

# *IOGCC CCGS Task Force Phase II Biennial Review of the Legal and Regulatory Environment for the Storage of Carbon Dioxide in Geologic Structures*

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*A Summary of State and Provincial Action to Create a Legal and Regulatory Infrastructure for Storage of Carbon Dioxide in Geologic Structures*

*An Update on IOGCC Legal and Regulatory Guidance for States and Provinces*

*Lessons Learned by the DOE Regional Carbon Sequestration Partnerships in the Permitting and Licensing of Validation Phase (Phase II) Pilot Projects*

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In September of 2007, the Interstate Oil and Gas Compact Commission (IOGCC) formally approved [Storage of Carbon Dioxide in Geologic Structures: A Legal and Regulatory Guide for State and Provinces](#). The guidance document was prepared by the IOGCC Carbon Capture and Geologic Storage (CCGS) Task Force. The most critical component of the document was a Model CO<sub>2</sub> Storage Statute and Model Rules and Regulations governing the storage of CO<sub>2</sub> in geologic media and an explanation of those regulatory components. It included two reports addressing the ownership and right of injection of CO<sub>2</sub> into the subsurface and a regulatory analysis of the applicability of the Underground Injection Control Program to CO<sub>2</sub> storage.

The guidance document was the product of a second phase (Phase II) of a five-year process that began with a meeting of state regulators and state geologists in Alta, Utah, in July of 2002. Following the Alta meeting, the IOGCC formed a “Geological CO<sub>2</sub> Sequestration Task Force” that produced a report early in 2005 that examined the technical, policy, and regulatory issues related to the safe and effective storage of CO<sub>2</sub> in subsurface geological media (oil and natural gas fields, coal seams, and deep saline formations) for both enhanced hydrocarbon recovery and long-term CO<sub>2</sub> storage. This report came to be known as the “Phase I” Report. Although the task force in this Phase I Report recognized that states and provinces with oil and natural gas conservation laws and natural gas storage statutes might be able to utilize those statutory and regulatory frameworks for CO<sub>2</sub> injection and storage, it concluded that some modification of those frameworks might be advisable, particularly for the post-operational phase for which no regulations exist. The IOGCC “Phase II” CCGS Task Force grew out of that recommendation.

The biennial update that follows remains a product of the IOGCC “Phase II” CCGS Task Force. It is the first of what may amount to a continuing series of reports by the IOGCC. The reports will review state and provincial activity in implementing legal and regulatory frameworks for the storage of CO<sub>2</sub> in geologic structures and update the IOGCC Model Statute and Model Rules and Regulations for the storage of CO<sub>2</sub> in geologic structures.



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In all of its phases, the IOGCC and its task forces have been funded by the U.S. Department of Energy (DOE) and its National Energy Technology Laboratory (NETL) through cooperative agreements with the University of Illinois (Phase I) and the New Mexico Institute for Mining and Technology (Phase II). In both phases, task force membership has included representatives from IOGCC member states and international affiliate provinces, state and provincial oil and gas agencies, DOE, DOE-sponsored Regional Carbon Sequestration Partnerships, the Association of American State Geologists (AASG), and observer-participants from the oil and natural gas industry. Phase II also included observer-participants from the U.S. Environmental Protection Agency (EPA), the U.S. Bureau of Land Management (BLM) and the environmental organization, Environmental Defense.

The task force gratefully acknowledges the support of the U.S. Department of Energy, the National Energy Technology Laboratory, the New Mexico Institute of Mining and Technology, and the critical support of the states and provinces and other entities that so generously contributed their employees' time to the production of this document. Deep appreciation is also expressed to the participants in the task force, who made the production of this document possible. The assistance of Berry H. "Nick" Tew, Jr. of Alabama in helping to draft and integrate task force comments on the remainder of the guidance document is also gratefully acknowledged.

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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the New Mexico Institute of Mining and Technology or of The Department of Energy.

## *Abstract*

This report is the product of the Interstate Oil and Gas Compact Commission (IOGCC) Carbon Capture and Geologic Storage (CCGS) Task Force. It is the penultimate deliverable of Phase II of the IOGCC CCGS Task Force under a cooperative agreement with the Southwest Regional Partnership on Carbon Sequestration. The report constitutes a “biennial review” that both updates the CCGS Task Force’s 2007 guidance document for U.S. states and Canadian provinces and summarizes the status of state and provincial efforts to develop laws and promulgate regulations as concerns the geologic storage of carbon dioxide. As with the IOGCC CCGS Task Force’s 2007 guidance, it is anticipated that a state<sup>1</sup> adopting a regulatory framework for CO<sub>2</sub> geologic storage will make changes to the model framework as necessary to conform to the state’s unique circumstances. The task force therefore continues to envision that the end-product will be a substantially consistent system in the United States and Canada for the geologic storage of CO<sub>2</sub> regulated at the state and provincial level in conformance with national and international law and protocol.

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<sup>1</sup> Although references throughout this Executive Summary are, for the most part, to “state” or “states”, it is the intent of the task force that the comments and provisions are equally applicable to Canadian provinces. Of course, this would not apply to discussions concerning underground storage rights and the Underground Injection Control Program of the U.S. Safe Drinking Water Act.

## Experimental Methods

The data for this study were gathered through informal surveys, letters, personal interviews, site visits, and published reports. Sources include government officials, regulatory agency employees, private oil and gas company owners and employees, oil and gas service-industry owners and employees, academics, trade publications, and government documents. Necessarily, much of the information is anecdotal and somewhat subjective. Statistics cited are identified by source. Estimates are based on published statistical evidence with the methodology and source identified.

In many instances, the actions of a particular state, or several states, are cited as examples of approaches to challenges faced by oil and gas development. It should be noted that in most of these cases, other oil- and gas-producing states are using similar approaches; the cited examples are deemed to be the most representative or inclusive.

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## Table of Contents

<b>Executive Summary</b> .....	<b>5</b>
<b>Part 1. Introduction</b> .....	<b>6</b>
<b>Part 2. A Review of State and Provincial Action to Create a Legal and Regulatory Infrastructure for Storage of Carbon Dioxide in Geologic Structures</b> .....	<b>12</b>
<b>Part 3: A Review of IOGCC Legal and Regulatory Guidance for States and Provinces for the Storage of Carbon Dioxide in Geologic Structures</b> .....	<b>38</b>

## List of Appendices

Appendix I: Model Statute for the Storage of Carbon Dioxide

Appendix II: Model General Rules and Regulations

Appendix III: Bibliography of State Reports, Legislation, and Regulations pertaining to the Storage of Carbon Dioxide in Geologic Structures

Appendix IV: Lessons Learned by the DOE Regional Carbon Sequestration Partnerships in the Permitting and Licensing of Validation Phase (Phase II) Pilot Projects

## Executive Summary

With growing concern over the effects of greenhouse gases on the environment, much research is being devoted to technological and policy efforts to mitigate the effects. One of the methods being discussed at length by policymakers and industry is CCGS or “carbon capture and geologic storage,” which is the capture of carbon dioxide from an emission source and geologically storing it underground.

Development of a comprehensive CCGS system is not limited to the technical aspects of storage. The development of a wide scale roll-out of a CCGS infrastructure will also require that key legal and policy issues be addressed. This “Biennial Review of the Legal and Regulatory Environment for the Storage of Carbon Dioxide in Geologic Structures” addresses the legal and regulatory environment facing the development of a comprehensive CCGS infrastructure. This report is not intended to be a set of recommendations or legal solutions to the legal and regulatory hurdles facing CCGS but is to document the progress states and provinces have made in addressing these complex issues.

In addition to state and provincial utilization of the IOGCC Model Statute and Rules, the U.S. Environmental Protection Agency (EPA) also referenced the statute and rules in development of the proposed CCGS rules under the UIC Program.

The rules the states and provinces have developed recognize the dual nature of carbon dioxide. While it is a major contributor to increasing greenhouse gases in the atmosphere, it also has commercial viability in enhanced oil recovery (EOR) operations. This report and previous IOGCC reports recognize this dichotomy. To facilitate CCGS as a climate mitigation strategy and as a commercial resource the task force has urged a “resource management” approach to the development of a CCGS legal and regulatory framework as opposed to a ‘waste disposal’ framework.

The Interstate Oil and Gas Compact Commission is a multi-state government agency that promotes the conservation and efficient recovery of domestic oil and natural gas resources while protecting public health, safety, and the environment. This report is a result out of the collaborative efforts of states and provinces to develop a viable CCGS legal and regulatory infrastructure and provide an overview of the importance states and provinces continue to place on the development of CCGS rules and regulations.



**Part 1. Introduction**

This report constitutes a review of what has transpired since September 2007 when the IOGCC published its report entitled [Storage of Carbon Dioxide in Geologic Structures: A Legal and Regulatory Guide for State and Provinces](#).<sup>2</sup>

On the surface, it might appear that little has changed since 2007 concerning the geologic storage of carbon. Below the surface, however, it is abundantly clear that significant and important foundational steps have been, and continue to be, taken in the United States and elsewhere in the areas of research into and application of CCGS technologies and to develop the regulatory mechanisms that will govern deployment of the technologies. The focus of this report is on the regulatory aspects of the geologic storage of carbon in the U.S. and Canada. At the two-year point, the IOGCC and its Carbon Capture and Geologic Storage (CCGS) Task Force are able to conclude that while much work by states and provinces remains to be done, an important core group of states --- North Dakota, Washington, Wyoming, Kansas, Louisiana, Montana, Ohio, Oklahoma and Texas --- has put legislation and/or regulations into place to govern the storage of CO<sub>2</sub> in geologic formations. All of these relied on the IOGCC model statute contained in the 2007 report. Just as significantly, a number of states are engaged in processes to first study and then formulate draft legislation in the coming months.

