Underground Coal Gasification

A Clean, Safe, Indigenous Energy Supply

Presented by
Julie Lauder, CEO UCG Association
Underground Coal gasification

• The process of gasifying coal whilst in situ
• Operating at depths of up to 2000 metres
• UCG can be applied on and off shore enabling access to vast quantities of the world’s otherwise unrecoverable coal
• In recent years the technology has progressed greatly
• Much of this development and growth and interest has been spearheaded by the UCG Association
The UCG Association

- Not for profit member based organisation
- Accelerate the safe commercial development of UCG
- Dedicated events – workshops, conferences, training – share knowledge, information, expertise - the next generation of industry specialists
- Governments, Decision makers, Licensing & Regulatory Bodies, Potential stakeholders, Environmental Groups and the Media
- Public and independent information service on UCG
- Over 50 members: oil & gas, national governments, regional agencies, banks, accountants, lawyers, providers of UCG services, UCG operators, universities, energy associations, coal associations, energy advisors, utilities and UCG specialists.
- 22 Countries represented: Argentina, Australia, Bangladesh, Belgium, Botswana, Brazil, Canada, Chile, China, Hungary, Indonesia, Ireland, Japan, Netherlands, Norway, Poland, Slovakia, South Africa, Thailand, UK, USA, Vietnam
Underground Coal Gasification

- Leading industry exponents of UCG believe the technology has been proven beyond doubt
- Long running pilot plants - two in Australia, one South Africa, one in China
- Recent pilots have also taken place in New Zealand and Canada, two nations with green credentials
- None have progressed to commercial scale
- There is only one commercial site in operation - Angren, Uzbekistan
- Operational for more than 50 years, upgrade by Linc energy who are now major owners
- *Though this is about to change*
Policy Affects Progress

- Some believe the slow progress of UCG is that the technology still lacks proof of concept
- Not at all
- Lack of inclusion in national energy policy, or research objectives.
- Hampers formation of Regulations, Licensing criteria, National and Local Planning guidelines, operational frameworks
- Reticence is understandable against a backdrop of anti coal rhetoric
- World Bank stance on funding for coal projects
- Adverse impact on market confidence - the ability to raise investment
Lack of Public Acceptance

- Need to change the public view of the energy industry
- The public are not ill informed of Coal Technology they are not informed at all
- Need Public Information and Outreach Programmes
- Create understanding of research, development - via academia and research
- Highlight the benefits more than the process
- Literature - factual but not technical
- UCG and Shale the same.
- Science not opinion must inform Policy Makers
- Anti coal action – delay lower emission technologies being deployed
Why the global interest?

Global Energy Challenge

- Energy Poverty
- Energy Security
- Sustainable Supply
- Climate Change

UCG addresses all of these issues
Benefits of UCG

As the gasification of coal takes place underground many of the advantages of UCG are obvious:

• No one works underground
• Less Surface Impact - No coal is brought to the surface
• Lower Fugitive Dust - Noise - Visual Impact- Ash
• Syngas can be piped directly to the end-user, reducing rail / road infrastructure
• Cheaper and easier site remediation on project completion
UCG – Lower emissions

• Particulates – 50% lower than surface equivalents, stay underground where they belong
• Harmful chemical vapours NOx, SOx, are captured and do not enter the atmosphere
• Reduced methane emissions - gas recovered not lost in atmosphere
• Leaves coal ash and other process wastes deep underground,
• Offers reduced environmental management and costs
• No external water supply – moisture in the coal
• Significant advantage for low rank, high ash coals such as India
• The whole process affords opportunities to use coal more effectively
• HELE – Higher Efficient Lower Emission technology.
UCG – CCUS Advantages

High pressure of a UCG power plant allows the full, higher-heating value of coal to be utilized, recovering the latent heat of vaporisation.

UCG operates at up to 80-85% efficiency - the amount of the syngas recovered at the surface is about 80 - 85% of the original heating value of the coal feedstock.

