C&R CONSULTING
Geochemical & Hydrobiological Solutions Pty Ltd
ABN 72 077 518 784

Underground Coal Gasification / Coal Seam Gas Investigations
Mineralogical, Geological, Petrographic and Soils Services
Hydrogeomorphic and Palaeogeomorphic Evaluations
Terrestrial and Aquatic Fauna and Flora Surveys
Climate History and Extreme Events Analysis
Contaminated Site and Mine Water Analysis
Environmental Compliance and Monitoring
Estuarine and Marine Water Assessments
Surface and Groundwater Investigations

PO Box 1777
Thuringowa, Qld, 4817, AUSTRALIA
Tel: +61 (0) 7 4725 3751
Mob: +61 (0) 417 635 032
info@candrconsulting.com.au
www.candrconsulting.com.au

Innovating Environmental Compliance Assurance
Novel insights and approaches from social sciences
Rotterdam, April 21-22, 2015

ABSTRACT

Consolidation and unification of environmental risk management plans in unconventional gas

Cuff, CC; Rasmussen, CE; Corkeron, M; Bush, A

New unconventional techniques designed to recover energy from coal seams and oil and gas from tight geological strata are technologically and scientifically complex, demanding a high level of statistically valid monitoring strategies based on scientifically valid data to ensure technological success and environmental safety.

UCG (Underground Coal Gasification) uses horizontal drilling with a continuous retractable ignition point (CRIP) and offers technological and environmental advantages over methods reliant on fraccing to provide gas pathways such as Coal Seam Gas – CSG/Coal Bed Methane – CBM).

However, UCG is a technologically complex process operating in a dynamic, thermo-geochemically complex environment. For example, for UCG the created burn chamber functions at temperatures in excess of 1200^{o}C with the temperature gradient decreasing away from the cavity boundary within a Fluid Active Zone (FAZ). Within this zone, the hydrostatic pressure of the cavity must be 2 to 3 bars below ambient hydrostatic pressure to (a) enable operational efficiency, and (b) limit the opportunity for component escape from the cavity. Redirection of flow towards the low pressure reactor (i.e. the fluid active zone, or FAZ) lowers the groundwater table around the site of operation. Consequently, scientifically grounded and statistically robust monitoring strategies before, during and after operation are required to ensure production success and environmental integrity.

The slow uptake of UCG as a viable alternative technology for energy extraction is partially attributed to the high level of scientific and engineering understanding need by both operators and regulators. Two aspects limiting UCG uptake include:

- The knowledge base resides almost entirely within the individual companies, jealously guarded, and re–distributed only by take–overs or staff migration. The Enforcement Practitioners are separated from the knowledge base (companies), but, by the power invested in their position, must make decisions on the adequacy of a technology where access is limited. An air of distrust develops when (a) industry can not be guided by the Enforcement Practitioners in a specific, non–ambiguous manner, and (b) the Environmental Practitioners are confronted by data that are outside the customary guidelines.

- The recovery of unconventional energy combines elements of (a) coal mining (extraction), (b) oil and gas production, and (c) water resource issues. In Australia, current legislation separates the three, with independent environmental monitoring regulations, often against differing sets of guidelines. Site and operational specific continuous monitoring regimes, have yet to be implemented.

The proposed approach of the Queensland Government Independent Scientific Panel (ISP) on UCG operations was to apply a LOPA (Layers of Protection Analysis) approach across the UCG life cycle (i.e. from site selection, design, operation, shutdown to decommissioning/rehabilitation). The application of LOPA to all risk points during a UCG life cycle ensures (a) appropriate protection to human and environmental health and safety, and (b) permits operational control by real–time monitoring of deviations from normal behaviour at critical control points identified within the LOPA.

The application of LOPA offers a structured model that will rationalise necessary information (data/scientific) across the whole–of–life cycle of the UCG project, offering both the regulators and the producers a common framework within which energy production and environmental protection can both be maximised.