It is clear that the IOGCC guidance document has had a significant influence on the process of the EPA in developing a rule<sup>3</sup> to govern the underground storage of CO<sub>2</sub> under the [Safe Drinking Water Act](#) (SDWA)<sup>4</sup> and the SDWA's [Underground Injection Control \(UIC\) Program](#).<sup>5</sup> It is not overstatement to say that the guidance document jumpstarted EPA's rule development process. Much of what the IOGCC recommended found its way into EPA's initial draft rule. Given this, there is every reason to believe that the systems that are being put into place in the U.S., based on the IOGCC model documents, should dovetail with the proposed EPA Storage Rule that is nearing finalization.

This is the inaugural report of what is anticipated to be a series of biennial reviews that the IOGCC will undertake in the coming years. These biennial reviews will both document and assess developments in the policy, legal, and regulatory landscape (national and international) of relevance to states and

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<sup>2</sup> Interstate Oil and Gas Compact Commission, *Storage of Carbon Dioxide in Geologic Structures: A Legal and Regulatory Guide for State and Provinces (2007)*, available at: <http://groundwork.iogcc.org/sites/default/files/2008-CO2-Storage-Legal-and-Regulatory-Guide-for-States-Full-Report.pdf> (hereinafter Interstate Oil and Gas Compact Commission).

<sup>3</sup> U.S. Environmental Protection Agency, *Underground Injection Control program – Geologic Sequestration of Carbon Dioxide*, [http://www.epa.gov/safewater/uic/wells\\_sequestration.html](http://www.epa.gov/safewater/uic/wells_sequestration.html). The EPA rule development process is anticipated to conclude in late 2010 or early 2011 with the publication of a final rule.

<sup>4</sup> U.S. Environmental Protection Agency, *The Safe Drinking Water Act – Basic Information*, <http://www.epa.gov/safewater/sdwa/basicinformation.html>.

<sup>5</sup> U.S. Environmental Protection Agency, *Underground Injection Control Program – Basic Information About Injection Wells*, <http://water.epa.gov/type/groundwater/uic/basicinformation.cfm>

provinces<sup>6</sup> in their regulation of the storage of carbon dioxide in geologic media. A key component of this biennial review is documentation of the laws and regulations that states have enacted or promulgated in response to the IOGCC guidance. The review updates documents in light of significant and innovative changes that have been made by states. This process is consistent with IOGCC's decades of experience with model legislation, most notably the model state conservation code. In these processes, the IOGCC first develops a model code and then revisits the code as necessary, amending and perfecting it to reflect evolving state experience and "best practice."

This report has benefited from the review of state legislation and rule-making since the 2007 report. In addition, the task force has been able to learn from and incorporate the work of stakeholders who have been providing input to EPA on its draft rule. One of the recommendations was that EPA amends its Class II rule under the UIC program to provide clear definition of a category of wells where CO<sub>2</sub> injection for EOR takes place concurrently with geologic storage of CO<sub>2</sub>. The task force acknowledged the importance of this issue by inserting new language in the Model Statute (Section 10) similar to language adopted by North Dakota in its statute. The language permits the state to make a determination as to whether CO<sub>2</sub> used in EOR projects also qualifies, for certification purposes, for carbon credits, allowances, trading, emission allocations, offsets, etc. This is an important addition because the model documents addressed only storage projects in which there was no EOR component. The task force believed then and now that EOR-related storage projects using anthropogenic CO<sub>2</sub> should be eligible to be considered concurrent storage for credit purposes. By recognizing the issue articulated by the stakeholder group and adopting language similar to North Dakota, the task force made much clearer the states' right and ability to recognize these "dual status" wells. This change also will be discussed in Part 3, which follows.

It had been anticipated that the task force would be able to learn from the experience of the U.S. Department of Energy (DOE) Regional Carbon Sequestration Partnerships<sup>7</sup> in seeking regulatory approval for their Phase II pilot CO<sub>2</sub> storage projects in states that had put into place regulations based on the task force models. Unfortunately, the Phase II pilot projects were ahead of states in passing laws and promulgating regulations. Lessons were learned from the partnerships in the process and these lessons will be set forth and analyzed in a separate publication, but they were not particularly useful in the task force's consideration of potential changes to the Model Statute and Model Rules and Regulations contained in this report. In seeking permits from states for the CCGS research wells and projects, the partnerships utilized existing and/or temporary legal and regulatory frameworks at both the state and federal levels. Clearly these existing or temporary permitting frameworks will not work for non-EOR storage projects beyond the research phase.<sup>8</sup> However, based on state regulatory experience

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<sup>6</sup> For the sake of brevity, reference to "states" should henceforth be interpreted as "state and Canadian provinces". The exception will be discussion pertaining to U.S. federal legislation, for instance the U.S. Safe Drinking Water Act, which has no relevance in Canada.

<sup>7</sup> US Department of Energy National Energy Technology Laboratory, Carbon Sequestration – Regional Carbon Sequestration Partnership, [http://www.netl.doe.gov/technologies/carbon\\_seq/partnerships/partnerships.html](http://www.netl.doe.gov/technologies/carbon_seq/partnerships/partnerships.html).

<sup>8</sup> The model documents created by the IOGCC CCGS Task Force in 2007 address only storage projects in which there is no EOR component.

in EOR, gas storage, and acid gas injection, the task force is confident that the regulatory scheme presented as a model in 2007 and updated here, with future modifications as appropriate, will provide the necessary regulatory framework for commercial non-EOR CCGS projects.

Based on the publicly released draft of the EPA Storage Rule, the task force has reason to believe that under the final rule, primacy will be provided to the states to administer the new class of UIC CCGS wells likely to be created by the rule (presumably Class VI). The task force encourages EPA in its final rule to permit a separate primacy application process for the likely new class of wells, thereby allowing states to determine which agency in the state will act as the regulatory agency to administer those rules. Separate primacy application is necessary to allow a state to avoid the potential problems associated with dual agency administration of the proposed rules. For example, state environmental agencies may not have the necessary statutory authority or administrative experience to properly address storage space (pore space) ownership issues. The task force believes that Class VI wells should remain as a separate UIC class well with independent primacy and should be structured to allow joint jurisdiction between state agencies should a state desire that approach.

To encourage CCGS commercial planning and development, it remains the strong recommendation of this task force that states continue to proceed expeditiously to develop and adopt CCGS regulatory frameworks based on the IOGCC model documents and that states not wait for finalized EPA regulatory action under the SDWA. As noted, the IOGCC model documents are in general alignment with the draft EPA Storage Rule and, therefore, any divergence in regulatory methodologies that might arise from adoption of the IOGCC model should be easily reconciled. The task force believes that the development of statutory authorities and rules are invaluable in providing a legal and regulatory framework for this industry to move toward commercialization by removing uncertainties that will impede even the most rudimentary planning for potential projects.

In its Phase I report in 2005, the IOGCC CCGS Task Force defined CO<sub>2</sub> as a direct emissions stream with purity in excess of 95% or a processed emission stream with commercial value. After much discussion, the task force in its Phase II Report in 2007 altered that definition in both the Model Statute and Model General Rules and Regulations to “anthropogenically sourced carbon dioxide of sufficient purity and quality as to not compromise the safety and efficiency of the reservoir to effectively contain the CO<sub>2</sub>.” In the definition put forward in the models contained in this report, the definition is altered yet again to read “an emissions stream containing carbon dioxide of sufficient purity and quality as to not compromise the safety and efficiency of the reservoir to effectively contain the carbon dioxide.” Notwithstanding the differences between the 2007 and the currently proposed definition, the focus of both is on the ability of the reservoir to safely and efficiently contain the CO<sub>2</sub>. There is yet another factor that will also influence and define the composition of CO<sub>2</sub> for geologic storage. That additional factor is transportation. For purposes of this report there are transportation cost issues that will limit the amount of impurities in the CO<sub>2</sub> emissions stream. This issue will be discussed in greater length in the work product of the IOGCC-Southern States Energy Board Pipeline Transportation Task Force that is currently conducting a legal and regulatory evaluation of the feasibility of a pipeline infrastructure for the transport and storage of CO<sub>2</sub>.

Part 2 of this report summarizes state and provincial activity to date passing laws and promulgating regulations<sup>9</sup> governing the geologic storage of CO<sub>2</sub>. Part 3 details the changes that the task force has made in both the Model Statute and Model Rules and Regulations. The revised model documents are set forth in Appendices I and II, respectively. Appendix III contains a bibliography of documents relevant to the storage of CO<sub>2</sub> in geological formations. Appendix IV of this report gives a summary of challenges, lessons learned, and recommendations of the RCSPs pilot projects in permitting and validation of their pilot projects.

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<sup>9</sup> In this report the words “rules” and “regulations” are used interchangeably and convey the same meaning. You will note the relevant model document is entitled “Model General Rules and Regulations.”

