

## CCSReg Project Policy Brief Summaries

The Carbon Capture and Sequestration Regulatory Project (CCSReg) is developing recommendations for regulation of deep geological sequestration of carbon dioxide in the United States. The project is funded by a grant from the Doris Duke Charitable Foundation and anchored at Carnegie Mellon University with collaborators at the University of Minnesota, Vermont Law School, and the law firm of Van Ness Feldman.

In January of 2009, the project released an interim report titled "Carbon Capture and Sequestration: Framing the Issues for Regulation." The interim report identifies a number of regulatory and legal barriers to the large-scale deployment of CCS technology and various options to remove them. The next stage of our work is to prepare policy briefs that recommend specific options to address these issues. The list below enumerates the policy briefs, providing a brief description and the anticipated release date for each brief.

- *Comprehensive Regulation of Geologic Sequestration (available from <http://www.ccsreg.org>)*
- *Governing Access to and Use of Pore Space for Deep Geological Sequestration (available from <http://www.ccsreg.org>)*
- *Compensation, Liability and Long-Term Stewardship for CCS (available from <http://www.ccsreg.org>)*
- *A Framework for Regulating Carbon Dioxide Pipelines for the Purpose of Transporting Carbon Dioxide to Geologic Sequestration Sites (available from <http://www.ccsreg.org>)*
- *Learning and Adaptation in Regulation of Geologic Sequestration (available from <http://www.ccsreg.org>)*
- *Carbon Dioxide Accounting in Carbon Capture and Sequestration (available from <http://www.ccsreg.org>)*
- *Managing the transition from EOR to Geologic Sequestration (forthcoming in 2010)*
- *Criteria for Permitting and Closure of Sequestration Sites (forthcoming in 2010)*
- *Removing Barriers to Commercial Deployment of CCS Technology (forthcoming in 2010)*

While drafts of forthcoming briefs will be available in full in the near future, the following pages summarize the key points from each of the six briefs that are currently available at the CCSReg project website. If you have any questions or would like to discuss any aspect of the attached summaries, please contact [stmccoy@cmu.edu](mailto:stmccoy@cmu.edu).

## Comprehensive Regulation of Geologic Sequestration

The current U.S. Underground Injection Control (UIC) Program is insufficient to address many of the issues raised by geologic sequestration (GS), including access to deep pore space and issues of long-term liability. This policy brief outlines how new federal legislation should resolve these and other issues.

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### Recommendations:

- The U.S. Congress should enact legislation to lay the groundwork for the comprehensive regulation of geologic sequestration (GS). Permits for the operation of GS projects should be issued under a version of the U.S. Environmental Protection Agency (EPA) Underground Injection Control (UIC) regime that has been explicitly expanded by new federal legislation to address the broader range of issues raised by GS activity.
  - Federal legislation should:
    - Declare that sequestering carbon dioxide (CO<sub>2</sub>) in geologic formations to mitigate the detrimental effects of climate change is in the public interest;
    - Address the issue of access to and use of geologic pore space;<sup>1</sup>
    - Amend the Safe Drinking Water Act to direct UIC regulators to promulgate rules for GS that: address all environmental, health and safety issues associated with GS; are principally based on adaptive, performance-based standards, as opposed to design standards;<sup>2</sup> and, include mechanisms to balance and resolve conflicts between multiple environmental objectives.
    - Direct UIC regulators<sup>3</sup> to coordinate with regulators in charge of greenhouse gas inventory accounting for the U.S.;<sup>4</sup>
    - Obligate GS project operators to contribute on the basis of their operating performance to a revolving fund to cover long-term stewardship; and
    - Create an independent public entity (the Federal Geologic Sequestration Board) to approve and accept responsibility for appropriately closed GS sites.<sup>5</sup>
  - As with the existing UIC program, states and tribes should be able to apply for primary enforcement responsibility to implement the expanded UIC Program for GS within their borders. However, primacy for permitting GS projects should be handled separately from primacy for other types of wells, using new criteria that include authorization of interstate compacts to harmonize and streamline regulatory requirements.
  - Once the preceding changes have been made, EPA will need to expand and revise its proposed rules for injection of carbon dioxide for geologic sequestration.
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<sup>1</sup> See CCS Regulatory Project. *CCSReg Policy Brief: Access to and Use of Pore Space for Geologic Sequestration*. July 13, 2009. Available at <http://www.ccsreg.org>

<sup>2</sup> See CCS Regulatory Project. *CCSReg Policy Brief: Two-stage, Adaptive Regulation of Geologic Sequestration*. August 28, 2009. Available at <http://www.ccsreg.org>

<sup>3</sup> "UIC regulators" include Federal regulators, or State or Tribal regulators with primacy.