Enables the CO2 in the flue gas to be captured in a supercritical state suitable for
Enhanced Oil Recovery (EOR)
Enhanced Coal Bed Methane (ECBM)
Carbon Capture Utilisation and Storage (CCUS)
UCG – Sustainable development

Coal an abundant natural resource - widely distributed, nine times more prevalent than crude oil. **Nearly 80% of known coal reserves are deemed unmineable.**

The poorest nations - least choice of indigenous energy

- Applying UCG technology to, stranded, low grade coal vastly increases recoverable coal reserves
- Estimates suggest increase of 300%-400%*
- Coal when applied to UCG becomes the largest sustainable resource base in the world
UCG - Costs

The economics are attractive - lower Capex and Opex. Plus as UCG is a multi disciplined technology it offers employment opportunities and potential new revenue streams.

Cost of UCG for Power Generation – UCGA 2010

* Mott MacDonald: “UK Electricity generation costs update” June 2010
Flexible Product Uses of Syngas

- Syngas Product
- Iron Reduction
- Synthetic Natural Gas

SYNGAS

- Hydrogen
- Ammonia
- Chemicals
- Fuel Cells
- Power Gen
- IGCC
- Steam & Power
- Methanol
- Fischer-Tropsch

- Petrol
- Naphtha
- Diesel
- Wax
- Polyolefins
- Methyl Acetate
- DME
- Formaldehyde
- Acetic Acid
- Ethylene
Worldwide UCG Activity

UK
Were 24 now 12 UCG licences all coastal regions, all off shore. Licensing and regulations advanced.

Belgium
EU trial at Thuillin in 1987. No further UCG activity.

Poland
Extensive research – GIG, Project HUGE. Many suitable sites identified. No licensing/regulations.

Slovak Republic
History of research, suitable sites, MOU’s signed but no further activity.

Serbia
Looking to start research soon.

Czech Republic
UCG under review as suitable sites identified.

Slovenia
UCG under review.

Bulgaria
Two projects under review. Overgas. Extensive research with EU backing.

Turkey
UCG project at planning stage, several suitable sites identified.

Romania
Technology being reviewed.

Russia

Kazakhstan
Sites identified but complicated approval process hampers.

Uzbekistan
Angren, now operated by Linc Energy – 50+ years.

USA
UCG development at Beluga River, Cook Inlet west of Anchorage, plans to go commercial in 2015. Major trials in 1950s and 80s, long history of research and pilot studies. Substantial interest and new projects planned for Wyoming, Montana, North Dakota, Colorado, and Alaska.

Colombia
UCG project planned, several suitable sites identified, continuing research, no regs.

Canada

Argentina
Increasing interest and sites identified.

Brazil
Demonstration project planned, technical research continues, several suitable sites known.

Botswana
UCG seen as key, to maximising its 210 billion tons of coal. No projects yet announced. Several large areas suitable.

South Africa
Eskom UCG project at Majuba, most advanced. Extensive history of research. Eskom, Sasol, Africany, Ekoaro, Linc. Huge amount of interest and experience, CDE, Aqua Alpha, MegChem.

Indonesia
Several MOU’s signed after appropriate site selection. No immediate activity expected due to lack of licensing structure.

Pakistan
Thar Sindh Province, UCG Pilot Design of UCG wells and prefabricated camp design have been completed, operational 2014.

New Zealand
Solid Energy, 3 year pilot ect at Huntley West. Others seeking potential sites. Licensing addressed.

Bangladesh
UCG activity planned. No licences yet awarded.

Australia
The country with the most advanced UCG projects – Linc Energy’s Chinchilla site and Carbon Energy at Bloodwood Creek, both projects in Queensland. ISP report The regions of Victoria and South Australia remain keen to develop projects.
Summary - UCG has so much to offer

- UCG in deeper coal could contribute significantly to global requirement for increased energy, reduced emissions.
- Indigenous resource – security of supply, help industrial growth in the wake of the global economic crisis
- Higher yield - at lower cost
- *Key to the safe commercialisation and growth of UCG – collaboration*
- Acceptance from all stakeholders – industry, government and regulatory bodies, social
- UCGA strive to ensure all who operate at a commercial level do so responsibly and with the highest regard to safety and environment
The UCG Association
At the forefront of the developing
UCG Industry

Next UCGA International Conference and Workshop
London 9th/10th April 2014

Thank you for your attention
Julie Lauder CEO, UCGA
www.ucgassociation.org