Environmental Perspectives of Geologic CCS (Carbon Capture and Storage)

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Finding the ways that work

Topics Covered

1. Overarching message
2. Reducing significant environmental impacts
3. Potential indirect environmental impacts
4. Public outreach and involvement

1. Overarching message

Significant CO_2 based impacts from CCS operations can be prevented with:

- ✓ Consistent and integrated frameworks between regulatory agencies
- ✓ Protocols for site characterization, selection and risk assessment
- ✓ Rigorous monitoring and verification
- ✓ Mitigation and remediation planning

IPCC 2005

1. Overarching message cont…

Air, water and biological quality impacts from CCS can (and must) be prevented with:

- ✓ First 4 mentioned for CO2 impacts
  - ✓ Consistent / integrated frameworks
  - ✓ Site characterization, selection and risk assessment
  - ✓ Monitoring and verification
  - ✓ Mitigation and remediation planning
- ✓ Compliance with bedrock environmental laws
- ✓ Technology information dissemination and local permitting assistance for new major point sources

1. Overarching message cont…

"All sites, even those with optimal features, must be assessed for potential human health and safety and environmental risks during the operational and post-operational phases of a project."

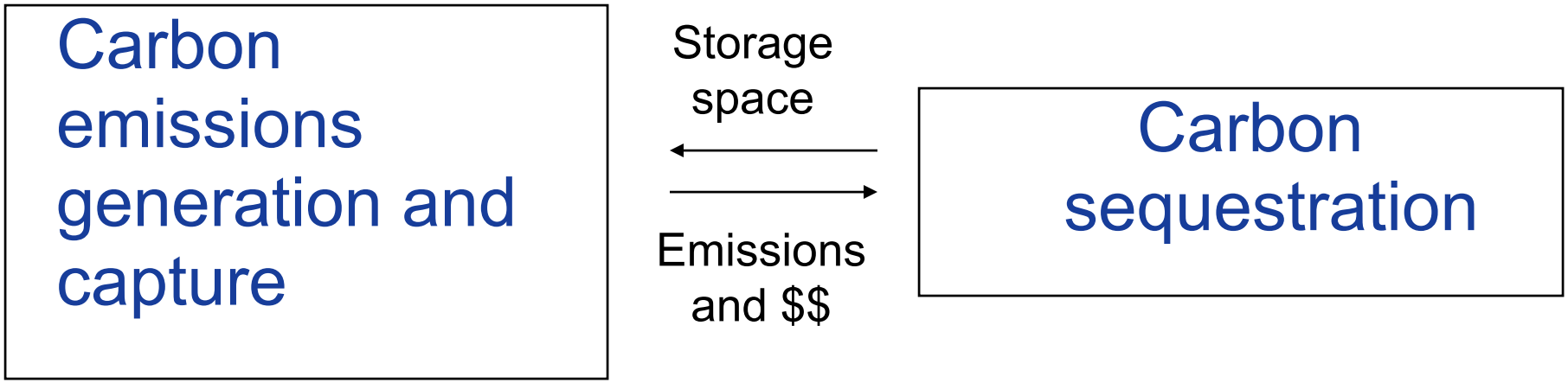
Burton et. al
AB 1925 report, November 2007

1. Overarching message cont…

"With appropriate site selection … monitoring … regulatory system and … use of remediation methods … the local health, safety and environment risks of geological storage would be comparable to the risks of current activities such as natural gas storage, EOR and deep underground disposal of acid gas."

Burton et. al
AB 1925 report, November 2007
Citing IPCC 2005

2. Reducing environmental impacts
(CO2 sources and sequestration go together)



Low carbon power generation, enhanced oil recovery, and saline aquifer injection should have a symbiotic relationship. GS site operators have valuable storage space and emitters have desire to reduce emissions. Examining the environmental impact of one without the other will create an incomplete picture, and lead to potential analytical shortcomings.

