

Requirements for Developing a Deep Brine Carbon Sequestration Project

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State-Based Developments in Regulating CO₂ Sequestration

by Ian Duncan, J.P. Nicot, and Scott Anderson

Escalating carbon dioxide (CO₂) concentrations in the atmosphere is an issue of global concern. Carbon capture and storage (CCS) projects can be used to substantially reduce CO₂ emissions to the atmosphere. Geologic sequestration enables fossil fuel to be decarbonized by capturing CO₂ emitted from stationary sources such as fossil fuel-fired power plants and injecting the gas (after compression to form a dense, supercritical fluid) into the subsurface in deep brine reservoirs for long-term storage. To date, however, little has been done to establish regulatory guidelines or operational standards that apply explicitly to geologic CO₂ sequestration in the United States.

Two key reasons for creating and implementing a rationale and effective regulatory framework for CCS projects are to (1) ensure public health and safety and (2) prevent environmental damage, particularly damage to underground sources of drinking water sources (USDWs). Additional issues include

- addressing the concerns of local government and residents—any negative environmental consequences of geologic sequestration are likely to impact the local community;
- providing a mechanism for stakeholders and the public to have effective input into the both the initial permitting process and the integrity of subsequent regulatory oversight;
- supporting confidence of the market place for CO₂ sequestration credits by assuring transparency;
- creating a predictable and level playing field for companies involved in geological sequestration of CO₂; and
- ensuring the adequacy of long-term monitoring, mitigation, and remediation efforts.

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Currently, subsurface injection of wastewater and other fluids in the United States is regulated under the U.S. Environmental Protection Agency's Underground Injection Control (UIC) program. The aim of the federal program is to protect USDWs under the authority of the Safe Drinking Water Act. Five classes of injection wells are currently part of the UIC program and EPA has recently released draft rules creating a UIC Class VI specifically for CO₂ sequestration (see "EPA's Proposed Underground Injection Control Regulations" by Russ Baier, page 6)

At the same time, a significant number of U.S. states are working on regulatory frameworks of their own for geologic CO₂ sequestration. Though less well known than EPA's efforts, they give important insights into the possible nature of the regulatory framework that may arise as states interact with the federal efforts.

Over the past few years, many states have begun attempts to address the regulatory issues associated with developing geologic carbon sequestration projects. In a few states, sequestration is illegal under current state law. Existing state law in Nevada, for example, forbids the injection of industrial wastes into aquifers, including saline aquifers, and this law appears to apply to CO₂ sequestration projects. Although several states (including Texas) have focused on fitting the activity within existing regulatory frameworks, many states are attempting to develop new, comprehensive approaches to regulation of geologic CO₂ sequestration.

There are two main routes for states to develop regulatory programs: by legislation and by rulemaking. In some cases, legislation can be quite specific in setting out what the regulations must contain. More commonly, legislation establishes guidelines for desired regulations and directs one or more state agencies to go through a rulemaking procedure to create a set of regulations. For example, Ohio House Bill 487¹ gives the state's Division of Mineral Resources Management the "exclusive authority to regulate the geologic storage of carbon dioxide." In other states, there may not be an obvious answer to the question of which agency to designate. For example, in states with a history of CO₂-based enhanced oil recovery (e.g., Oklahoma, New Mexico, Michigan, Mississippi, Texas, Louisiana), the state's oil and gas regulatory agency may have the most experience in regulating CO₂ injection, while the state's environmental or groundwater protection agency has significant expertise regarding UIC activities in general.

A preliminary survey of legislation, committee reports, and other activities reveals an interesting range of objectives and approaches being used by different states across the United States. The diverse activities of these states reflect the innovation that results from the interactions of groups of regulators, scientists, engineers, and policy experts with a wide range of backgrounds and expertise. In our analysis, we have included information from a wide range of sources, including draft legislation; legislation submitted and then tabled; reports from legislative committees; final legislative bills; draft rules; reports submitted to rulemaking task forces; and, if available, final rules.

Our approach is designed to capture the essence of what problems the states are grappling with and to make some of their more innovative ideas available to a broader audience. This article reviews a range of state regulatory approaches.