<sup>4</sup> See CCS Regulatory Project. *CCSReg Policy Brief: Treatment of CCS under U.S. Greenhouse Gas Regulations*. Forthcoming in 2009. Available at <http://www.ccsreg.org>

<sup>5</sup> See CCS Regulatory Project. *CCSReg Policy Brief: Compensation, Liability and Long-Term Stewardship for CCS*. July 13, 2009. Available at <http://www.ccsreg.org>

## **Governing Access to and Use of Pore Space for Deep Geological Sequestration**

Large-scale development of geologic sequestration (GS) of CO<sub>2</sub> requires federal legislation that establishes a regulatory framework for authorizing injection of CO<sub>2</sub> into deep geologic pore space on federal and private lands. This policy brief outlines the form that framework should take.

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### **Recommendations:**

- GS projects should be permitted under an expanded version of the Environmental Protection Agency's Underground Injection Control (UIC) program.
  - The issuance of a GS injection permit by a UIC regulator should expressly grant to the GS project developer the right to inject and sequester CO<sub>2</sub> in the deep pore space within the boundaries specified by the permit.
  - The UIC regulator should provide public notice and a significant but finite period for filings by, and comparative consideration of, alternative GS projects that might be precluded or substantially impaired by the grant of the initial application.
  - During the same period, other property owners should be allowed to present evidence that current or imminent non-GS uses may be materially impaired by the proposed project. Preexisting interests that are not asserted during this period should be subject to GS development without compensation.
  - If a showing of impairment of a non-GS use is made, the GS project should be permitted only in accordance with 1) a contractual agreement between the owner of the preexisting interest, 2) a modification of the project that avoids the impairment, or 3) a finding by the UIC regulator that the GS project is of such public importance as to justify condemnation of the preexisting interest, with appropriate compensation if necessary.
  - The 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<sub>2</sub> or compromise the integrity of GS site. The legislation should recognize that mineral rights, like any other property interest, are subject to eminent domain.
  - The federal legislation should limit the trespass liability of a project developer operating pursuant to a valid UIC permit. Use of pore space should give rise to a trespass claim, under an exclusive federal remedy, only in cases where the injection and migration of CO<sub>2</sub> materially impairs a current or imminent use.
  - The Federal Land Policy Management Act should be modified to specifically authorize the use of federal lands for GS. Through an integrated permitting system, the Bureau of Land Management and the EPA should jointly license GS projects on federal lands under a new legislative framework similar to the oil and gas leasing provisions of the Mineral Leasing Act and the expanded UIC regime proposed in this brief.
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## Compensation, Liability and Long-Term Stewardship for CCS

For carbon capture and sequestration (CCS) to be deployed commercially at large-scale, workable liability rules for geologic sequestration (GS), as well as a program for long-term stewardship of closed sequestration sites, will need to be in place. This policy brief reviews current liability rules for personal injury, property damage, and trespass claims arising out of GS operations, options for any necessary changes in those rules, and recommends a federally administered long-term stewardship program.

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### Recommendations:

- Operating commercial GS projects should remain subject to liability rules under otherwise applicable State and Federal law and should 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 FGSB should be an "independent agency," but housed within an existing federal agency for purposes of administration. It 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.
  - 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 (with the prior requirement that the FGSB will recover costs of remediation from the project operator or other parties).
  - Depending on the timing of general federal CCS legislation, it may be necessary to establish a stop-gap federal indemnity program for the stewardship phase of "first-mover" projects. Those projects should ultimately be covered by the stewardship program outlined in this brief.
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## **A Proposed Framework for Regulating Carbon Dioxide Pipelines for the Purpose of Transporting Carbon Dioxide to Geologic Sequestration Sites**

This policy brief summarizes the regulatory issues relating to construction and operation of the carbon dioxide (CO<sub>2</sub>) pipeline infrastructure that will be needed to transport CO<sub>2</sub> from source to geologic sequestration sites for purposes of carbon capture and sequestration (CCS).

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### **Recommendations:**

- Create an "opt-in" federal regulatory regime that provides the Federal Energy Regulatory Commission (FERC) with authority to consider and grant or deny applications for federal siting permits for new CO<sub>2</sub> pipelines built to transport CO<sub>2</sub> for purposes of permanent sequestration. The federal siting permit should provide the pipeline with federal eminent domain authority.
  - Once new CO<sub>2</sub> pipelines with federal siting permits are operational they should be subject to non-discriminatory access and rate regulation. Prescriptive cost-of-service rate regulation is not necessary.
  - Retain the current system of state siting and economic regulation for existing CO<sub>2</sub> pipelines. New CO<sub>2</sub> pipelines would also be subject to the current system unless they opt into the federal regulatory regime by filing for and obtaining a federal siting permit.
  - Streamline the permitting process for CO<sub>2</sub> pipeline projects on federal lands.
  - Utilize the existing pipeline safety regulatory framework to ensure safe operation of all CO<sub>2</sub> pipelines.
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## Learning and Adaptation in Regulation of Geologic Sequestration

Until the U.S. and other countries have operated a number of commercial-scale geologic sequestration (GS) projects in a variety of geological settings, it will be difficult to identify many of the issues that may arise during project operation, the magnitude of possible impacts, or how best to regulate them. However, GS is such an important climate mitigation technology that we need to proceed to develop and operate several commercial-scale injection projects as soon as possible so that we may begin the learning process.

