Underground Coal Gasification

Resource Development Council (RDC) of Alaska

March 17, 2011
Anchorage, AK

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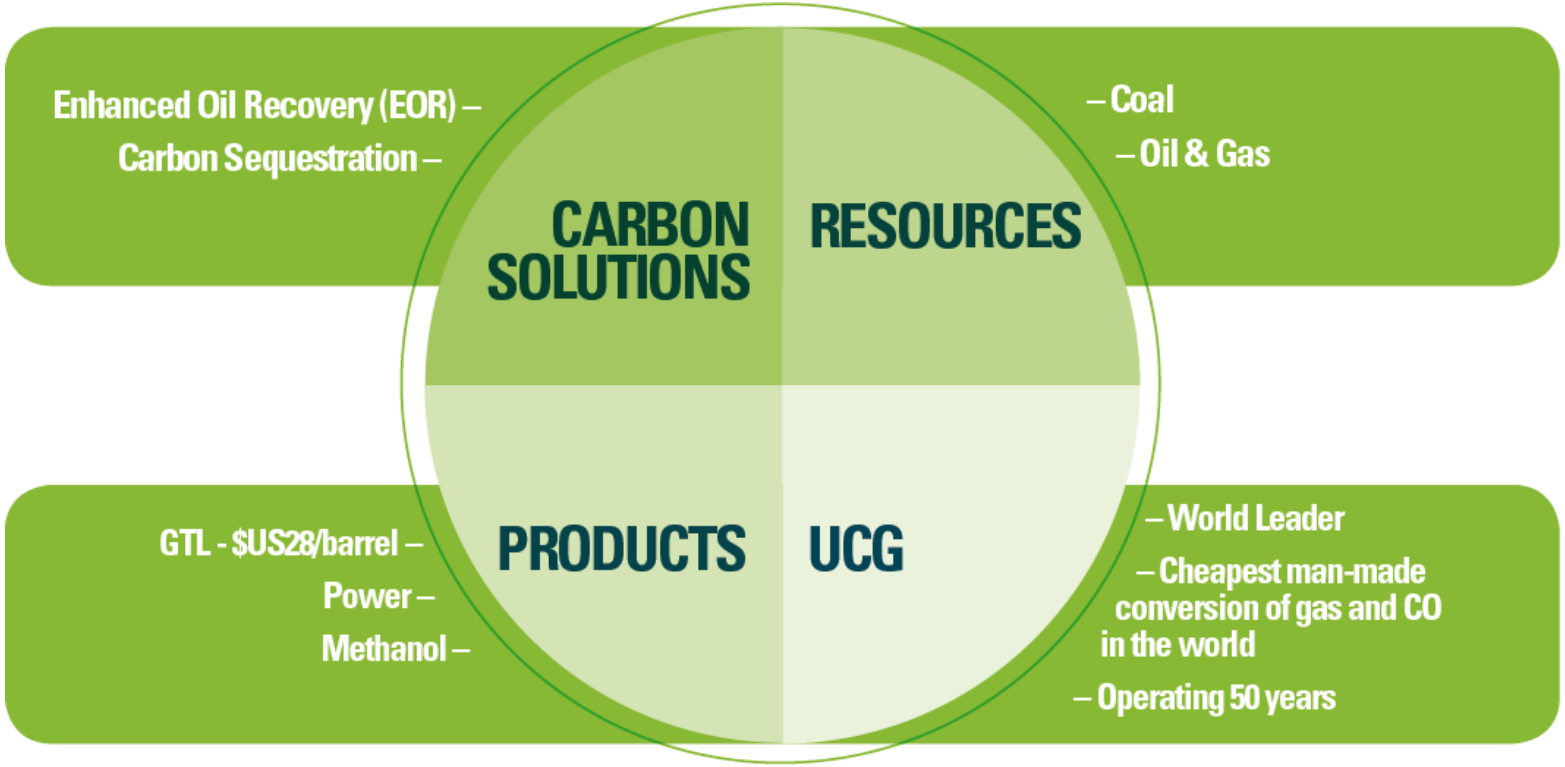
Agenda

- Introduction
- Linc Energy
- Business Model
- UCG & GTL
- Carbon Solutions/EOR
- Social & Economic Benefits
- Environmental
- Summary – Q & A

