UCG Technology, Modelling and Project Developments

Gasification Technologies Conference 2011

San Francisco: 9 -12 October
About Linc Energy

• Linc Energy is a globally focused, Australian-based energy company with extensive coal and oil & gas resources
• Listed on the ASX (LNC) – also traded OTCQX (LNCGY)
• Global leader in Underground Coal Gasification (UCG)
• Proven proprietary UCG technology
• Gas to Liquids (GTL) and Enhanced Oil Recovery (EOR) capabilities for energy solutions
• 10 established locations across four continents
• Nearly three million acres of coal tenure and over 18 million acres of oil & gas acreage across three continents

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Business Model

Carbon Solutions
- Enhanced Oil Recovery (EOR)
- Carbon Sequestration

Resources
- Coal
- Oil & Gas

Products
- GTL - $US28/barrel
- Power
- Methanol

UCG
- World Leader
- Cheapest man-made conversion of gas and CO in the world
- Operating 50 years

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Understanding UCG

- In-situ resource conversion (in the coal seam)
- UCG uses oxygen, heat and pressure to convert coal to syngas (coal extracted as a gas)
- Syngas is a valuable energy form with many uses
- Minimised surface disturbance (small surface infrastructure footprint - no surface coal mine)
- Minimised personnel risk (no underground mine)
- Utilizing coal more effectively – coal is a key component of world energy mix
Underground Coal Gasification
UCG (Syngas) Uses

- Syngas can be converted to valuable products:
  - Gas to Liquids (GTL) - clean fuels
  - Enhanced Oil Recovery (EOR)
  - Electric power generation
UCG Technology - Operations

**Syngas Production**

- Yerostigaz - Angren, Uzbekistan:
  - Important UCG heritage
  - 50 years of UCG operating experience
  - World’s only commercial UCG operation
  - +91% Linc Energy ownership
  - Electric power generation
  - Proven consistent and reliable syngas production
UCG Technology - Operations

Syngas Production

- Chinchilla, Queensland, Australia:
  - 12 years of UCG operating experience
  - 100 % owned by Linc Energy
  - Development of Linc Energy’s proprietary UCG technology
  - Recognized as “Best practice in UCG”:
    - Proven UCG technology
    - Proven operations capability
    - Established HSE culture and practices
    - Extensive ground water monitoring
UCG Technology - Operations

UCG to GTL Syncrude Production

- Chinchilla, Queensland, Australia:
  - World’s only UCG to GTL operating facility
  - 100% owned by Linc Energy
  - Unique technical and operational capability
  - Production of GTL syncrude (clean fuels):
    - Diesel
    - Jet Fuel
  - UCG syngas to GTL clean fuels technology and operational capability now proven

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CHINCHILLA – UCG TO GTL (Diesel) DIESEL DASH

• The world’s first ever journey using GTL diesel produced from UCG syngas (coast to coast across Australia)
• 6,062 km (3,767 miles) driven at last fuel
• Fuel consumption:
  – 16.5 km/litre (47MPG) for the entire trip
• Total Linc Energy ‘syndiesel’ used:
  – 367 litres (97 US gal)
UCG Technology – Project Development & Modelling

• Project Assessment & Development:
  • Site selection (resource definition)
  • Feasibility & economic assessment
  • Design – gasifiers, wells & surface facilities

• Operations:
  • Process control & management
  • Shut down & decommissioning
UCG Technology – Modelling Tools

- Linc Energy proprietary UCG mathematical models:
  - Hydrogeology & Reservoir
  - Geomechanical & geotechnical
  - Computational fluid dynamics (CFD)
  - Subsurface gasification
  - UCG well design
  - Surface gas processing
  - UCG cavity decommissioning
UCG Technology – Model Utilisation

• Hydrogeology & Reservoir models:
  • Baseline groundwater characterisation
  • UCG gasification field layout & design
  • Environmental monitoring & management

• Geomechanical & geotechnical models:
  • Baseline rock strength characterisation
  • UCG gasifier design
  • UCG gasification field layout & design
UCG Technology – Model Utilisation

• Computational fluid dynamics (CFD) models:
  • UCG Gasifier design
  • UCG gasification field layout & design
  • Cavity growth design & management
  • Syngas composition quality & management

• Subsurface Gasification models:
  • Syngas composition quality & management
  • Process control & management
UCG Technology - modeling

• UCG well design models:
  • Horizontal well design (in the coal seam)
  • Thermal, hydraulic and mechanical design
• Surface gas processing models:
  • Surface gas treatment facilities design
  • Process control & management
• UCG cavity decommissioning models:
  • Design, implementation & management
UCG Technology – Team

- Technical:
  - Multidiscipline (engineers, geologists, hydrogeologists, drilling specialists, mathematical modelers, chemists, hydrogeochemist, etc)
  - Established & highly specialised skills “inhouse”
  - UCG, GTL and Power Generation capabilities

- Operations:
  - UCG and GTL facilities
  - Drilling and Coiled Tubing Unit activities
  - Established HS&E culture and approach
UCG Technology – Project Approach

• Each project is unique - project design based on site specific physical characteristics including:
  • Coal Characteristics
  • Geology
  • Hydrogeology
  • Surface topography and infrastructure
• Unique combination of an experienced team along with proven technology & design models, tools and operational capabilities ensures project success
Development Projects – Queensland, Australia

• Chinchilla (UCG Gasifier 5):
  • “State of the art” commercial UCG technology
  • Under construction (startup Q4 - 2011)
  • Advanced UCG well designs:
    • Optimised horizontal well drilling & completion
    • Optimised thermal and hydraulic design
  • High oxygen injection capability
• Aggressive coal resource exploration:
  • Prove up existing coal tenements (divest non core)
Development Projects - South Australia, Australia

- Coal and oil & gas tenements across three basins:
  - Walloway
  - Arckaringa
  - Cooper
- Coal resource definition underway
- Extensive seismic exploration underway
- Oil & gas exploration drilling underway
- UCG to GTL & Power study in progress

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Development Projects - Alaska, USA

- Extensive coal and oil & gas leases:
  - **North Slope**: Umiat oilfield development progressing. (+1 billion barrel original oil in place)
  - **Cook Inlet (Anchorage)**:
    - Gas well drilling underway
    - Coal characterisation drilling underway
    - UCG site selection in progress
  - Integrated opportunity (UCG – GTL – EOR – power)
Development Projects - Wyoming, USA

Powder River Basin (PRB):
- Extensive coal and oil & gas leases
- Operations established around Casper
- Existing oil & gas reserves and production
- Commercial UCG project underway:
  - EOR + power + GTL
  - Phase 1 progressing through permitting phase
- GTL modularisation study underway
Development Projects – North Dakota and Montana, USA

- Coal leases across North Dakota and Montana
- Evaluation of coal resources underway
- Planning underway for establishment of operations
Development Projects – Vietnam

- Business cooperation with VINACOMIN and Marubeni
- Development of UCG for electric power generation
- Potential for power delivery to over 6 million households
- Project definition and development in progress
Proven UCG Technology is the key

At Linc Energy we are developing a fully integrated energy business centered around UCG:

• Utilise our proprietary UCG technology
• Convert our coal resources to syngas
• Use our syngas to produce GTL fuels (diesel, jet fuel), electric power and utilize CO2 for EOR
• Increase oil production from our oilfields (EOR)
• Sequestration of carbon (utilizing EOR and decommissioned UCG cavities)
Chinchilla, Queensland - Australia
Thank You

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