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Carbon Management in the Exergy UCG™ Technology: Mechanisms, Efficiency, and Costs

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Management of greenhouse gas (GHG) emissions – carbon management – is a critical issue for any fossil fuel technology, which defines its long-term viability and acceptance.

Underground Coal Gasification (UCG) has long been presented as an example of a coal-based technology that has the potential of reducing GHG emissions to the extent that could turn it into a clean coal technology of choice in a carbon-restricted world.

Carbon management methods conceived, developed and, in part, implemented in the Exergy UCG™ (***ε***UCG™) technology include four specific *in situ* techniques, namely, CARBON RETENTION, CARBON REFLUX, CARBON QUENCHING and CARBON INTERMENT. Applied together, they modify the well-established ***ε***UCG™ technology so that the projected carbon footprint of both the ***ε***UCG™ process proper and the syngas-fed end-use plants is demonstrably lower than those of currently dominant industrial processes, such as conventional CCGT power generation or synthesis of methanol, gasoline, urea etc.

These carbon management techniques, based on a substantial body of experimental and modeling work, are examined here in terms of their conceptual design, impact on the plant carbon footprint, effect on overall energy and carbon efficiency of the process and the capital and operational cost of their implementation.

To illustrate the significance of carbon management, an example of the ***ε***UCG™ based commercial plant being developed in Alberta, Canada is studied in substantial technical, environmental and economic details.