About Linc Energy

- Linc Energy is an innovative, forward thinking energy company and leader in advanced coal technology
- World leader in Underground Coal Gasification (UCG)
- Incorporated October 29, 1996 as Linc Energy N.L.
- Publicly listed (ASX:LNC and OTCQX:LNCGY)-13,000 shareholders
- World Headquarters - Brisbane, Australia
- Market Capitalization $1 billion – dividend paid October 2010
- Over 380 staff in 7 offices across 3 continents and growing
- Current operations in AU, USA, Uzbekistan and Vietnam
- Over 10 years successful UCG operations in Chinchilla, AU
- Linc Energy is one of the largest coal reserve holders globally with over 700 million tons of coal available for UCG development

Business Model



About Linc Energy USA

- Linc Energy Operations, INC. – US Company
- May 2009, Linc Energy purchased Powder River Basin reserves on state leases from GasTech Inc.
- September 2009, Linc Energy purchased additional acreage in Montana, North Dakota
- Purchased Cook Inlet Basin, Alaska assets in February 2010.
- Linc Energy US headquarters is located in Denver, CO
- Regional offices located in Anchorage, AK and Casper, WY
- Currently 30 US staff employees and growing
- UCG, GTL, and EOR projects planned in Alaska & Wyoming
- Oil & Gas E & P projects in AK, WY and other states

About Linc Energy Alaska

- Linc Energy (Alaska) Inc.
- Anchorage, AK – Linc Energy regional office
- 3 Anchorage employees and growing: Corri Feige – Project Manager
- Alaska assets
  - 122,000 acres oil & gas leases in Cook Inlet Basin (GeoPetro Alaska LLC)
  - 181,000 acres of UCG coal exploration licenses (Alaska Mental Health)
- Site LEA #1 was drilled in October, 2010 for natural gas for Alaskan domestic supply – analysis confirms 3 significant sand formation intervals that appear to be gas charged
- LEA #1 analysis continues
- Feasibility analysis underway for all opportunities including UCG, GTL, and EOR
- Analyzing Oil & Gas opportunities – E & P, EOR