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## **Part 2. A Review of State and Provincial Action to Create a Legal and Regulatory Infrastructure for Storage of Carbon Dioxide in Geologic Structures**

## Overview

With the IOGCC's adoption and release on September 24, 2007, of its guidance document for states ([Storage of Carbon Dioxide in Geologic Structures: A Legal and Regulatory Guide for States and Provinces](#)<sup>10</sup>), states and Canadian provinces had the tools they needed to begin contemplating development of laws and regulations to govern the geologic storage of carbon within their jurisdictions. Within 6 months of release of the IOGCC document states and provinces had begun to develop legal and regulatory frameworks for the geologic storage of carbon: Washington state made use of the IOGCC document to develop regulations. Wyoming developed legislation that was passed and signed into law. Since that time, Washington and Wyoming have been joined by North Dakota, Louisiana, Montana, Ohio, Texas, and Oklahoma in passing legislation. Regulations have been promulgated in North Dakota and Kansas. As this report goes to print, development of regulations is expected soon in Wyoming and Texas. In addition, many more states and provinces have created working groups and processes, often mandated by legislation, to develop frameworks by proscribed dates.

The legal and regulatory framework governing storage of CO<sub>2</sub> in the course of EOR or gas recovery already exists in most oil and natural gas producing states and provinces. What follows, therefore, is a summary of what has transpired over the last two years in states and Canadian provinces in the development of laws and regulations for the non-EOR-related geologic storage of carbon. It is noted that the cutoff date for inclusion of information for this report was April 1, 2010, and therefore very little, if any, information is included that pertains to 2010 legislation. For information on legal and regulatory developments in states and provinces in 2010 and beyond, please reference the [IOGCC Groundwork website](#).<sup>11</sup>

Following are summaries of state legislative and regulatory progress for individual states. In Section A of Part 2, states that have either developed or are developing a regulatory framework are listed with states that have made the most progress at the front of the list.

Section B lists states that have taken some form of action in developing a regulatory framework but are still in the beginning stages or have not passed substantive legislation or promulgated rules. States are listed in alphabetical order. Section C lists states with little or no activity in alphabetical order. Anecdotal information is provided when available. Finally, Section D lists the Canadian provinces in alphabetical order.

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<sup>10</sup> Interstate Oil and Gas Compact Commission, *supra* note 2.

<sup>11</sup> Interstate Oil and Gas Compact Commission, Groundwork – Carbon Sequestration State Progress <http://groundwork.iogcc.org/topics-index/carbon-sequestration/state-progress>,



**Table 1. States with CCGS Regulatory Frameworks**

State	Laws Passed	Laws Pending	Rules
Illinois	Limited		
Kansas			02/2010
Louisiana	G,P,A,L		Not yet begun
Montana	G,P,A,L		Awaiting development of EPA final rule
North Dakota	G,P,A,L		04/2010
Ohio		G	Expected to begin summer 2010
Oklahoma	G		Verification of carbon credits for CO2 storage
Texas	G,A		Pending public comment period
Utah			Anticipated 2011
Washington	P,A,L		07/2008
West Virginia	G		Anticipated 2011
Wyoming	G,P,A		Pending public comment period

*G=General Provisions; P=Pore Space Ownership; A=Aggregation of Storage Rights; L=Long-Term Liability*

**Table 2. States with CCGS Legislative/Regulatory Activity \***

Alaska	Idaho	Michigan	Pennsylvania
California	Indiana	New Mexico	Virginia
Colorado	Kentucky	North Carolina	

*\*In alphabetical order*

**Table 3. States with Little or No CCGS Legislative/Regulatory Activity \***

Alabama	Hawaii	Missouri	Oregon
Arkansas	Iowa	Nebraska	Rhode Island
Arizona	Maine	Nevada	South Carolina
Connecticut	Maryland	New Hampshire	South Dakota
Delaware	Massachusetts	New Jersey	Tennessee
Florida	Minnesota	New York	Vermont
Georgia	Mississippi		Wisconsin

*\*In alphabetical order*

**Table 4. Canadian Provinces and Territories\***

Alberta	Newfoundland & Labrador	Saskatchewan
British Columbia	Nova Scotia	Yukon

*\*IOGCC International Affiliates*

## A. States with CCGS Regulatory Frameworks

### Illinois

*Summary: Limited substantive legislation. No regulations.*

Illinois has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. In August of 2009, the Illinois Legislature passed [HB 3854](#)<sup>12</sup> which establishing the Carbon Capture and Storage Legislative Commission. The CCS Legislative Commission is tasked with making a report to the Illinois General Assembly by December 31, 2010, pertaining to specific legislation on CCS. HB 3854 also amended the Illinois Power Agency Act to allow the agency to acquire by eminent domain permanent easements for the distribution, transportation, and storage of CO<sub>2</sub>.

### Kansas

*Summary: No substantive legislation has been passed. Regulations covering the general framework for geologic storage in the state have been promulgated and were effective on February 25, 2010. Left unaddressed legislatively and in the regulations are pore space ownership, aggregation of storage rights, and long-term liability.*

In 2007, the Kansas Legislature, apparently decided that new legislation was not immediately necessary for the state to develop rules and regulations for the geologic storage of carbon in the state. It passed [HB 2419](#), mandating that the state develop regulations for CO<sub>2</sub> injection wells. The [regulations](#)<sup>13</sup> were published in the Kansas Register on February 11, 2010, and became effective on February 25, 2010. The rules are largely based on the IOGCC model with the exception that Kansas will not take liability of the storage sites in the post-closure period.

#### **2009 Regulation - Effective on February 25, 2010:**

[Rules on Carbon Dioxide Storage Facilities](#)<sup>14</sup>

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<sup>12</sup> H.B. 3854, 96<sup>th</sup> Leg. (Ill.2009), available at: <http://groundwork.iogcc.org/sites/default/files/IL%20HB3854%209-21-09.pdf>.

<sup>13</sup> Kan. Admin. Regs. § 82-3-311a (2010); see Kan. Admin. Regs. §§ 82-3-1100 through 1120 (2010), available at: <http://groundwork.iogcc.org/sites/default/files/Kansas%20CO2%20Regulations.pdf>; see also Kan. Register. Vol. 29, No. 6 (2010).

<sup>14</sup> Kan. Admin. Regs. §§ 82-3-1100 through 82-3-1119 (2010), available at: <http://groundwork.iogcc.org/sites/default/files/Kansas%20CO2%20Regulations.pdf>.

## *Louisiana*

*Summary: Legislation was passed in 2009 covering the general framework for geologic storage, pore space ownership, aggregation of storage rights, and long-term liability. As for regulations, the rule development process has not yet begun.*

In 2009, the Louisiana Legislature passed HB 661, Act 517 addressing the geologic storage of CO<sub>2</sub>. It is a comprehensive bill. The rule development process has not yet begun.

### **2009 Laws – Effective August 15, 2009:**

[AN ACT relative to the storage of carbon dioxide](#)<sup>15</sup>

## *Montana*

*Summary: Legislation was passed in 2009 that will become effective upon a primacy delegation to the state by EPA. The legislation covers the general framework for geologic storage, pore space ownership, aggregation of storage rights, and long-term liability. As for regulations, development of rules is awaiting development by EPA of a final rule on CO<sub>2</sub> Geologic Sequestration Wells expected in late 2010 or early 2011.*

Although the Montana Legislature's Interim Committee on Energy and Telecommunications began in 2007 to examine the possibility of developing draft carbon storage legislation for introduction in 2009, the committee could not reach a consensus. It did, however, issue a comprehensive report. Notwithstanding this, several bills were introduced --- one bill on the House side (the governor's bill) and three on the Senate side --- in the 2009 legislative session covering the issue. Senate Bill 498 ultimately passed and was signed into law by the governor on May 6, 2009. While some sections were effective on May 6, 2009, most elements of the law will not be effective until the state is granted primacy authority by the U.S. EPA under Rules for CO<sub>2</sub> Geologic Sequestration Wells currently being developed by EPA and not expected until late 2010 or early 2011.<sup>16</sup>

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<sup>15</sup> H.R. 660 Act No. 517, Reg. Sess. (La. 2009). Enacted by the Legislature of the Louisiana as House Bill 661, Act 517, "AN ACT to enact R.S. 19:2(12) and Chapter 11 of Title 30 of the Louisiana Revised Statutes of 1950, to be comprised of R.S. 30:1101 through 1111, relative to the storage of carbon dioxide; to provide for expropriation; to provide for the duties and powers of the commissioner of conservation; to provide for definitions; to provide for public hearings; to provide for enforcement; to provide for compliance orders; to provide for penalties; to provide for certificates of public convenience and necessity; to provide for certificates of completion; to provide for liability; to provide for the Geologic Storage Trust Fund; to provide for fees; to provide for uses of the fund; to provide for accounting and reports of the fund; to provide for site-specific trust accounts; and to provide for related matters." The bill's effective date was August 15, 2009.

<sup>16</sup> *Supra* note 3.

As concerns the promulgation of regulations, development of rules in Montana is expected to await the grant of primacy authority by EPA.<sup>17</sup>

**2009 Laws – Effective May 6, 2009<sup>18</sup>:**

[An act regulating carbon sequestration<sup>19</sup>](#)

### *North Dakota*

*Summary: Legislation was passed and became effective in 2009. The legislation covers the general framework for geologic storage, pore space ownership, aggregation of storage rights, and long-term liability. Regulations implementing the legislation became effective on April 1, 2010.*

In early 2008, North Dakota briefly debated whether new legislation was needed for the geologic storage of carbon dioxide in the state. It was concluded that new legislation was needed and at the request of the North Dakota Industrial Commission (comprised of the Governor, the Attorney General, and the Agriculture Commissioner), a task force set to work drafting such legislation. The task force was made up of representatives of the state's major industrial sectors (coal mining, electric generation and transmission, and oil and natural gas), the trade associations for each industry, the University of North Dakota Energy & Environmental Research Center, the State Health Department, the State Mineral Resources Department and the Office of the Attorney General. Based on the work of the task force, the Industrial Commission, in advance of the 2009 legislative session, pre-filed two bills. One covered geologic storage (SB 2095) and the other pore space (SB 2139). Both bills were subsequently passed into law and signed by the governor on April 8, 2009. The bills were effective on July 1, 2009, and April

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<sup>17</sup> *Id.*

<sup>18</sup> As noted in the text above, while some sections were effective on May 6, 2009, most elements of the law will not be effective until the state is granted primacy authority by the U.S. Environmental Protection. See notes 7 and 8.

