface well. The injected gases react with coal to form a combustible gas which is brought to the surface in a production well, cleaned and used as a fuel or chemical feedstock. A cavity is formed as the coal burns and the roof is allowed to collapse. This process results in lateral growth of the gasifier in the seam and is allowed to continue until the quality of the product gas declines. When this occurs the seam is re-ignited at a new location further along the gasifier. Once the coal within the underground gasifier has been exhausted, new injection and production wells are drilled alongside the exhausted gasifier and the process is repeated.

UCG has the potential to exploit coal resources which are either uneconomic to work by conventional underground coal extraction, or inaccessible due to depth, geology or other mining and safety considerations. The successful development of UCG will not only depend on advances in the use of technology but also on demonstrating that a clean energy can be produced without detriment to the
environment. As a method of exploiting coal, UCG represents a substantial environmental improvement on the combination of coal mining and surface combustion of coal.

The Underground Coal Gasification (UCG) Process-

Process Wells (the collective term for the injection and production wells in a UCG project) are drilled into multiple coal seam/s.

The injection wells are used to feed a pressurized oxidant such as air or oxygen/steam into the coal seam.

The production wells recover the product gases.

The process wells are connected within the coal seam by the linkage of low hydraulic resistance pathways that allow production and movement of the syngas.

At the surface the syngas is converted to Methane and then DME (Dimethyl Ether), if required, in a small chemical processing plant or for any other use.

UCG vs Surface Gasification-

UCG differs from above-ground gasification in a number of ways:

Coal is not mined and chemical processes all occur in situ in the virgin coal seam/s.

Process water for gasification usually comes from the coal itself.

No ash or slag removal and handling are necessary since they stay underground.

Production cost of Methane or DME is far lower using UCG than from the conventional mining and processing of coal to produce Methane or DME.

11. Projects of Underground coal gasification (UCG): As discussed, UCG will develop more global reserves using in-situ conversion of stranded coal deposits into power, fuels, chemicals and other products. Nearly 85% of known coal reserves are unmineable with surface mining techniques, but UCG is producing fuels and hydrocarbon feedstock today from unrecoverable coal deposits.

Countries are turning to UCG to fully utilize their coal resources in an economically viable and environmentally acceptable manner. Using UCG technology even without a carbon-capture-and-sequestration plan could also be eligible for carbon credits.
In the US, BP and GasTech Inc. are developing an UCG demonstration project that will test GasTech’s technology in the Powder River Basin that will be followed by a commercial-scale UCG project. BP and Ergo Energy Technologies will cooperate in UCG projects using Ergo’s expertise in developing once unrecoverable coal through its proprietary in-situ technology.

BP also signed with Lawrence Livermore National Lab to cooperate in UCG technology development and projects, addressing carbon management to evaluate CO2 storage feasibility; environmental risk assessment/management; and numerical modeling of UCG processes.

India sees coal gasification as a major energy source for achieving the country’s economic growth, and anticipates the technology contributing as much as 9% to 10% to the country’s domestic energy needs over the next five years. India looks to utilize its vast coal reserves, which are the forth-largest reserves in the world, to reduce dependency on oil and gas imports. Given its growing demand, UCG will be used to tap India’s coal reserves that are difficult to extract economically using conventional technologies.

South Africa is at the forefront of research in using lower-grade coal for power generation. Eskom’s UCG pilot plant at its Majuba power station in Mpumalanga uses UCG syngas to fuel the station’s boilers. A proposed $3 billion, 2,100-MW IGCC power station will receive syngas from an adjacent commercial-scale UCG project.

Construction is under way on China’s first UCG project in the Northern Inner Mongolia Autonomous Region. The $112 million project is a joint venture between Hebei Xin’ao Group and China University of Mining and Technology. The project will produce 1.5 MMcmd of syngas and yield 100,000-tpy of methanol, as well as generate 32.4 million kWh/year of power.

Vietnam Coal and Minerals Corp., Marubeni and Linc Energy will use UCG technology to develop 30 billion tons of bituminous coal reserves in the Song Hong (Red River) Delta for power generation. Marubeni initially provided $100 million to explore the area.

Cougar Energy UK is also developing a 400-MW Pakistani power project with the country’s Sindh Coal Authority that will use UCG to gasify Thar coalfield reserves.

Alberta is playing host to a deep underground coal gasification demonstration project. The Canadian province claims the demonstration is among the first of its kind in North America and is possibly the deepest underground coal gasification ever conducted in the world. The Government of Alberta, through the Alberta Energy Research Institute, is providing $8.83 million (US$6.7 mn) to the $30 million (US$23.6 mn) project with Swan Hills Synfuels of Calgary. Swan Hills expects the project to demonstrate the ability to manufacture synthetic gas from Alberta’s coal resources, with the future potential of using the coal seams for carbon capture and storage.