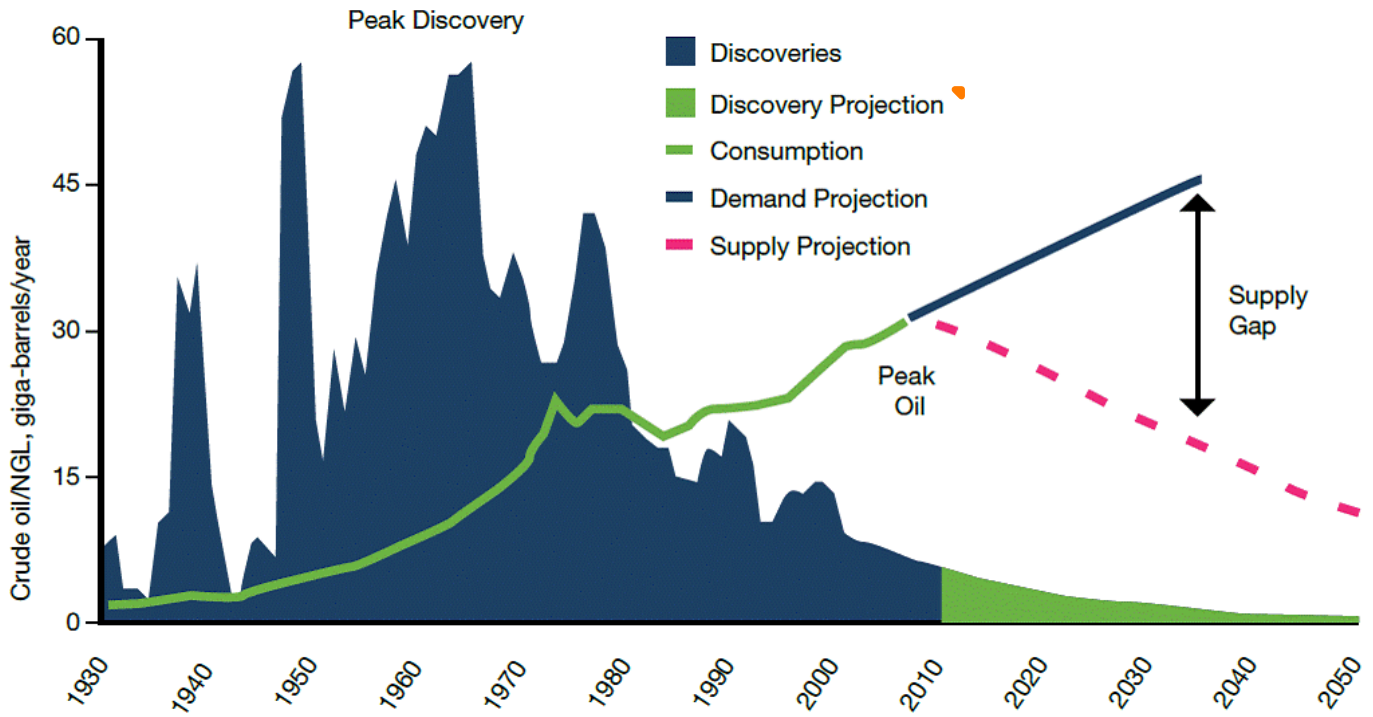
Oil and Gas Leases - Alaska

LEA #1 - Alaska


Linc Energy (Alaska), Inc.
Linc Energy Operations, Inc.
LEA #1
API# 50-009-20033-0000
Location:
SE ¼, Section 30, T16N, R3W
Permit to Drill# 210-1220

LEA #1 - Alaska

Global oil discovery, supply and demand trends and projections (EIA World Energy Projections)



"Production (of oil) reaches 104 mb/d in 2030 requiring 64 mb/d of gross capacity additions – six times the current capacity of Saudi Arabia – to meet demand growth and counter decline."

"For all the uncertainty highlighted ... we can be sure that the energy world will look a lot different in 2030 than it does today."

International Energy Agency
World Energy World Energy Outlook 2008

UCG – A key advantage

- Underground Coal Gasification (UCG) can access deep, "stranded" coal anywhere in the world
- Delivers low cost, consistent quality syngas for production of valuable power and fuels
- Significant environmental benefits:
  - Power generation – UCG is carbon capture ready
  - Fuel production – zero sulfur and low aromatics

What is UCG?

- UCG converts coal to a gas while still in the ground
- Two wells, injection and production are drilled horizontally into the coal seam and connected with a linking well
- A third "service" well is usually drilled to support operations
- Oxygen/air is injected, heat and steam are generated, creating a chemical reaction
- Produces synthesis gas (syngas) of mainly hydrogen and carbon monoxide

Dewatering Coal Seam is Undesirable for UCG

Linc Energy's advanced UCG technology requires that normal groundwater levels be maintained

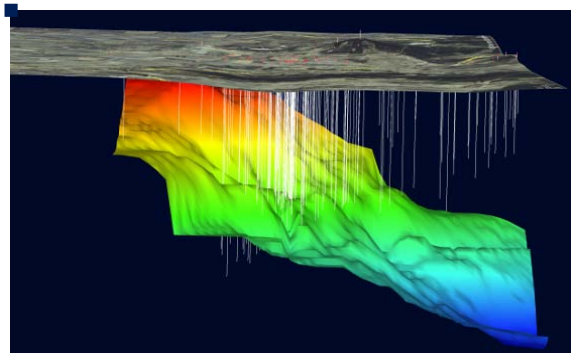
This is opposite to all other forms of energy extraction from coal

The UCG Process

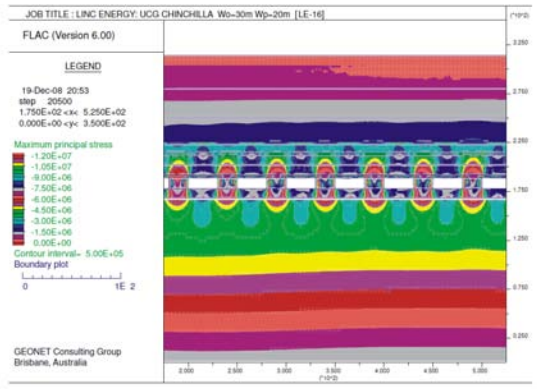
Most Important Controls

- Site selection – many variables
- Operations – maximizing gas quality by minimizing gas loss by controlling hydrostatic pressure
- Monitoring – before, during and after