<sup>19</sup> S. 498, 61<sup>st</sup> Leg. (Mont. 2009). Enacted by the Legislature of the State of Montana as Senate Bill 498, approved on April 22, 2009 entitled "AN ACT REGULATING CARBON SEQUESTRATION; REQUIRING A PERMIT FOR A CARBON DIOXIDE INJECTION WELL; AUTHORIZING THE BOARD OF OIL AND GAS CONSERVATION TO REGULATE THE INJECTION OF CARBON DIOXIDE; AFFIRMING THE DOMINANCE OF A MINERAL ESTATE; ESTABLISHING FEES FOR ADMINISTERING A CARBON SEQUESTRATION PROGRAM AND LONG-TERM OVERSIGHT OF WELLS; REQUIRING NOTICE OF CARBON DIOXIDE INJECTION WELLS; REQUIRING THE BOARD TO SOLICIT AND CONSIDER COMMENTS FROM THE DEPARTMENT OF ENVIRONMENTAL QUALITY PRIOR TO ISSUING AN INJECTION PERMIT AND PRIOR TO ISSUING A CERTIFICATE OF COMPLETION; REQUIRING THE BOARD TO SOLICIT AND CONSIDER COMMENTS FROM THE DEPARTMENT OF ENVIRONMENTAL QUALITY PRIOR TO TRANSFERRING LIABILITY TO THE STATE; REQUIRING TESTING AFTER ISSUANCE OF A CERTIFICATE OF COMPLETION AND PRIOR TO TRANSFER OF LIABILITY; ALLOWING FOR THE TRANSFER OF TITLE TO SEQUESTERED CARBON DIOXIDE TO THE STATE AFTER BOARD CERTIFICATION; ALLOWING UNITIZATION FOR GEOLOGIC STORAGE RESERVOIRS; EXEMPTING A CARBON DIOXIDE INJECTION WELL FROM GROUND WATER PERMIT REQUIREMENTS; AMENDING SECTIONS 70-30-105, 75-5-103, 75-5-401, 77-3-430, 82-10-402, 82-11-101, 82-11-104, 82-11-111, 82-11-118, 82-11-122, 82-11-123, 82-11-127, 82-11-136, 82-11-137, 82-11-161, 82-11-163, 82-11-201, 82-11-204, 82-11-205, AND 82-11-214, MCA; AND PROVIDING EFFECTIVE DATES.

9, 2009, respectively. While the North Dakota legislation was clearly modeled on the IOGCC model statute, it had two additional elements that are worth noting. One feature of the geologic storage bill was its authorization of the commission to issue a determination as to the “amount of injected CO<sub>2</sub> stored in a reservoir that has been or is being used for an enhanced oil or gas recovery project.”<sup>20</sup>

It further states that the purpose in giving the commission the authority to determine “storage amounts is to facilitate using the stored carbon dioxide for such matters as carbon credits, allowances, trading, emissions allocations and offsets, and for other similar purposes.”<sup>21</sup> In the pore space bill, the bill prohibited the severance of the title to pore space from the title to the surface of the real property overlying the store space.<sup>22</sup>

Concerning development of regulations for geologic storage of CO<sub>2</sub> in North Dakota, the North Dakota Industrial Commission --- using the IOGCC Model Rules and Regulations --- issued a proposed set of regulations on September 10, 2009, as part of a broader set of administrative rule changes. A public hearing was held on October 15, 2009, and based on comments received, changes were made in the document. On November 16, 2009, the commission gave its final approval to the regulations. On December 4, 2009, the Attorney General certified that statutory requirements for approval of the regulations by the commission had been met. After being sent to the Administrative Rules Committee, a joint committee of the North Dakota House and Senate, the regulations became final on April 1, 2010, when no action was taken by the committee. With these rules in effect, North Dakota becomes the first state with a complete and comprehensive legal and regulatory regime for the geologic storage of CO<sub>2</sub> in North America.<sup>23</sup>

#### **2009 Laws - Effective July 1, 2009, and April 9, 2009, respectively:**

[Relating to the geologic storage of carbon dioxide](#)<sup>24</sup>

[Relating to the ownership of subsurface pore space.](#)<sup>25</sup>

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<sup>20</sup> N.D. Cent. Code § 38-22-23(1) (2009).

<sup>21</sup> N.D. Cent. Code § 38-22-23(2) (2009).

<sup>22</sup> N.D. Cent. Code § 47-31 (2009).

<sup>23</sup> While Washington had legislation and rules two years earlier, it can be argued that the North Dakota regime is the more comprehensive of the two.

<sup>24</sup> S. 2095, 61<sup>st</sup> Leg., 2009 Regular Sess. (N.D. 2009). See also Interstate Oil and Gas Compact Commission – Groundwork, North Dakota Senate Bill 2095, available at: <http://groundwork.iogcc.org/sites/default/files/North%20Dakota%20Senate%20Bill%20No.%202095%20Relating%20to%20the%20Geologic%20Storage%20of%20Carbon%20Dioxide.pdf>. Enacted by the Legislature of the State of North Dakota as Senate Bill 2095, to create and enact chapter 38-22 of the North Dakota Century Code, relating to the geologic storage of carbon dioxide; to repeal section 38-08-24 of the North Dakota Century Code, relating to priorities in permitting carbon dioxide geologic storage projects; to provide a penalty; and to provide a continuing appropriation. The bill’s effective date was July 1, 2009.

## 2010 Regulations - Effective April 1, 2010:

### [Geologic Storage of Carbon Dioxide](#)<sup>26</sup>

#### Ohio

*Summary:* Legislation providing the general framework for geologic storage of CO<sub>2</sub> will become effective on June 20, 2010. The legislation does not address aggregation of storage rights, long-term liability, or pore space ownership. A process for developing necessary regulations is expected to begin by summer 2010.

On March 31, 2010, the governor signed a major revision of the state's Oil and Gas Code. Initially proposed by the state's Department of Natural Resources (DNR), the revised code was designed, among other things, to accommodate and provide the general legislative framework necessary for the geologic storage of CO<sub>2</sub> in the state. The law became effective on June 30, 2010. It does not address aggregation of storage rights, long-term liability, or pore space ownership, although pore space ownership is well-established under Ohio law. Authority is provided in the legislation for rule-making.

## 2010 Laws – Effective June 30, 2010:

[Senate Bill 165](#)<sup>27</sup> revises the definitions of “owner” and “brine” in the Oil and Gas Law, and applies the definition of “urbanized area” to the entire Oil and Gas Law. It also defines “well stimulation” or “stimulation of a well,” “material and substantial violation,” and “severer” in the Oil and Gas Law.<sup>28</sup>

#### Oklahoma

*Summary:* In 2009, the Oklahoma Legislature passed SB 610, which established the basic legal framework for CO<sub>2</sub> geologic storage. It did not address pore space, aggregation of storage rights, or

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<sup>25</sup> S. 2139, 61<sup>st</sup> Leg., 2009 Regular Sess. (N.D. 2009). See also Interstate Oil and Gas Compact Commission – Groundwork, North Dakota Senate Bill 2139, available at: <http://groundwork.iogcc.org/sites/default/files/North%20Dakota%20Senate%20Bill%20No.%202139%20Relating%20to%20the%20Ownership%20of%20Subsurface%20Pore%20Space.pdf>. Enacted by the Legislature of the State of North Dakota as Senate Bill 2139, to create and enact a new chapter to title 47 of the North Dakota Century Code, relating to ownership of subsurface pore space; to provide for application; and to declare an emergency. The bill's effective date was April 9, 2009.

<sup>26</sup> N.D. Admin. Code § 43-05-01 (2010); see also Interstate Oil and Gas Compact Commission – Groundwork, North Dakota Administrative Code § 43-05-01 available at: [http://groundwork.iogcc.org/sites/default/files/NDCC38-22andNDAC43-05\\_04-2010.pdf](http://groundwork.iogcc.org/sites/default/files/NDCC38-22andNDAC43-05_04-2010.pdf) at 8.

<sup>27</sup> S.B. 165, 128<sup>th</sup> Gen. Ass. (2010), available at: <http://groundwork.iogcc.org/sites/default/files/SB%20165%202010.pdf>. The bill was effective upon signing by the Governor on March 31, 2010.

<sup>28</sup> *Id.*

long-term liability. No regulations under this framework have been established. It should be noted, however, that the Oklahoma Conservation Commission adopted rules governing the verification of carbon credits for CO<sub>2</sub> storage in 2009.

[Senate Bill 1765](#)<sup>29</sup> became law in 2008, establishing the Oklahoma Geologic Storage of Carbon Dioxide Task Force with a mandate to submit a report with legislative recommendations. The initial deadline for the report of December 1, 2008, was extended in 2009 and another extension is expected in 2010. Nonetheless, the task force produced a [report](#)<sup>30</sup> in 2008. Several recommendations were incorporated into [SB 610](#)<sup>31</sup>, which was signed into law on June 1, 2009, becoming effective the same date. This bill established a basic CO<sub>2</sub> regulatory framework for geologic storage in Oklahoma. While it did not address the issue of pore space ownership, aggregation of storage rights, or long-term liability, it did specify that if the state establishes a unitization scheme for CO<sub>2</sub> geologic storage in Oklahoma, jurisdiction will be with the Corporation Commission. It also addressed the ownership of CO<sub>2</sub>. It should also be noted that the law as to pore space ownership in Oklahoma is well established and therefore a statute addressing the issue may not be necessary. No regulations have yet been promulgated under the statute.

