Considerations on Underground Coal Gasification (UCG) – In India & Elsewhere

Presentation to U.S.-India Coal Working Group Meeting

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U.S. Dept of Energy • Washington, DC • June 6, 2007
UCG offers a very inexpensive way to convert coal to gas

Coal suited to UCG is often unsuited to any other mining

UCG “syngas” can be used for many different applications

UCG can also provide excellent carbon management (CO2)

Human safety benefits from lack of coal mining & transport

But it is important for gov’t authorities to make sure that:

- **Specific** UCG technology is safe & commercially proven
- Otherwise you get “surgery performed by people who aren’t trained as surgeons” – potential environmental & safety mess
The preliminary points

1. Air-blown UCG is cheaper than surface gasification because:
   - No mining, no coal transport or handling
   - No need to build gasifier facilities & equipment (e.g., reactors)
   - No oxygen plant (air separation unit or “ASU”) or syngas cooler

2. UCG typically uses coal that’s otherwise inaccessible
   - This increases total available coal reserves – substantially

3. UCG syngas has many applications:
   - Power generation (directly) – will work with today’s turbines
   - Can be converted to synthetic natural gas, liquid fuels, etc.
4. Air-blown UCG can provide excellent carbon management:
   - About half the coal’s carbon comes out of the ground as CO2
   - This can be re-injected with an energy penalty of only ~ 3%
   - Several geological options for sequestration, incl. spent chambers
   - Remaining syngas can produce power with emissions of CO2 per MWh ≤ those of an efficient combined-cycle natural gas plant

5. Human health and safety benefit (if UCG is done safely):
   - No mining by conventional methods (this appealed to Lenin!)
   - Eliminates coal mining’s conventional health & safety risks
What governments (and investors) must assure

- Safety & reliability of specific UCG processes & technologies
- “Anyone can start a fire underground” – but who can control it?
- UCG experiments in the West, without expertise, were disasters
  - Risks to human safety (possible explosions, etc.)
  - Risks to groundwater (possible contamination, including by metals)
  - Risks of underground fires (some are still burning uncontrolled)
- Yet UCG can be done safely & reliably (e.g., Ergo Exergy process)
- The existence of safe, reliable, commercial projects provides a guide to what authorities (and investors) should insist upon
What authorities & investors should demand

- Proof of prior successful UCG operations
  - Preferably commercial, but at least (a) large scale & (b) sustained
- Proven process controls that can be explained & demonstrated:
  - Ability to achieve underground ignition – and to shut it off
  - Ability to control reaction & quality of gas, and sustain over time
  - Ability to prevent groundwater contamination (esp. in long run)
  - Ability to prevent leaching of heavy metals (whatever the coal type)
- Site-specific suitability of the particular UCG process
  - E.g., depth & isolation of coal seam, tests for leachability, etc.
Things to watch out for!

- Mining vs. gas drilling regulatory regimes
  - UCG is a form of mining, yet it involves gas – and drilling
  - It needs a sensible regulatory regime – for example, should not require separate permits for each hole drilled
  - Absent practicality and common sense, UCG can’t get going

- Carbon management opportunities – and pitfalls
  - CO2 management must be planned from the outset, *but* –
  - Ideally, authorities/owners and operators should also preserve ability of UCG to benefit from carbon credits and carbon trading
  - Thus, care must be taken to assure availability of credits & other financial incentives for CO2 that is sequestered from Day One
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