Controlling UCG Impacts



- ❑ PREDICT
- ❑ CONTROL
- ❑ MONITOR



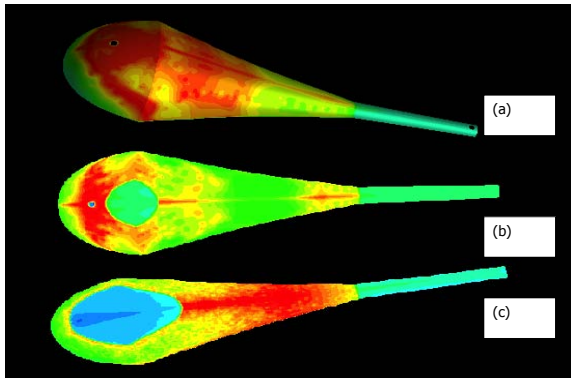
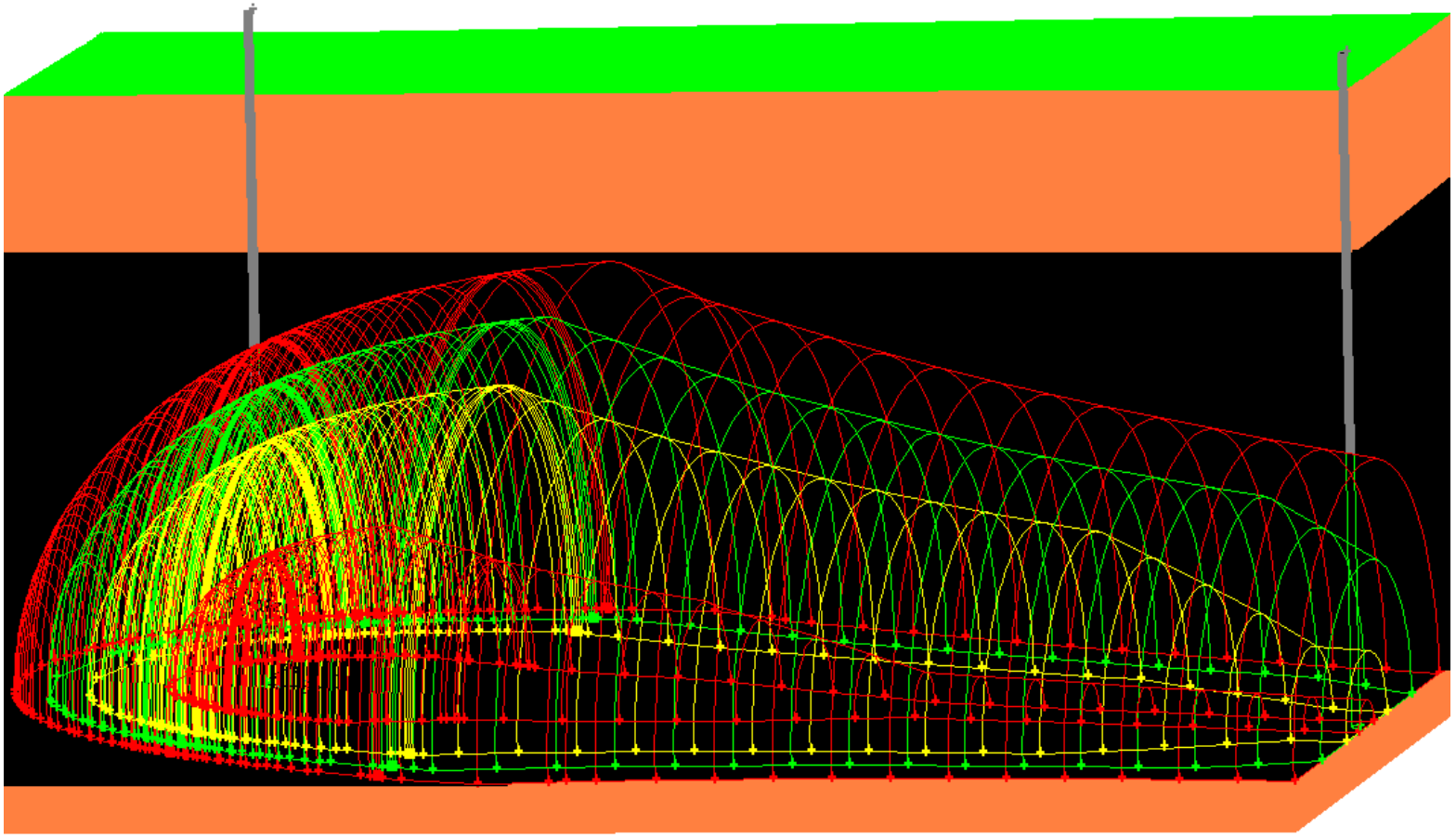
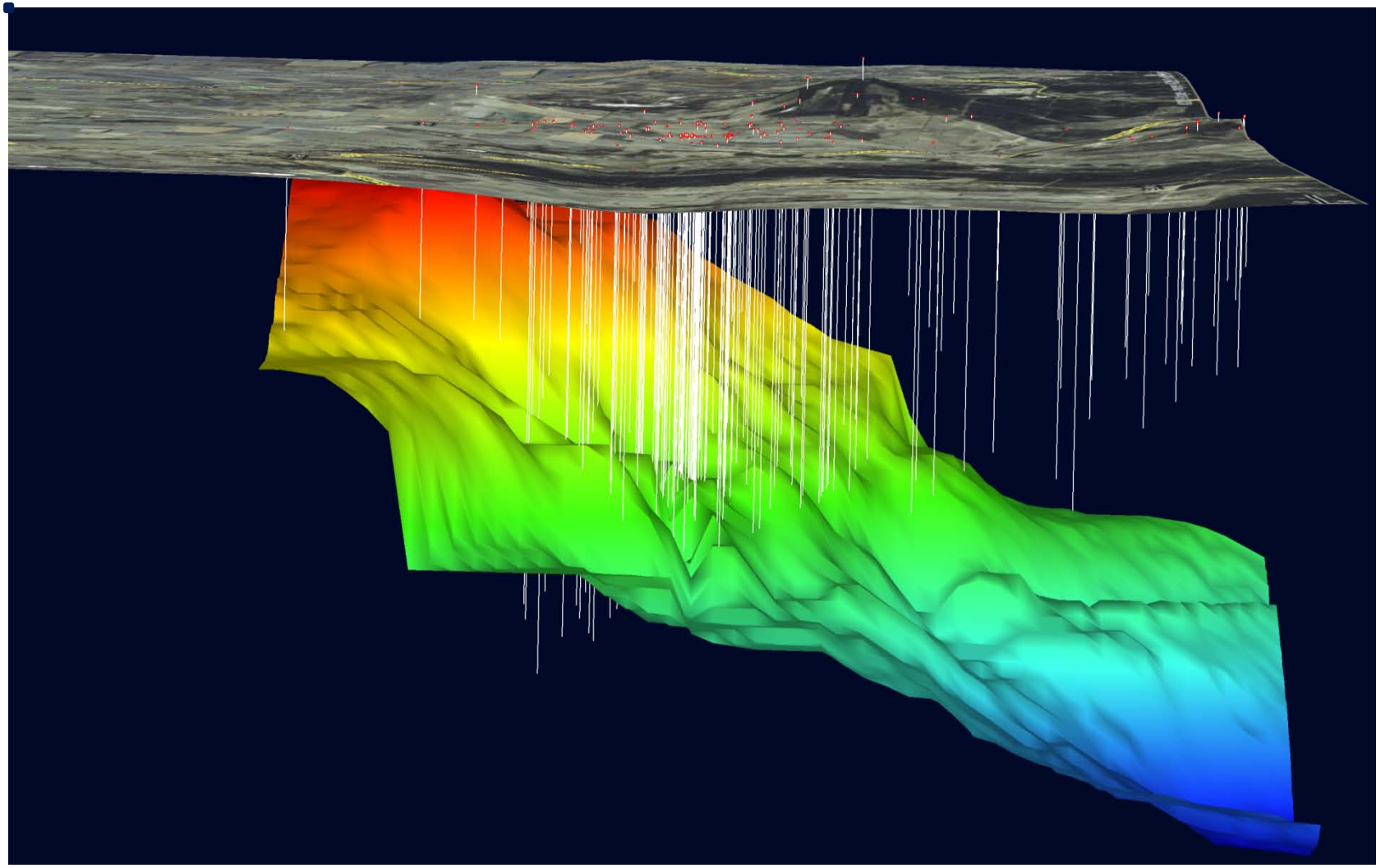


