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

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The big picture

- 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.

Preliminary points (continued)

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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- Heller Ehrman LLP – a global law firm, among the world's largest
  - Leading *energy* practice + leading *technology* practice = creation of the Clean Tech Energy Group in 2001
  - In 2006, the firm also created its Climate Change Practice Group
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