Underground Coal Gasification – Eskom experiences and opportunities

Presented to 4th EU_South Africa Clean Coal Working Group Meeting
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UCG Development
Plans & Progress

Eskom UCG Research Strategic Drivers & Approach

**Why**
Is Eskom doing UCG research?

**UCG Technology Drivers**
- Independent, long-term fuel source
- Total Environmental footprint (including C)
- Low cost energy source
- Mining efficiency
- Security of supply – baseload option

**How**
Is Eskom doing UCG research?

Both the research and the strategic drivers are continuously evolving.
Eskom UCG Development Progress at Majuba

Eskom has licensed UCG technology from Ergo Exergy Technologies Inc. (Canada)

Eskom UCG Development Plans

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<thead>
<tr>
<th>Scale:</th>
<th>Research - Pilot</th>
<th>Commercial</th>
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<tbody>
<tr>
<td>Concept</td>
<td>Design</td>
<td>Execution</td>
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<tr>
<td>Concept</td>
<td>Design</td>
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<td>Primary Outputs</td>
<td>High-Level Research Objectives</td>
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<td>• Research data</td>
<td>To confirm a commercial gas specification</td>
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<td>• Fuel Gas</td>
<td>To prove the viability of producing electricity with UCG technology</td>
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<td>• Research data</td>
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Key:
- Not Req.
- Complete
- To be done

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UCG Development Findings

UCG Technology Development – General Findings

- A phased developmental approach is advisable to minimise investment risk. Each phase must have specific deliverables and hold points.
  - Coalfield exploration and characterisation for UCG is advisable as a starting point,
  - A pilot plant is then required to provide base-level performance specifications,
  - The technology performance needs to be continuously evaluated against stringent criteria, in order to generate the required detailed design specification for the following phases.
- Any plant after the pilot requires a sizable investment, hence requires a bankable feasibility study with detailed designs and specifications.
- There are no commercial UCG plant in service worldwide, to use as a reference for an engineering, operational and regulatory basis.
UCG Technology Development
- General Findings

• UCG is not catered for in existing Acts and Legislation.
• Pro-active engagement with all stakeholders is advisable, with frequent interaction and information sharing within the confines of IP restrictions.
• With regards skills development:
  • UCG is an embryonic technology,
  • UCG bridges 3 industries – mining, petrochemical and power,
  • A multi-disciplinary is therefore advisable, to grow the skills required.
• Partnering with specialist technology providers is advisable, to fill the gaps.
• Information sharing between UCG technology developers and suppliers is advisable, within the confines of IP restrictions.
Overall Conclusions

- UCG technology can successfully gasify the geologically complex coal resources at the Eskom Majuba site.
- The first Eskom UCG pilot gasifier operated successfully from Jan 2007 to Sep 2011.
- A second Eskom gasifier is presently being licensed.

UCG is a promising clean coal option which allows the effective extraction and use of previously unminable RSA coal resources.

Overall Conclusions

- However, UCG technology at Majuba site cannot yet comply with commercial entry criteria and processes, and still requires research & development.
  - Specifically, the current conservative UCG gas specification is technically treatable, combustible in a gas turbine, and can be co-fired - BUT it comes with potentially deteriorated performance indicators (specifically the Carbon footprint).
  - Eskom and its licensor have therefore revised the UCG gas specification, which needs to now be proven with a larger pilot scale, prior to any further design work being done on larger plant.

Eskom considers UCG to not yet be a commercially proven technology, and that it needs further development.
Recommendations

- A phased developmental approach is recommended to minimise investment risk.
- Communication of on-going developments is key.

THANK YOU