State-Based Regulatory Frameworks

Much of the state-level activity on geological sequestration regulations was begun by the Interstate Oil and Gas Compact Commission (IOGCC).² In 2005, with funding from the U.S. Department of Energy (DOE), IOGCC published a task force report, entitled *Carbon Capture and Storage—A Regulatory Framework for the States*. This report was followed in 2007 by a second report, entitled *CO₂ Storage—A Legal and Regulatory Guide for States*. This second report—together with concerns about mitigation of climate change in some state legislatures—has resulted in an increased interest at the state level in developing regulations for permitting CO₂ sequestration projects in brine reservoirs.

Washington State

Washington has primacy over regulation of UIC wells Classes I–V; however, it has no experience with CO₂-based enhanced oil recovery. Washington is developing a substantial rulemaking program. The development of draft rules guiding geological carbon sequestration is being led by the state's Department of Ecology. Washington State legislation, Engrossed Substitute Senate Bill 6001,³ gave the department until June 30, 2008, to finalize the rules. The draft rules have been made available online to the public and have been the basis for stakeholder meetings and formal written input from interested parties. The rulemaking has the stated aims of developing permitting guidance documents for CO₂ geologic sequestration projects, including necessary geologic characterization and monitoring; developing stricter requirements for well construction design and operations for CO₂ injection wells under the UIC program; establishing criteria for evaluating carbon sequestration plans; creating a performance standard that defines the term "permanent sequestration"; and establishing a requirement that permit applicants produce a detailed description of safety and emergency response plans for the project.

Kansas

In 2007, the Kansas Legislature passed House Bill 2419⁴ that assigns the regulation of geologic CO₂ sequestration to the Kansas Corporation Commission (KCC) and provides tax incentives for CO₂ sequestration. It also provides for tax incentives by exempting from property tax any CO₂ capture and sequestration. KCC is responsible for regulating all underground CO₂ sequestration in Kansas. The bill required KCC to complete rulemaking by July 1, 2008, and directed KCC to include the following in its rulemaking: site selection criteria; design and development criteria; operation criteria; casing requirements; monitoring and measurement requirements; safety requirements, including public notification; closure and

abandonment requirements; and long-term monitoring. Draft rules are available for public review.

Wyoming

Recently passed legislation authorizing rulemaking to permit CO₂ sequestration in brine reservoirs has been praised as the first comprehensive legislation for regulating CO₂ sequestration to be passed by a state. House Bill 90⁵ includes a number of requirements for any CO₂ sequestration project, including a plan for periodic mechanical integrity testing of all wells; a monitoring plan to assess the migration of the injected CO₂ and to insure the retention of the CO₂ in the geologic sequestration site; requiring proof of bonding or financial assurance to ensure that geologic sequestration sites and facilities will be constructed, operated, and closed in a specified way; a detailed plan for post-closure monitoring, verification, maintenance, and mitigation; and proof of notice to surface owners, mineral claimants, mineral owners, lessees, and other owners of record of subsurface interests. This bill has not yet resulted in rulemaking.

Utah

The Governor of Utah set up a Blue Ribbon Advisory Council (BRAC) on Climate Change to assess the options the state has in combating climate change. The 2007 BRAC report⁶ identified key questions to be addressed in the development of a consistent regulatory framework for CCS projects, including what immunity may be required from potentially applicable criminal and civil environmental penalties; what property rights may need to be established or clarified, such as the possible passage of title to CO₂ (including to the government) during transportation, injection, and storage; what government-mandated caps on long-term CO₂ liability may be required; how should owners/operators of CO₂ transportation and storage facilities be licensed; and how should intellectual property rights related to CCS, and monitoring of CO₂ storage facilities be handled. The BRAC report also suggested that other regulatory barriers include revisiting the traditional least-cost/least-risk regulatory standard or mitigating added risks and financing challenges of CCS projects with assured, timely cost-recovery.

Senate Bill 202⁷ passed by the Utah Legislature in 2007 initiated an ambitious, wide-ranging rulemaking activity to be completed by 2011 and focused on site characterization approval; geomechanical, geochemical, and hydrogeological simulation; risk assessment; mitigation and remediation protocols; issuance of permits for test, injection, and monitoring wells; specifications for the drilling, construction, and maintenance of wells; issues concerning ownership of subsurface rights and pore space; allowed composition of injected matter; testing, monitoring, measurement, and verification for the entirety of the geologic sequestration chain of operations, from the point of capture of the CO₂ to the sequestration site; closure and decommissioning procedure; short- and long-term liability and indemnification for sequestration sites; and conversion of enhanced oil recovery operations to geological CO₂ sequestration sites.