It should also be noted that in March 2009, the Oklahoma Conservation Commission adopted permanent rules that provide a mechanism for the verification of the sequestration of carbon dioxide, both terrestrial and geologic (Title 155, Chapter 30).

#### **2009 Laws – Effective June 1, 2009:**

[Oklahoma Carbon Capture and Geologic Sequestration Act](#)<sup>32</sup>

#### **2009 Regulation - Effective on July 1, 2009:**

[Carbon Sequestration Verification Program](#)<sup>33</sup>

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<sup>29</sup> S.B. 1765.51<sup>st</sup> Leg. (Okla. 2007), *available at*:  
<http://groundwork.iogcc.org/sites/default/files/OK%20SB1765%2010-9-09.pdf>.

<sup>30</sup> Report of the Oklahoma Geologic Storage of Carbon Dioxide Task Force (2008), *available at*:  
<http://groundwork.iogcc.org/sites/default/files/OK%20Report%20of%20OK%20CO2%2010-09-09.pdf>

<sup>31</sup> S. 610, 52<sup>nd</sup> Leg. (Okla. 2009), *available at*::  
<http://groundwork.iogcc.org/sites/default/files/Oklahoma%20Senate%20Bill%20No.%20610%20Oklahoma%20Carbon%20Capture%20and%20Geologic%20Sequestration%20Act.pdf>. Enacted by the Legislature of the Oklahoma as Senate Bill 610, AN ACT relating to environment and natural resources creating the Oklahoma Carbon Capture and Geologic Sequestration Act. The bill was effective upon signing by the Governor on June 1, 2009.

<sup>32</sup> *Id.*

<sup>33</sup> Okla. Conservation Commission. Carbon Sequestration Verification Commission.  
[http://www.ok.gov/conservation/Agency\\_Divisions/Water\\_Quality\\_Division/WQ\\_Carbon\\_Sequestration/About\\_/](http://www.ok.gov/conservation/Agency_Divisions/Water_Quality_Division/WQ_Carbon_Sequestration/About_/).

## Texas

*Summary: Legislation was passed in 2009 in three areas. One bill established incentives for carbon capture and geologic storage projects. Another covered offshore geologic storage. The third set forth the general framework for CO<sub>2</sub> geologic storage in Texas in formations above or below formations productive of oil and natural gas. The effective date for all three pieces of legislation was September 1, 2009. The legislation did not establish a general framework for storage in non-oil and natural gas producing parts of the state nor did it settle issues of pore space ownership, aggregation of storage rights, or long-term liability. As for regulations, the Texas Railroad Commission (RRC) was charged by the legislature with adopting geologic storage regulations consistent with eventual EPA rules for geologic storage and the Texas Commission on Environmental Quality (TCEQ) was tasked with developing standards and rules for such storage. The RRC is moving forward on approving its regulations with the goal of a final set of regulations by early summer 2010. The TCEQ is likewise engaged in a process to develop its rules.*

In 2009, the Texas Legislature passed three bills that addressed various aspects of carbon capture and geologic storage. The three bills were HB 469, relating to the establishment of incentives for the implementation of certain carbon capture and storage projects; HB 1796, relating to the development of offshore carbon geologic storage; and SB 1387, identifying regulatory jurisdiction for onshore carbon geologic storage and specifying requirements including permitting, financial assurance, monitoring and inspection of storage into formations productive of oil or gas, or brine formations above or below oil or gas formations. Under this latter bill, jurisdiction is vested in the RRC except for storage into non-oil and gas producing formations, which must be studied before further legislative action is taken.

The RRC was also tasked under SB 1387 with adopting geologic storage regulations consistent with eventual EPA rules for geologic storage of CO<sub>2</sub><sup>34</sup> in a reservoir that is initially or may be productive of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir, and the TCEQ was tasked with developing standards and rules for an offshore deep subsurface geologic repository for the storage of anthropogenic carbon dioxide. SB 1796 also required the TCEQ, the RRC, and the Texas Public Utility Commission to participate in the federal government process for developing federal greenhouse gas reporting and registry requirements and required TCEQ to adopt those requirements by reference.

Concerning development of regulations under SB 1387, RRC staff prepared draft regulations for the consideration of the RRC on March 9, 2010. The proposed rules would take effect under title 16, chapter 5 of the Texas Administrative Code.<sup>35</sup> As of the date of this report, the proposed rules have yet to be finalized.

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<sup>34</sup>U.S. Environmental Protection Agency, Underground Injection Control Program – UIC Program Primacy, <http://www.epa.gov/safewater/uic/primacy.html>. States may apply for primacy to administer the UIC program in their states.

<sup>35</sup>R.R. Comm'n of Tex., *Proposed CCS Rules Creating Chapter 5 of Title 16 TAC*, available at: <http://www.beg.utexas.edu/gccc/download/prop-new-Ch5-carbon-dioxide.pdf>.



The TCEQ is likewise engaged in a process to develop its rules. Its rule will establish a process for the Executive Director of the TCEQ to make a statutorily required determination (under the Texas Water Code) before a permit can be issued by the RRC to an operator to store CO<sub>2</sub> in geologic formations. The determination relates to whether the conditions of the permit are necessarily protective of the fresh water resources in the state.

#### **2009 Laws - Effective September 1, 2009:**

[Relating to the establishment of incentives by this state for the implementation of certain projects to capture and sequester carbon dioxide that would otherwise be emitted into the atmosphere](#)<sup>36</sup>

[Relating to the development of carbon dioxide capture and sequestration in this state \(Offshore\)](#)<sup>37</sup>

[Relating to the implementation of projects involving the capture, injection, sequestration, or geologic storage of carbon dioxide](#)<sup>38</sup>

### *Utah*

*Summary: No substantive legislation. No regulations.*

Utah has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. However, in 2008, Utah passed and signed into law [SB 202](#)<sup>39</sup> which, among other things, mandated

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<sup>36</sup> H.R. 469, 81<sup>st</sup> Leg. (Tex. 2009), *available at*: <http://groundwork.iogcc.org/sites/default/files/Texas%20House%20Bill%20No.%20469%20Relating%20to%20the%20Establishment%20of%20Incentives.pdf>. Enacted by the Legislature of the State of Texas as House Bill 469 and approved on May 31, 2009, an act relating to the establishment of incentives by this state for the implementation of certain projects to capture and sequester carbon dioxide that would otherwise be emitted into the atmosphere. It amends portions of the Texas Government Code, the Health and Safety Code, the Natural Resources Code, and the Tax Code, Tex. Tax Code Ann. It was effective on September 1, 2009.

<sup>37</sup> H.R. 1796, 81<sup>st</sup> Leg. (Tex. 2009), *available at*: <http://groundwork.iogcc.org/sites/default/files/Texas%20House%20Bill%20No.%201796%20Relating%20to%20the%20Development%20of%20Carbon%20Dioxide%20Capture%20and%20Sequestration%20in%20Texas.pdf>. Enacted by the Legislature of the State of Texas as House Bill 1796 and approved by the House on May 31, 2009, and the Senate on June 1, 2009, relating to the development of carbon dioxide capture and sequestration in Texas. It amends portions of the Texas Health and Safety Code, the Tax Code, and the Transportation Code. It was effective on September 1, 2009.

<sup>38</sup> S. 1387, 81<sup>st</sup> Leg. (Tex. 2009), *available at*: <http://groundwork.iogcc.org/sites/default/files/Texas%20Senate%20Bill%20No.%201387%20Relating%20to%20the%20Implementation%20of%20Projects%20Involving%20the%20capture,%20injection,%20sequestration,%20or%20Geologic%20Storage%20of%20Carbon%20Dioxide.pdf>. Enacted by the Legislature of the State of Texas as Senate Bill 1387 and approved by the Senate on April 22, 2009, and the House on May 18, 2009, relating to the implementation of projects involving the capture, injection, sequestration, or geologic storage of carbon dioxide. It amends portions of the Texas Water Code and the Natural Resources Code.

the development of rules pertaining to carbon capture and geologic storage by January 1, 2011. The law also requested recommendations as to the need for any specific legislation. The state has created a working group, which has commenced work. The working group has assigned responsibility for capture and transport issues to the Department of Environmental Quality and the storage issues to the Division of Oil, Gas, and Mining of the Department of Natural Resources. Release of any final storage rules likely will await completion by EPA of rules for CO<sub>2</sub> storage currently under development<sup>40</sup> but not expected before 2011.

## *Washington*

*Summary: Legislation was passed and became effective in 2007 and two sets of rules were promulgated and became effective in 2008. The state also has received an application for a pilot study that proposes to inject CO<sub>2</sub> into basalt formations.*

Washington holds the honor of being the first state off the mark with legislation and rules that address carbon capture and storage (CCS). Senate Bill 6001 was enacted and signed by the governor (with a partial veto) on May 3, 2007, and became effective on July 22, 2007. On June 19, 2008, two sets of rules to implement SB 6001 were promulgated: Geologic Sequestration rules including companion air quality regulations covering carbon dioxide emissions; and Final Underground Injection Control (UIC) rules<sup>41</sup> for the geologic sequestration of CO<sub>2</sub>. The rules were effective on July 20, 2008. The IOGCC model rules and the federal UIC standards were the models initially used. However, Washington's water quality laws required that the state address some aspects in a different way than was suggested by the IOGCC model rules. Washington's rules are similar to, but not the same as, published proposed federal rules. When federal rules<sup>42</sup> are final in 2010 or 2011 Washington will consider minor rule amendments to allow federal delegation of the state program. (For example, Washington's rules use class V wells for injection, but draft federal rules create a new class VI wells for carbon sequestration.)