Figure 6 Temperature distributions in the boundary of cavity

Cavity growth prediction



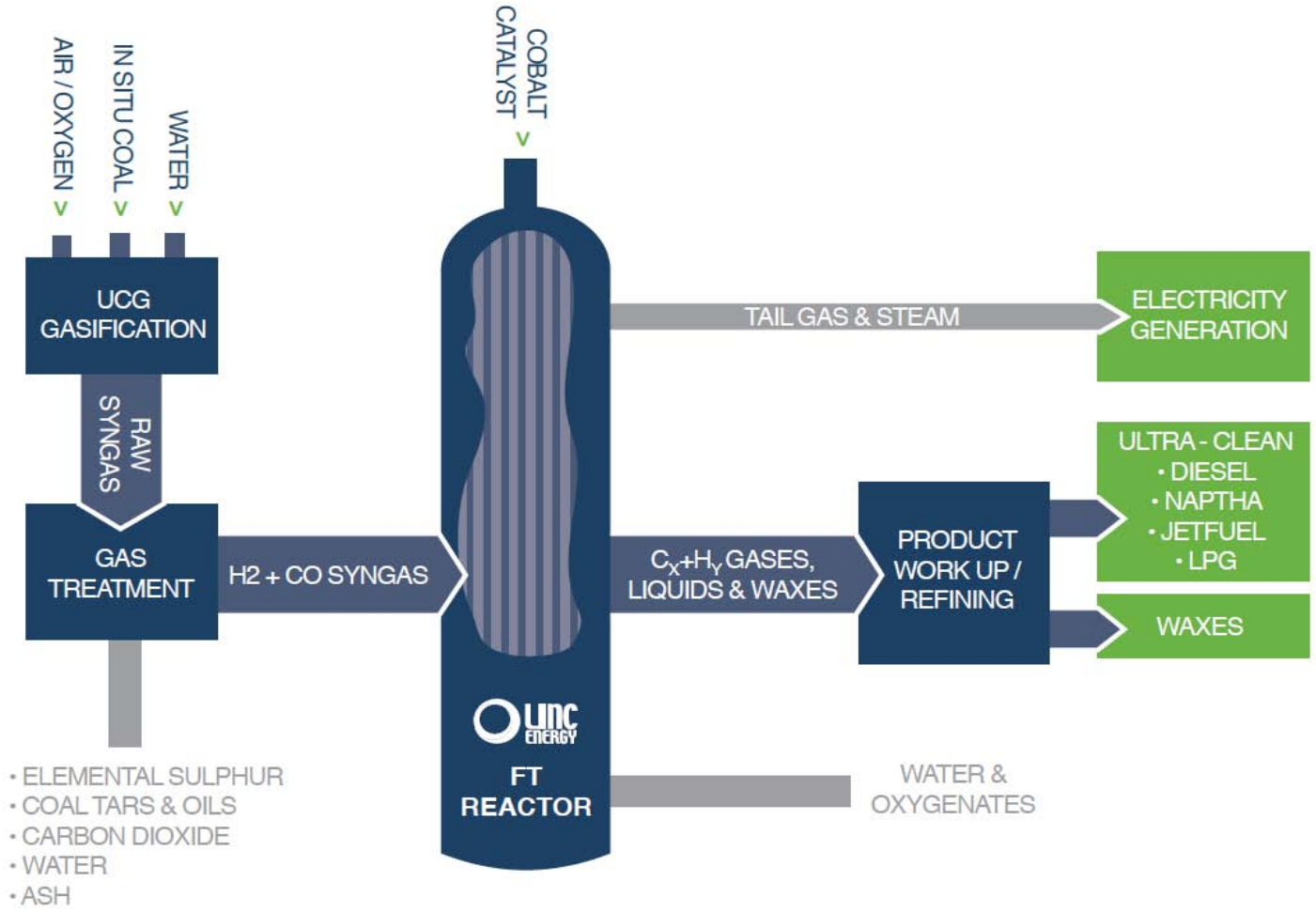
Hydrology Modeling - Chinchilla



Controlling Groundwater Inflow

- To manage groundwater inflow UCG takes advantage of a simple principle:
  - By operating at or slightly below the hydrostatic pressure of the coal seam, water inflows can be maintained at the designed level

