Regulating Access to Pore Space, Site Permitting, and Long-Term Stewardship
A Report from the CCSReg Project

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Details at: http://www.ccsreg.org

The four topics for today's presentation

1. Overview of the CCSReg project
   Granger Morgan

2. Solving the problem of pore space access for sequestration projects
   Granger Morgan

3. Effectively managing long-term stewardship of closed sequestration projects
   Bob Nordhaus

4. Ensuring GS rules reflect the best knowledge available
   Ed Rubin
At Carnegie Mellon...

...Ed Rubin and his student and colleagues have worked extensively on technical performance and cost issues related to CC and GS (largely DoE support).

Building on this work, with NSF support, Profs. Apt, Fischbeck, Lave, Keith, Morel, and their students and colleagues have worked extensively on the economics of adoption.

But, while there are big technical challenges...

...at least in the U.S., issues of regulation are as or more critical to the future success of GS. To begin to address those issues, in 2007 we ran two workshops – first in Washington, DC in March.

Commissioned papers from:

- BP
- Bellona/Statoil
- RFF/IVL/CICERO
- UK Energy Research
- Australian GHG Office
- SwissRe

- Carnegie Mellon
- MIT
- Stanford
- NRDC
- PIK

Then at SwissRe near Zurich in November.
In order to pursue...

...these issues further, we secured major funding ($1.8-million) from the Doris Duke Charitable Foundation. This, along with NSF funding (~$200k), has allowed us to create the CCSReg project, a distributed effort anchored at Carnegie Mellon.

In January of 2009, we issued a 155-page Interim report that framed the issues.

Project details are at
www.ccsreg.org

Sean McCoy is project manager
Why now?

A number of Hill staff have asked us: "What's the rush? Why not wait to resolve these issues until things are much further along?"

One reason is that the states are not waiting.

The US is moving toward a patchwork of resolutions that will be complicated and potentially much more expensive than it need be.

Melisa Pollak has compiled a state-by-state summary that is available on the CCSReg project web site.

States are moving forward today

Pore space:

Long-term stewardship:

GS policy:

EOR exclusion:
Our project addresses issues... 
...across the entire system from capture, to transport to geologic sequestration (GS). However, today we'll focus on three key issues in GS.

Three key problems:

1. Access to and use of pore space
2. Liability and long-term stewardship
3. Adaptive approach to permitting and site operation
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Access to Pore Space

In much of the world (Europe, Australia, Canada, etc.), governments control access to most deep-subsurface resources. In much of the U.S., these rights are undefined.

This ambiguity might be resolved in several ways, many of which could make CCS economically infeasible.

We believe that a federally coordinated solution is superior to a state-by-state solution, or resolution in the courts.
We Propose:

Federal legislation that establishes a uniform regulatory framework for authorizing injection of CO₂ into deep geologic pore space on both private and federal lands.

The regulation would modify the present UIC program in several important ways.

Details of our Proposals on Access to and Use of Pore Space

- Modify but work within EPA's Underground Injection Control (UIC) program
- The issuance of a UIC injection permit and pore space permit should expressly grant a GS project developer the legal right to inject and sequester CO₂ within the boundaries specified by the permit.
- UIC permitting should provide public notice and a significant but finite period for:
  1. Filings by, and comparative consideration of, alternative GS projects that might be precluded or substantially impaired by the grant of the initial application; and,
  2. Filings by mineral rights owners (and other pore space users) notifying the UIC permitting agency of conflicting uses of the pore space during permit process.
Details of our Proposals on Access to and Use of Pore Space...(Cont.)

• If material impairment of a non-GS use is demonstrated, the GS project should be permitted only in accordance with:
  1. A contractual resolution of the preexisting interest;
  2. A modification of the project that avoids the impairment; or,
  3. A finding by the UIC permitting agency that the GS project is of such public importance as to justify condemnation of the preexisting interest, with appropriate compensation if necessary.

• Federal legislation should declare that subsurface trespass claims against GS operators who are in compliance with a valid permit are not compensable unless the injection and migration of CO\textsubscript{2} actually and substantially impairs an established current or imminent use of the subsurface that had been identified during the UIC permit proceeding.

Details of our Proposals on Access to and Use of Pore Space ...(Cont.)

• Geological sequestration of CO\textsubscript{2} should be declared an activity in the national interest, and UIC regulators should be authorized to balance any conflicting national interests.

• Legislation should not preempt state mineral rights laws, except where necessary to ensure that mineral exploration and production activities will not cause leakage of sequestered CO\textsubscript{2} or compromise the integrity of GS site.
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Liability risk management strategies depend on the project stage

During the operational phase use conventional risk management

Develop a Federal compensation fund
We Propose:

1. Creation of an independent Federal Geologic Sequestration Board ("FGSB") housed in DoE not EPA.

2. Creation of a Geologic Carbon Sequestration Stewardship Fund into which all operating projects pay a small per-ton fee.