Washington already has received an application for a pilot study that proposes to inject 1,000 metric tons of CO<sub>2</sub> into basalt formations of the Columbia River Basalt Group.

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<sup>39</sup> S.B. 202. 2008 General Sess. (Utah 2008), available at: <http://groundwork.iogcc.org/sites/default/files/UT%20SB202%20%206-1-09.pdf>. Energy Resource and Carbon Initiative.

<sup>40</sup> *Supra* note 3.

<sup>41</sup> *Supra* note 3.

<sup>42</sup> U.S. Environmental Protection Agency, Underground Injection Control Program – Geologic Sequestration of Carbon Dioxide, [http://water.epa.gov/type/groundwater/uic/wells\\_sequestration.cfm](http://water.epa.gov/type/groundwater/uic/wells_sequestration.cfm). EPA is presently developing a rule under the UIC Program to cover CO<sub>2</sub> Geologic Sequestration Wells.

## 2007 Law - Effective on July 22, 2007

[An Act relating to mitigating the impact of climate change](#)<sup>43</sup>

## 2007 Regulation - Effective on July 20, 2008

[Geologic Sequestration rules](#)<sup>44</sup>

[UIC rules for the Geologic Sequestration of Carbon Dioxide](#)<sup>45</sup>

### *West Virginia*

*Summary: No substantive legislation. No regulations.*

West Virginia has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. However, at the governor's request the legislature in 2009 took up the issue of carbon storage. On April 11, 2009, a bill was passed ([HB 2860](#))<sup>46</sup> and signed. The legislation mandates creation of a carbon dioxide sequestration working group and the promulgation of legislative rules to implement the provisions of the statute. The statute also requires the working group to prepare an interim report

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<sup>43</sup> S. 6001, 60<sup>th</sup> Leg., 2007 Regular Sess. (Wash. 2007), *available at*: <http://groundwork.iogcc.org/sites/default/files/WA%20SB6001%20%206-30-09.pdf>. See also Wash. Rev. Code § 80.80 (2007) *available at*: <http://groundwork.iogcc.org/sites/default/files/WA%20Rev%20Code%2080.80.pdf>. Enacted by the Legislature of the State of Washington as Senate Bill 6001, delivered to the Governor on April 20, 2007 and signed by the Governor with a partial veto on May 4, 2007 creating Chapter 307, 2007 Laws PV. Although the legislature in 2009 made modifications to Chapter 80.80, it did not revise the requirements for geologic sequestration. The modifications that were made related to the definition of power plant and the treatment of long term financial commitments and unspecified sources of power.

<sup>44</sup> Wash.Admin.Code § 173-407-010 thru 173-407-080 (2008), *available at*: <http://groundwork.iogcc.org/sites/default/files/wac173407.pdf>. (provisions relating to geologic sequestration); see also The State of Wash. Dep't of Ecology – Concise Explanatory Statement and Responsiveness Summary: Ch 173-407 and Ch. 173-218 WAC, <http://www.ecy.wa.gov/biblio/0802017.html>.

<sup>45</sup> Wash.Admin.Code § 173-218-010 thru 173-218-130 (1984), *available at*: <http://groundwork.iogcc.org/sites/default/files/wac173218.pdf>.

<sup>46</sup> H.B. 2860. 79<sup>th</sup> Leg.; 2d Sess. (W.Va. 2009), *available at*: <http://groundwork.iogcc.org/sites/default/files/WV%20HB2860%207-8-09.pdf>. AN ACT to amend and reenact §22-11-4, §22-11-22, §22-11-24 and §22-11-25 of the Code of West Virginia, 1931, as amended; and to amend said code by adding thereto a new article, designated §22-11A-1, §22-11A-2, §22-11A-3, §22-11A-4, §22-11A-5, §22-11A-6, §22-11A-7, §22-11A-8 and §22-11A-9, all relating to regulating the sequestration and storage of carbon dioxide; providing for powers and duties of the Department of Environmental Protection; providing for civil penalties and injunctive relief; providing for criminal penalties; providing for civil liability; setting forth legislative findings; defining terms; specifying powers and duties; specifying carbon dioxide permitting requirements; establishing a working group to study and make recommendations regarding carbon dioxide sequestration; and authorizing the promulgation of legislative rules and cooperative agreements.

for the legislature by July 1, 2010, and a final report by July 1, 2011, that includes, among other things, any recommendations for legislation addressing ownership of pore space. The West Virginia Carbon Dioxide Working Group issued the interim report on July 1, 2010.<sup>47</sup> There is some possibility that the working group may decide to speed up its work to complete the report earlier than July 2011. This could make legislative consideration of a sequestration bill possible in 2011.

In 2009, the legislature also passed [SB 507](#)<sup>48</sup> that amended and re-enacted a provision relating to the West Virginia Clean Coal Technology Council and mandated it to prepare a study of carbon capture and control.

## Wyoming

*Summary: Legislation was passed and became effective in 2008 and again in 2009. The legislation covers the general framework for geologic storage, pore space ownership, and aggregation of storage rights. Unaddressed is financial assurance, which the legislature is expected to consider in 2010. Regulations covering both unitization and geologic sequestration (except financial assurance) are being developed with the likelihood of approved rules being in place by the end of 2010.*

In 2008, a mere four months after the release of the IOGCC guidance document, the Wyoming Legislature passed two bills that were signed into law by the governor. The following year, three additional bills were passed and signed into law. In 2010, a bill has been introduced (HB 17)<sup>49</sup> that is supported by the governor and which would address issues of financial assurance in the operational and post-operations phases. The bill is drafted with the understanding that the federal government will assume financial responsibility post-closure.

Concerning unitization, on August 16, 2010, by his signature, Governor Dave Freudenthal approved as adopted on June 8, 2010. The approved rules were filed on August 17, 2010, with the Secretary of State. With the rules approved and filed, compliance with these rules was effective September 15, 2010. A [memo](#)<sup>50</sup> was sent to owners and operators regarding compliance with the new rules. The August 24th memo provides clarification specific to questions received during the Wyoming Oil and Gas Conservation Commission ([WOGCC](#))'s public comment meeting held on July 27th and 28th.

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<sup>47</sup> W. Va. Carbon Dioxide Working Group, *Preliminary Report* (2010).

<sup>48</sup> S.B. 507.79<sup>th</sup> Leg., 2d Sess. (W.Va. 2009), available at: <http://groundwork.iogcc.org/sites/default/files/WV%20SB507%207-20-09.pdf>. AN ACT to amend and re-enact §5C-2-5 of the Code of West Virginia, 1931, as amended, relating to powers and duties of the West Virginia Clean Coal Technology Council; requiring a study of carbon capture and control; and quarterly reports to the Joint Committee on Government and Finance.

<sup>49</sup> H.B. 17, 60<sup>th</sup> Leg., Budget Sess. (2010); see Wyo. State. Ann. § 35-11-318 (2010), available at [http://groundwork.iogcc.org/sites/default/files/HB0017\\_enrolled%20Act%20No.%2026.pdf](http://groundwork.iogcc.org/sites/default/files/HB0017_enrolled%20Act%20No.%2026.pdf).

<sup>50</sup> Wyoming Oil and Gas Conservation Commission (August 24, 2010). Memorandum regarding Adoption of WOGCC Rules & Regulations, Clarifications.

On a second front, broader carbon sequestration rules developed by the state's Department of Environmental Quality likewise are moving forward through a mandatory review process. These latter rules contain only a placeholder for financial assurance rules. The development of and mandatory review process for financial assurance rules will commence if and when a financial assurance bill passes the legislature and is signed into law by the governor.

**2008 Laws - Effective on July 1, 2008:**

[Ownership of Subsurface Pore Space](#)<sup>51</sup>

[Carbon Capture and Sequestration](#).<sup>52</sup>

**2009 Laws – Effective July 1, 2009:**

[Ownership of Pore Space-Dominance of Mineral Estate](#)<sup>53</sup>

[Responsibilities of Injectors and Pore Space Owners](#)<sup>54</sup>

[Sequestration Site Unitization](#)<sup>55</sup>

**2010 Regulations - Effective August 16, 2010**

[Chapter 3, Operation Rules, Drilling Rules](#)<sup>56</sup>

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<sup>51</sup> H.R. 89, 59<sup>th</sup> Leg., 2008 Budget Sess. (Wyo. 2008). See Wyo. Stat. Ann § 34-1-152 (2009); see also Wyo. Stat. Ann. § 34-1-202(e) (2009). Enacted by the Legislature of the State of Wyoming as House Bill 89, approved on March 4, 2008, creating W.S. 34-1-152 and amending W.S. 34-1-202(e). The bill's effective date was July 1, 2008.

<sup>52</sup> H.R. 90, 59<sup>th</sup> Leg., 2008 Budget Sess. (Wyo. 2008). See Wyo. Stat. Ann § 30-5-501 (2008); see Wyo. Stat. Ann § 35-11-313 (2008); see Wyo. Stat. Ann § 35-11-103 (c) (2008). Enacted by the Legislature of the State of Wyoming as House Bill 90, approved March 4, 2008, creating W.S. 30-5-501 and 35-11-313 and amending W.S. 35-11-103(c). The bill's effective date was July 1, 2008.