GTL – in simple terms



UCG Operations - Chinchilla

GTL Demonstration Plant Chinchilla

GTL Demonstration Plant

UCG Alaska Plan

- Phase I – Demonstration
  - Single UCG gasifier
  - 90 day Trial – 12 months monitoring
- Phase II – Multiple Gasifier
  - A gas panel of 3 – 6 gasifiers
  - 12 month trial
- Phase III – World Class UCG – GTL project
  - Producing 20,000 bbl/day of clean synthetic diesel, jet fuel, and other liquids
  - Producing all required power requirements
  - Consuming roughly 20,000 tons/day of coal
  - Producing commercial quantities of pure CO2 ready for EOR
  - Could operate for over 20 years in 3,200 acres of coal seam (30” thick)

Carbon Solutions

- Carbon Capture & Sequestration ready
- Syngas is 'cleaned' prior to further use
- The gas cleaning process often creates a clean CO_2 waste stream, ready for EOR or sequestration
- EOR – Enhanced Oil Recovery
- UCG provides cheap & accessible CO2 necessary for EOR
- Every ton of CO2 = approximately 3 - 5 barrels of oil

Social and Economic Benefits

- UCG does not compete with traditional surface mining
- Source of new jobs utilizing existing labor force and skills
- Significant value added from "stranded" coal
- Long term source of clean liquid fuels and CO2
- Safe – limited surface footprint & impact, no labor underground
- Creates new royalty stream for host states and municipalities
- Significant source of new state and local property taxes
- Energy Security and Independence
  - Domestic supply of diesel & jet fuel
  - Domestic supply of CO2 for EOR projects
  - Domestic utilization of coal-generated power

Environmental

Groundwater

- Linc's UCG process relies upon in-situ moisture content of the coal seam
- Natural hydrostatic pressure is needed for UCG operations so groundwater is protected in place

Groundwater Quality

- Quality maintained by limiting groundwater outflow
- Linc's Chinchilla trials have experienced no groundwater contamination in over 10 years of operation

Subsidence

- Linc Energy targets zero subsidence

Controlling Subsidence

- Linc Energy has developed advanced subsidence modeling techniques for UCG generator design:
    - Targeting "zero subsidence" design
    - Extraction width is designed to control fracturing in the roof materials
    - Pillars are designed to provide for UCG subsidence control
- Modeling process similar to that used in underground coal mining

Summary – Q & A

- Linc Energy's UCG technology is well developed and ready to be implemented commercially
- Product quality can be controlled within specific limits dictated by site characteristics and can be manipulated above-ground to suit selected applications
- Site characteristics are used to design and control underground processes
- Questions

Thank You

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Resource Development Council (RDC) of Alaska Energy Briefing March17,2011 Anchorage, AK

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Commercial UCG Project Phase I & II (example)

- A "stranded" coal seam of 30' thickness:
    - contains over 34 million tons of coal per 640 acre section
- Phase I - A single UCG generator:
    - consumes approximately 80-90 tons/day
    - produces over 8.0 mmcfd of syngas
- Phase II - An operating panel of 3 - 6 UCG generators:
    - Could operate for well over 100 years in 34 mt resource
    - produces over 50 mmcfd of syngas
    - could support a gas turbine plant of 100 MW

Commercial UCG Project Phase III (example)

- World Class UCG – GTL project:
  - producing 20,000 bbl/day of clean synthetic diesel, jet fuel and other liquids and valuable by-products
  - Producing all its own power requirements plus over 200 MW of exported power
  - consuming approximately 20,000 tons/day of coal
  - producing commercial quantities of pure CO2 ready for EOR sequestration or other purpose
  - Could operate for over 20 years in 3,200 acres of coal seam if 30’ thick (5 sections).