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### Recommendations:

- In a series of policy briefs,<sup>1</sup> we recommend a general regulatory framework for GS that is based upon an expanded Underground Injection Control (UIC) program.<sup>2</sup> While the regulatory program should be put in place as soon as possible, regulators should remain flexible with respect to many of the specific details (e.g., the form that performance standards should take or the magnitude of risk-based fees that should be collected to cover the costs of long-term stewardship) until operating experience is gained from at least five commercial-scale GS projects in a range of geological settings domestically and abroad.
  - After several (e.g., 5-10) commercial-scale GS facilities, each sequestering 2 Mt/yr or more, have operated for at least five years, Congress and EPA should commission an expert Technical Advisory Committee of the National Research Council (NRC) to review the accumulated evidence and make recommendations on how the details of performance-based standards in a UIC program expanded to accommodate GS<sup>3</sup> should be implemented.
  - Once the regulatory framework for GS under an expanded UIC program has been put in place, the implementation of the performance-based standards for any given site should be adaptive because each sequestration project will be different. That is, consistent with the objective of safe operation, the standards 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 the accumulated evidence as injection proceeds.
  - Every ten years, Congress and EPA should reconvene the expert Technical Advisory Committee of the NRC to evaluate the cumulative experience from all commercial-scale projects domestically and abroad in order to assess whether fundamental changes to the structure of the GS regulatory framework, or its implementation are needed.
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<sup>1</sup> See the series of policy briefs available at <http://www.ccsreg.org/>.

<sup>2</sup> See 40 CFR § 144.1 (2008) and CCS Regulatory Project. Policy Brief: Comprehensive Regulation of Geologic Sequestration. July 13, 2009. Available at <http://www.ccsreg.org>.

<sup>3</sup> For details of this expanded UIC program, see CCS Regulatory Project. Policy Brief: Comprehensive Regulation of Geologic Sequestration. July 13, 2009. Available at <http://www.ccsreg.org>

## Carbon Dioxide Accounting in Carbon Capture and Sequestration

In order for carbon capture and sequestration (CCS) to be an effective climate change mitigation tool, captured CO<sub>2</sub> must be effectively sequestered and accounted for properly under a greenhouse gas (GHG) emission reduction program. This will require knowing how much CO<sub>2</sub> is captured, how much is transported from the site of capture to a geologic sequestration (GS) project, how much is injected, and—if there is any leakage from a GS project—how much escapes to the atmosphere. While accounting for CO<sub>2</sub> across all stages of CCS is important, accounting for CO<sub>2</sub> in GS projects is particularly challenging. This policy brief addresses accounting across all stages of CCS, but focuses primarily on accounting for sequestered CO<sub>2</sub> at GS sites and the associated monitoring strategies necessary to protect the integrity of GHG emission limits.

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### Recommendations:

- Operators of each stage of a CCS project—capture, transport, and geological sequestration—should be required to measure and report the mass of CO<sub>2</sub> handled, including the amount captured, exported, imported, and injected.
- Each stage of a CCS project should be a covered entity under a cap and trade system or other GHG emission reduction program. GS projects should be covered entities regardless of size or emissions rate, and sequestered CO<sub>2</sub> should be treated as avoided emissions rather than as offsets.
- Routine monitoring, to protect health and the environment, and to demonstrate containment of CO<sub>2</sub> at GS sites, should be site-specific, performance-based, and incorporate the lessons learned from the first handful of carefully monitored commercial-scale projects.<sup>1</sup>
- *Only if* routine subsurface monitoring finds that CO<sub>2</sub> has migrated through the confining formation *and* either surface monitoring of vegetation or soil gas detects leakage, should focused surface measurements be required to locate and quantify leakage emissions for accounting in a GHG regulatory regime.
- If a loss of containment is detected, GS project operators should be required to undertake a monitoring program to quantify emissions from the site. Regulation should establish performance standards identifying the level of leakage a monitoring program should be designed to detect. The monitoring program should be designed to quantify, at a minimum, the reporting requirements. The operator should be required to submit emissions allowances to cover the measured amount. If a satisfactory monitoring program cannot be implemented at the site (due to technological or other factors), the operator should submit allowances to cover a set fraction (e.g., 0.1% to 1%) of the total amount of CO<sub>2</sub> sequestered at the site.
- An emissions allowance reserve program should be created to address possible emissions during the long-term stewardship phase. GS project operators should be required to deposit emissions allowances equal to some small fraction (e.g., less than 0.5%) of their annual injection quantity into a pooled fund, which would be used to cover leakage from all GS projects during long-term stewardship. The fund should be managed by the Federal Geologic Sequestration Board.<sup>2</sup>

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<sup>1</sup> See CCS Regulatory Project. *CCSReg Policy Brief: Learning and Adaptation in Regulation of Geologic Sequestration*. August 28, 2009. Available at <http://www.ccsreg.org>

<sup>2</sup> See CCS Regulatory Project. *CCSReg Policy Brief: Access to and Use of Pore Space for Geologic Sequestration*. July 13, 2009. Available at <http://www.ccsreg.org>