<sup>53</sup> H.R. 57, 60<sup>th</sup> Leg., 2009 Gen. Sess. (Wyo. 2009). See Wyo. Stat. Ann. § 34-1-152(e) (2009). Enacted by the Legislature of the State of Wyoming as House Bill 57, approved on February 26, 2009, amending W.S. 34-1-152 (e). The bill's effective date was July 1, 2009.

<sup>54</sup> H.R. 58, 60<sup>th</sup> Leg., 2009 Gen. Sess. (2009). See Wyo. Stat. Ann § 34-1-153 (2009). Enacted by the Legislature of the State of Wyoming as House Bill 58, approved on February 26, 2009, creating W.S. 34-1-153. The bill's effective date was July 1, 2009.

<sup>55</sup> H.R. 80, 60<sup>th</sup> Leg., 2009 Gen. Sess. (2009); see Wyo. Stat. Ann. §§ 35-11-314 through 317; see Wyo. Stat. Ann. § 30-5-104(d) (2009); see Wyo. Stat. Ann. § 35-11-313(f) and (ii)(F) (2009). Enacted by the Legislature of the State of Wyoming as House Bill 80, approved on February 27, 2009 creating W.S. 35-11-314 through 35-11-317; amending W.S. 30-5-104(d); and amending W.S. 35-11-313(f)(intro) and (ii)(F). The bill's effective date was July 1, 2009.

<sup>56</sup> Chapter 3, Operation Rules, Drilling Rules (WOGCC) as adopted August 16, 2010.

## B. States with CCGS Legislative/Regulatory Activity

### Alaska

*Summary: No legislation. No regulations.*

Alaska has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. It is, however, in the final stages of completing a report that examines a variety of issues related to carbon capture and storage. At the request of the governor, the report is being undertaken by the [Alaska Subcabinet for Climate Change](#)<sup>57</sup>. It is likely to conclude that no new laws or regulations are needed for CO<sub>2</sub> storage in conjunction with EOR but that legislation and regulations would likely be needed for non-EOR CO<sub>2</sub> geologic storage. The report is expected to be completed by September of 2010 and could include recommendations for consideration by the state legislature in 2011.

### California

*Summary: No substantive legislation. No regulations.*

California has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. In 2006, California passed [HB 1925](#)<sup>58</sup> which mandated a report containing recommendations for how the state can develop parameters to accelerate the adoption of geologic sequestration strategies for the long-term management of industrial carbon dioxide. That [report](#) was completed in November 2007.<sup>59</sup> Legislation is likely to await completion of a WestCarb pilot project in the state.

### Colorado

*Summary: No legislation. No regulations.*

Colorado has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. However, in March 2010, the governor asked the state's Department of Natural Resources to convene a task force to examine the issues surrounding carbon capture and geologic storage. In response the state has created a 13-member Carbon Capture and Sequestration Task Force.<sup>60</sup> A goal of

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<sup>57</sup> Climate Change in Alaska, <http://www.climatechange.alaska.gov/>. This site documents the work of the Climate Change Sub-Cabinet to date. The process consisted of different Advisory groups, which in turn broke down into several Technical Working Groups (TWG's). Reports are completed and available from this web-site for Adaption, Mitigation, Immediate Action, and Research needs.

<sup>58</sup> A.B. 1925, 2006 Gen. Ass. (Ca. 2006), available at: [http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab\\_1901-1950/ab\\_1925\\_bill\\_20060926\\_chaptered.html](http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_1901-1950/ab_1925_bill_20060926_chaptered.html).

<sup>59</sup> California Energy Commission, [Geologic Carbon Sequestration Strategies for California: Report to the Legislature \(2007\)](#), available at: <http://groundwork.iogcc.org/sites/default/files/CA%20Report%20CO2%20strategies%206-30-09.pdf>.

<sup>60</sup> Colo. Dep't of Natural Res., Carbon Capture and Sequestration Task Force. <http://dnr.state.co.us>.

the task force is developing omnibus legislation for the 2011 General Assembly. The task force is made up of lawmakers, agency officials, conservation groups, and representatives of the utility, energy, and cement industries. The task force meets monthly to discuss and assess ways in which legal and regulatory challenges to geologic sequestration might be addressed.

## *Idaho*

*Summary: No legislation. No regulations.*

Idaho has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. The state has, however, under the direction of the governor, established the [Idaho Strategic Energy Alliance](#).<sup>61</sup> The Alliance consists of approximately a dozen issue-oriented volunteer task forces. The task force with responsibility for carbon sequestration, among other things, is the Carbon Issues Task Force.

## *Indiana*

*Summary: No legislation. No regulations.*

Indiana has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. Two bills relating to geologic storage and transportation were introduced in the 2010 legislative session. One bill, SB115<sup>62</sup>, addressed eminent domain for carbon dioxide pipelines in the state. The other, SB211<sup>63</sup>, addressed broader issues pertaining to CO<sub>2</sub> storage and transportation in the state. Neither was passed into law. Prospects are good that Indiana will take up similar legislation again in 2011.

## *Kentucky*

*Summary: No legislation. No regulations.*

Kentucky has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. However, a bill, [HB 491](#)<sup>64</sup>, was introduced in February 2010 in the Kentucky Legislature.

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<sup>61</sup> Idaho Office of Energy Res., Idaho Strategic Energy Alliance, <http://www.energy.idaho.gov/energyalliance/>.

<sup>62</sup> S.B.115.116<sup>th</sup> Gen. Assembly. 2d Reg. Sess. (Ind. 2010), available at: <http://groundwork.iogcc.org/topics-index/carbon-sequestration/legislation/indiana-sb-115-eminent-doman-for-carbon-dioxide-pipeli>.

<sup>63</sup> S.B.211.116<sup>th</sup> Gen. Assembly 2d Reg. Sess. (Ind. 2010), available at: <http://groundwork.iogcc.org/topics-index/carbon-sequestration/legislation/indiana-sb-115-eminent-doman-for-carbon-dioxide-pipeli>.

<sup>64</sup> H.B. 491, 10<sup>th</sup> Regular Sess. (Ky. 2010), available at: <http://www.lrc.ky.gov/record/10RS/HB491.htm>. AN ACT relating to carbon management and making an appropriation therefore Create new sections of KRS Chapter 353 declaring carbon dioxide management and storage to be important goals; declare certain geologic strata to be the property of the Commonwealth; direct the Division of Oil and Gas Conservation to develop a regulatory plan for development of geologic carbon dioxide storage including condemnation powers; provide minimum requirements for permitting; create an assessment against carbon dioxide generators per ton of carbon dioxide stored; direct the secretary of the Environmental and Public Protection Cabinet to negotiate with bordering states to resolve issues

Otherwise, Kentucky is the process of seeking primacy for UIC-Class II injection wells, currently being regulated in the state through the U.S. EPA Region IV Office in Atlanta.

### *Michigan*

Summary: *No legislation. No regulations.*

Michigan has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. In 2009, two CO<sub>2</sub> geologic storage bills were informally circulated, one of which was significantly influenced by the IOGCC model legislation. However, no legislation was passed. A CO<sub>2</sub> geologic storage bill may be introduced in 2010.

### *New Mexico*

Summary: *No legislation. No regulations.*

New Mexico has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. In late 2008, within 3 months of the release of the IOGCC guidance document, New Mexico developed and released a comprehensive [Blueprint for the Regulation of Geologic Sequestration of Carbon Dioxide in New Mexico](#). However, the New Mexico Legislature did not take up the issue. In 2009, both a comprehensive geologic storage bill and a pore space bill were introduced but neither became law. The storage bill failed to make it out of committee and the pore space bill, although passed by the Senate, failed to be acted upon by the House prior to adjournment. In 2010 a pore space bill was introduced with the support of the governor. However, it did not become law prior to adjournment.

### *North Carolina*

Summary: *No legislation. No regulations.*

North Carolina has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. Although not part of a formal process, the state has begun to look into the potential for geologic CO<sub>2</sub> storage and the corresponding need for a legal and regulatory infrastructure.

### *Pennsylvania*

Summary: *No legislation. No regulations.*

Pennsylvania has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. Legislation was introduced in the 2010 legislative session in the form of [HB 80](#)<sup>65</sup>. This

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of geologic carbon storage; create the Kentucky Carbon Storage Authority to take ownership of closed and stable carbon storage facilities; create the Kentucky carbon storage fund for management and liability of closed carbon storage facilities; create mechanism for assessment fee to be adjusted.

<sup>65</sup>TH.B.80.2009 Sess (Pa.2009), available at:

<http://www.legis.state.pa.us/cfdocs/billinfo/billinfo.cfm?year=2009&ind=0&body=H&type=B&BN=0080>. An Act



legislation has the support of the governor and the secretary of the Department of Environmental Protection (DEP).

### *Virginia*

Summary: *No legislation. No regulations.*

Virginia has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. A bill entitled “Geologic Storage of Carbon Dioxide”, SB247<sup>66</sup>, was introduced in January 2010 in the Senate. It was referred to the Committee on Agriculture, Conservation and Natural Resources, which voted against moving the bill forward. It did, however, ask that the [Virginia Commission on Coal and Energy](#)<sup>67</sup> study the issue further and report back with the goal of again considering a CO<sub>2</sub> geologic storage bill in 2011.

## **C. States with Little or No Legislative/Regulatory Activities**

### *Alabama*

Summary: *No legislation. No regulations.*

Alabama has not yet enacted legislation pertaining to the geologic storage of CO<sub>2</sub>.