3. Stop-gap federal indemnity for the post-closure phase of first movers until the FGSB comes into effect.

Recommendations on Liability & Long-Term Stewardship:

- Operating commercial GS projects should remain subject to liability rules under otherwise applicable state and federal law and would rely on the private insurance market, or mutual insurance, for risk management.

- A federal program operated by a Federal Geologic Sequestration Board ("FGSB") should be created to oversee the long-term stewardship of adequately closed injection projects. The Board should administer, and be financed by, a revolving fund that is based upon risk-based assessments on GS projects during their operating life.

- Once an injection project is completed and regulators determine that the project meets established standards and does not present unreasonable health, safety, or environmental risks, it should be transferred to the federal long-term stewardship program along with all liability and responsibility for compensation.
Recommendations on Liability & Long-Term Stewardship ...(Cont.)

- Any necessary remediation or compensation payments during the stewardship phase should be the responsibility of the FGSB, and should be disbursed from the revolving fund. The FGSB could also make the fund available for emergency remediation of sites not yet covered by the long-term stewardship program (but the FGSB will recover costs of remediation from the project operator or other parties). The FGSB could delegate stewardship responsibility to state agencies.

- Once a GS project is transferred to the FGSB, claims for compensation and remediation must be asserted against the FGSB rather than the project operator or upstream entities. However, the project operator would remain liable to the FGSB for failure to disclose environmental risks or willful violation of regulations.

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Need for an adaptive approach

Regulations developed to govern the operation and closure of GS projects, as well as criteria for a transition to long-term stewardship, should be periodically reviewed and revised in light of accumulated experience from GS projects operated in the United States and elsewhere.

Similarly, the regulatory requirements for any geological sequestration project should be formulated in such a way as to allow the operating requirements of the project to change as more site-specific or general information is gained over the course of the injection period, provided that such changes are consistent with the overriding objective of protecting health, safety and the environment.

Performance-based standards

Regulations governing GS projects should be formulated as performance-based standards rather than procedure-based standards, to the extent that this can be done while assuring that all GS activities are conducted in a manner that provides reasonable protection to health, safety and the environment.

In general, the objective of performance-based standards is to provide a greater degree of flexibility and cost-effectiveness in achieving the safe operation of a GS project.
Why a performance-based adaptive approach?

• To respond to potential CO₂ migration in pore space:
  – Regulations should allow the regulator and site operator to modify details of the site monitoring plan, injection operations, and other regulated activities on the basis of accumulated evidence as injection proceeds.

• To account for varying geological properties and GS site designs:
  – Regulatory requirements (including those for long-term stewardship) should be periodically reviewed and revised as needed after considering the accumulated experience with CCS projects in the United States and elsewhere.

The Regulators

Regulation should be the responsibility of the following organizations:

• FERC and DOT, for interstate CO₂ pipelines
• EPA, to oversee the licensing and operation of injection sites, with the option to delegate responsibility to states
• A newly created independent Federal Geologic Sequestration Board (FGSB, described earlier), for long-term stewardship of closed sites.
Mechanism to incorporate learning into the regulatory process

We propose the creation of a CCS Technical Advisory Committee of the National Research Council that will:

- Review accumulated evidence and make recommendations on the performance-based regulatory strategy used by the EPA to regulate GS after several (5-10) large commercial-scale GS facilities (2 Mt CO₂/yr or more) have operated for at least five years.
- Evaluate at that time the cumulative experience from all domestic and foreign commercial-scale projects and assess whether fundamental changes to the structure of the GS regulatory framework are needed.
- Meet at least once every ten years thereafter to review and evaluate accumulated evidence and experience.

Development of Model Legislative Language

While the Policy Briefs lay out the basic ideas we believe should govern the regulation of CCS, we are now finalizing draft legislative language that is more specific.

We harbor no illusions that Congress would quickly adopt such legislation just as we have drafted it.

However, we think it is useful to have a concrete example of the legislation we think is needed.
The bill we are drafting consists of five separate titles:

**TITLE I** — CARBON DIOXIDE PIPELINES

**TITLE II** — ADAPTIVE PERFORMANCE-BASED APPROACH TO CCS REGULATION

**TITLE III** — LICENSING AND OPERATION OF INJECTION SITES

**TITLE IV** — LONG-TERM STEWARDSHIP OF CLOSED INJECTION SITES

**TITLE V** — ACCOUNTING FOR SEQUESTERED CARBON DIOXIDE

We will complete a first draft of proposed legislative language within the next day or so.

To receive a copy, either:

- Visit the CCSReg project website at [www.ccsreg.org](http://www.ccsreg.org)
- Speak with Sean McCoy ([stmccoy@cmu.edu](mailto:stmccoy@cmu.edu)) to request a copy of the draft language via email.
Bottom Line:

While the widespread use of CCS still faces many hurdles, resolving regulatory and legal uncertainties is one of the most important.

Designing a viable framework to address these issues is both complicated and challenging.

That is why we have put together an interdisciplinary team of engineers and lawyers who have worked together on these issues for the last two years.

We believe that the framework we have developed points the way to resolving the key issues needed to move CCS forward to help mitigate climate change.

Acknowledgments

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