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Clean Coal: Underground Coal Gasification in Alberta

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Summary
Alberta, Canada will be the first location in North America to extract energy from underground coal gasification, a clean coal initiative. This is an in-situ process using salt water and oxygen mixed with underground pressure and temperature to create a synthesis gas (primarily carbon monoxide and hydrogen) which, once refined, can be used in a manner similar to natural gas.

The process is more environmentally friendly as it does not use or come in contact with fresh water supplies and there is minimal surface disturbance. There is also a possibility of using coal seams for carbon sequestration in the future which can also be used in oil sands extraction. Successful gasification can store carbon dioxide emissions by up to 90%. Coal power plants release about 97% of the carbon emissions related to coal use (Natural Resources Canada, pg. 26). As gasification leads to an alternative to direct coal power generation, this measure could lead to little or no greenhouse gas emissions from coal related activities (Natural Resources Canada).

Market Data
Swann Hills Synfuels, a Canadian company, is beginning a $24 million dollar demonstration project north of Edmonton. This project will attempt coal gasification 1,400 meters underground, utilizing coal deposits which are not economically viable to extract by mining. Swann Hills Synfuels plans on having its two demonstration wells producing synthesis gas by June, 2009. If this project is successful it will open up a new energy market in North America, a larger market for Alberta coal, and provide new market opportunities in Alberta's vast coal deposits.

The Alberta Energy Research Institute, part of the Alberta government, is providing $7 million to help fund this demonstration. This technology will allow for access to an even larger share of the estimated 2 trillion tons of coal believed to exist in Alberta, most of which is not yet available due to lack of access and economic costs. Alberta currently has over 33 billion tons of proven coal reserves which are known to exist and are economically extractable, representing over 70% of Canada's total coal reserves (Alberta Energy).

As concern over greenhouse gas emissions continues to grow, the Canadian federal government is developing an action plan designed to combat climate change by reducing emissions 20% from 2006 levels by 2020, and to have 90% of Canada's electricity come from non-emitting sources like clean coal (Environment Canada). Underground coal gasification may have a role in accomplishing this goal. The process allows for pre-combustion carbon capture which would remove carbon from the synthesis gas leaving hydrogen as the fuel source for downstream use. The captured carbon can be stored in the coal seam, or eventually used for enhanced oil recovery (EOR) purposes for in-situ drilling (Natural Resources Canada, pg. 36-38).

Further uses of coal gasification include Integrated Gasification Combined Cycle (IGCC) Plants which gasify coal and immediately convert it to electricity. IGCC Plants do currently exist in the United States, but these plants gasify mined coal rather than using underground coal gasification. Synthesis gas can also be used to create hydrogen gas, which is currently being researched as a zero-emissions fuel-cell source. Furthermore, synthesis gas can also be used to create products such as fertilizer and methanol through polygeneration plants. (Natural Resources Canada, pg. 35-36).

Best Prospects
While this is just a demonstration, its success could create a new market in Alberta's coal industry. It is likely that coal gasification could grow in popularity and will expand beyond this demonstration project. If it does,

this opens up opportunities for American companies entering the Alberta coal industry or supplying in-situ mining equipment and services. Transportation and refining of the synthesis gas will also be an emerging market once larger scale production begins. With further technological developments, the potential to expand the industry of coal gasification in North America opens up research, equipment development, and management opportunities for gasification, power generation, polygeneration, and carbon capture facilities.

Resources & Contacts

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For More Information

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