Montana

For the past few years, Montana has been grappling with legislation proposed to develop a regulatory framework for geologic CO₂ sequestration. Senate Bill 218⁸ attempted to initiate a process to create a regulatory framework, including establishing a regulatory program for CO₂ sequestration; evaluating possible CO₂ sequestration sites; establishing recordkeeping and reporting requirements; and establishing requirements for retention of CO₂ and for verification and monitoring. The bill



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had not been adopted at the time this article was written and the Montana Legislature was engaged in an interim study on the subject.

Oklahoma

The Oklahoma Legislature this year passed Senate Bill No. 1765,⁹ which initiates a study of a regulatory framework for CO₂ sequestration based, in part, on the IOGCC model regulations. Under this bill, the Oklahoma Department of Environmental Quality and the Corporation Commission are directed to develop a memorandum of understanding outlining a shared regulatory oversight scheme. The commission is directed to develop a permitting approach, including rulemaking and establishing a financial surety approach. Oklahoma currently has primacy over UIC Class I–V wells.

Senate Bill 1765 has rather general language directing the agency in the rulemaking process. It states that in order to establish a storage facility for CO₂, the state regulatory agency shall find that

- the storage facility and reservoir are suitable and feasible for the injection and storage of CO₂;
- a good faith effort has been made to obtain the consent of a majority of the owners having property interests substantially affected by the storage facility and that the operator intends to acquire any remaining interest by eminent domain or as otherwise allowed by statute;
- the use of the storage facility for the geologic storage of CO₂ will not contaminate other formations containing fresh water or oil, gas, coal, or other commercial mineral deposits; and
- the proposed storage will not unduly endanger human health and the environment.

California

In California, Assembly Bill 705¹⁰ was intended to direct creation of regulations for carbon sequestration for adoption by 2011. The state's Division of Oil, Gas, and Geothermal Resources was directed to develop standards and regulations for the following: site characterization and selection; geomechanical, geochemical, and hydro-geological simulation; risk assessment; mitigation and remediation protocols; permits for test, injection, and monitoring wells; specifications for the drilling, construction, and maintenance of wells; and issues concerning ownership of subsurface rights and pore space. Assembly Bill 705 was recently withdrawn and there is currently no legislation or rulemaking activity pending in the state on CCS regulation, although the California Energy Commission issued a thorough report regarding CO₂ sequestration in November 2007.¹¹

New Mexico

New Mexico has a long history of oil and gas production including CO₂-based enhanced oil recovery. An interim report by a task force set up by the Governor of New Mexico

(under Executive Order 2006-69), completed in December 2007,¹² suggested that the implementation of a regulatory framework for geologic CO₂ sequestration raises numerous property rights, monitoring, verification, and liability issues and should address the following questions:

- Should CO₂ be treated as a waste or a commodity and how should the regulatory framework deal with this distinction?
- Who owns the pore space in geologic formations and can the interests of the owner of the pore space be balanced against the interests of the owner of mineral interests in the context of long-term CO₂ sequestration?
- How can a liability framework be framed protect public and private interests for commercial-scale CO₂ sequestration projects? Should state or federal government?

These issues bear more on the broad legal context for sequestration rather than on a regulatory framework. The New Mexico Legislature is expected to develop legislation on CO₂ sequestration during its 2009 session.

Summary

The IOGCC model regulations thus far have heavily influenced the wording of proposed legislation and draft rulemaking occurring at the state level, but they have not been adopted whole or in part as regulations. This may be mainly a product of timing, given that the IOGCC report was only made public in late 2007. Washington has arguably has the most comprehensive and carefully thought out permitting rules. The state encouraged and received extensive input and commentary from stakeholders and the public. This approach provides a useful model for other states to follow. A key issue as state regulatory frameworks evolve will be how they mesh with developing EPA standards for permitting under the UIC program. It is likely that most if not all of the state rulemaking will have to be modified to meet new federal standards. em

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