2. Reducing environmental impacts cont… (sources of emissions)

1. Major facility construction and operation (emissions source and capture)
2. CO_2 transport (pipeline, trucks)
3. Injection well completion and pad construction (drilling, trucks, maintenance)
4. Injection, gathering and reinjection operation (compression)
5. Storage operations

2. Reducing environmental impacts cont… (types of impacts)

- Air / gaseous emissions
  - CO2 leakage (global warming, public health & safety)
  - Surface and subsurface contamination
  - Air pollution (traditional pollutants)
  - Water / aquifer contamination (pH, minerals, metals, oil / gas, displaced fluids, etc.)
- Biologic and aquatic
  - Operations and infrastructure of major source (surface impacts)
  - Operations and infrastructure of major source (water use)
- Justice / equity
  - Intergenerational equity / morality
  - Environmental impact consolidation (hot-spots)

2. Reducing environmental impacts cont… (strategies)

- Environmental impact from **air / gaseous** emissions

IPCC, AB 1925 recs, research

- CO_2 leakage and global warming
- CO_2 leakage and public health / safety
- Surface and subsurface degradation (CO_2)

- Air pollution (traditional pollutants)

Traditional regulatory programs

- Water / aquifer contamination both at the site of injection and in surrounding aquifers (pH, minerals, metals, oil / gas, displaced fluids)

UIC, water use permitting, research

2. Reducing environmental impacts cont… (strategies)

- Biologic and aquatic
  - –Aquifer depletion / degradation from major source
  - –Endangered species and surface impoundments
  - –Open space / loss of rural environment
  - –Others

Potential for operations and infrastructure impacts is largely dependent on the characteristics surrounding the storage site (surface and aquifer conditions) – scientifically accurate application of water extraction permitting and ESA needed

2. Reducing environmental impacts cont… (strategies)

- Justice / equity
  - Intergenerational equity / morality
  - Minimizing environmental impact

Rigorous storage protection and measurement

Siting consideration & cumulative risk assessment

To be discussed in a different panel discussion

2. Reducing environmental impacts cont…

Question:

What steps can and should be taken to allow for CCS technology adoption and deployment in California, both in healthy ecosystems and in degraded air and water sheds, in order to protect our environment and public health?

Legislative? Administrative? Local? Leave as is?

2. Reducing environmental impacts cont… (summary)

CO_2 source

- IPCC specified measures (slide 3)
- Rigorous and appropriate application of traditional environmental laws and permitting authority
  - CEQA, NEPA, ESA, NSR, NSPS, UIC, Land and H_2O use permits, etc.
- Local permitting assistance and enhanced air quality protections
- Inherent controls of emissions
- Research and development of emission control technology

Sequestration sites

"Existing technology and conventional data sets can readily meet the needs of carbon sequestration projects."

Burton et. al
AB 1925 report
November 2007

(IPCC measures with California site specific MRVA)

3. Potential indirect impacts

- Issues associated with cost / benefit and alternatives
  - Plant efficiency reduction ← Will more power plants be needed?
  - Opportunity for coal ← Will dirty power plants get a free ride into the state, and disadvantage renewable energy and energy efficiency?

3. Potential indirect impacts cont…

- Issues associated with cost / benefit and alternatives
  - More and dirtier power plants?
    - Answer: With CCS, more fossil power plants may come on line, but with significantly reduced GHG and traditional pollutant emissions. We must ensure that emissions and permitting laws are complied with and further refined to respond to penetration of new technology.
  - Less RE and EE?
    - Answer: California's loading order and RPS requires RE and EE to move ahead. This is not an either / or scenario.

4. Public outreach and involvement

- Project developers, government and interested parties should engage early and often
- Projects need easy to understand materials, both with regard to new technology at the capture facility and sequestration site
- Demonstration of project / sequestration safety, compliance with environmental laws, and overall feasibility will increase acceptance

Thank you.

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