### *Arkansas*

Summary: No legislation. No regulations.

Arkansas has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. The next opportunity for consideration of geologic storage legislation will be January 2011.

### *Arizona*

Summary: *No legislation. No regulations.*

Arizona has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. The state’s Oil and Gas Conservation Commission does have rules regarding the use of CO<sub>2</sub> for EOR.

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amending the act of November 30, 2004 (P.L.1672, No.213), known as the Alternative Energy Portfolio Standards Act, further providing for definitions and for alternative energy portfolio standards; and providing for sequestration facility permitting and for title to carbon dioxide, immunity and transfer of liability; establishing the Carbon Dioxide Indemnification Fund; providing for carbon dioxide sequestration facility and transportation pipeline on Commonwealth State forest lands; and providing for application of the Public Utility Code to transporters of carbon dioxide.

<sup>66</sup> S.B.247.2010 Regular Sess. (Va.2010).

<sup>67</sup> Va. Commission on Coal and Energy, <http://dls.state.va.us/CEC.HTM>.

Arizona was also the site of a [West Coast Regional Carbon Sequestration Partnership](#) (WestCarb)<sup>68</sup> pilot project where a CO<sub>2</sub> test well was drilled but no CO<sub>2</sub> was ever injected. As of now, the state is waiting to see what the national trend will be before taking steps on the development of legislation and rules regarding CO<sub>2</sub> geological storage.

### ***Connecticut***

Summary: No legislation. No regulations.

Connecticut has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. The focus in Connecticut to date has been on terrestrial sequestration.

### ***Delaware***

Summary: No legislation. No regulations.

Delaware has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***Florida***

Summary: No legislation. No regulations.

Florida has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***Georgia***

Summary: No legislation. No regulations.

Georgia has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. One relevant factor is that there is apparently limited potential for CO<sub>2</sub> geologic storage in the state.

### ***Hawaii***

Summary: No legislation. No regulations.

Hawaii has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***Iowa***

Summary: No legislation. No regulations.

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<sup>68</sup> West Coast Regional Carbon Sequestration Partnership, <http://www.westcarb.org/>.

Iowa has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. Although 80% of Iowa's electric generation comes from coal, the state has not issued any laws or rules to regulate emissions from coal-fired plants in the state. In 2007, Iowa established the [Iowa Climate Change Advisory Council](#)<sup>69</sup> with a charge to identify policies and strategies for the state to respond to the challenge of global climate change. In December of 2008, the council released its Final Report<sup>70</sup>.

### *Maine*

*Summary: No legislation. No regulations.*

Maine has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. In accordance with Maine statute<sup>71</sup>, the Maine Department of Environmental Protection is currently developing emission standards for CO<sub>2</sub> from coal gasification facilities. Maine considers CCS to be a possible control option under a BACT analysis but not an emission standard.

### *Maryland*

*Summary: No legislation. No regulations.*

Maryland has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### *Massachusetts*

*Summary: No legislation. No regulations.*

Massachusetts has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. The state's private sector and the Massachusetts Institute of Technology are, however, actively engaged in researching the potential for CCS in the state. Once viable technologies are identified through this and other research the state would then look to the development of a comprehensive CCS legal regime.

### *Minnesota*

*Summary: No legislation. No regulations.*

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<sup>69</sup> Iowa Climate Change Advisory Council, <http://www.iaclimatechange.us/>.

<sup>70</sup> Iowa Climate Change Advisory Council, ICCAC Final Report (2008), available at: <http://www.iaclimatechange.us/capag.cfm>.

Minnesota has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. It is, however, an active member of the Midwest Governor's Association, which has studied the development of CCS rules, regulations, and infrastructure.

### *Mississippi*

Summary: *No legislation. No regulations.*

Mississippi has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### *Missouri*

Summary: *No legislation. No regulations.*

Missouri has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### *Nebraska*

Summary: *No legislation. No regulations.*

Nebraska has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### *Nevada*

Summary: *No legislation. No regulations.*

Nevada has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. However, the Nevada Bureau of Mines and Geology has completed two reports that examine the potential for geologic storage of CO<sub>2</sub>. One [report](#)<sup>72</sup> takes a broad look at the potential while the [other](#)<sup>73</sup> focuses on the EOR-related potential. The Nevada Legislature meets only every two years and the next available opportunity for consideration of geologic storage legislation would be February – May 2011.

### *New Hampshire*

Summary: *No legislation. No regulations.*

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<sup>72</sup> Preliminary Assessment of the Potential for Carbon Dioxide Disposal by Sequestration in Geological Settings in Nevada, Nevada Bureau of Mines and Geology, Report 51 (2005), *available at:* <http://www.nbmg.unr.edu/dox/r51.pdf>.

<sup>73</sup> Assessment of the Potential for Carbon Dioxide Sequestration with Enhanced Oil Recovery in Nevada, Nevada Bureau of Mines and Geology Open-File Report 07-7 (2007), *available at:* <http://www.nbmg.unr.edu/dox/of077/of077.pdf>.

New Hampshire has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### *New Jersey*

Summary: *No legislation. No regulations.*

New Jersey has not yet enacted legislation or promulgated regulations specifically governing geological CO<sub>2</sub> storage. Existing state regulations regarding well drilling, air permitting, land use permitting, and pipeline-related issues would apply to any proposed CCS project.

New Jersey recently joined the Midwest Regional Carbon Sequestration Partnership, and is currently conducting an assessment of geological carbon sequestration potential in New Jersey and the adjacent offshore region. The state has not taken a policy position in support of or in opposition to CCS; the statewide assessment is a scientific study for research purposes.

### *New York*

Summary: *No legislation. No regulations.*

New York has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. Project specific legislation<sup>74</sup> was introduced in June 2009 by Governor Paterson (Program Bill #45). However, the legislation did not pass and the project is no longer active.

### *Oregon*

Summary: *No legislation. No regulations.*

Oregon has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. It has, however, talked about adopting the Rules for CO<sub>2</sub> Geologic Sequestration Wells once the rules currently being developed by EPA are complete.<sup>75</sup> While not a member of any of the geologic sequestration-focused DOE Regional Carbon Sequestration Partnerships, Oregon will be reporting to the United States Geological Service (USGS) on the state's geologic potential for CO<sub>2</sub> storage. It does not appear that Oregon has much potential for conventional CO<sub>2</sub> storage. Like Washington, the greatest

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<sup>74</sup> A.08802, 2009-2010 Regular Sess. (N.Y. 2009), *available at*: [http://assembly.state.ny.us/leg/?default\\_fld=&bn+=A08802%09%Summary=Y&Text=Y](http://assembly.state.ny.us/leg/?default_fld=&bn+=A08802%09%Summary=Y&Text=Y). AN ACT to amend the public service law, in relation to a pilot program to enable the capture and storage of carbon dioxide; and to enact the "carbon capture and sequestration act." *See also* S. 53303, 4<sup>th</sup> Extraordinary Sess., (N.Y. 2009), *available at*: [http://www.assembly.state.ny.us/leg/?default\\_fld=&bn+=S53303%09%09%09&Summary=Y&Text=Y](http://www.assembly.state.ny.us/leg/?default_fld=&bn+=S53303%09%09%09&Summary=Y&Text=Y). AN ACT to amend the public service law, in relation to a pilot program to enable the capture and storage of carbon dioxide; and to enact the "carbon capture and sequestration act."

<sup>75</sup> *Supra* note 3.

potential for CO<sub>2</sub> storage in the state would appear to be in deep basalt formations although there is not much research going into this possibility at the moment. Additionally, Oregon has only one coal-fired power plant, limiting the state's need for CO<sub>2</sub> geologic storage.

### ***Rhode Island***

Summary: *No legislation. No regulations.*

Rhode Island has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***South Carolina***

Summary: *No legislation. No regulations.*

South Carolina has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***South Dakota***

Summary: *No legislation. No regulations.*

South Dakota has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***Tennessee***

Summary: *No legislation. No regulations.*

Tennessee has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***Vermont***

Summary: *No legislation. No regulations.*

Vermont has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

### ***Wisconsin***

Summary: *No legislation. No regulations.*

Wisconsin has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. Additionally, there is no pending legislation or regulations. The Wisconsin Public Service Commission has, however, commissioned a report on the potential for geologic storage of CO<sub>2</sub> entitled: [An Investigation to Explore the Potential for Geologic Sequestration of Carbon Dioxide Produced by](#)

[Wisconsin's Electricity Generation Fleet.](#)<sup>76</sup> The report is in a public comment stage with the report itself not yet finalized.

## D. Provincial Summaries

### *Alberta*

Summary: *No legislation. No regulations.*

Alberta has not yet enacted specific legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. The plan is to have specific legislation drafted for consideration in the fall. Regulations will be developed thereafter. On June 29, 2010 the Alberta [Energy Resources Conservation Board](#) issued Bulletin 22-2010<sup>77</sup> informing readers of the existing processes in place for applications for the development and operation of carbon capture and storage and acid gas injection projects in Alberta.

### *British Columbia*

Summary: *No new legislation. No new regulations.*

British Columbia has legislation and regulations in place governing storage reservoir rights, underground storage, and disposal relating to oil and natural gas operations. The province is in the process of creating a regulation listing prescribed substances that will allow any desired substances, including carbon dioxide from any source, to be disposed of or stored in underground storage reservoir rights.

### *Newfoundland and Labrador*

Summary: *No legislation. No regulations.*

Newfoundland and Labrador has not enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. As a large exporter of hydroelectric power, Newfoundland and Labrador produces very little CO<sub>2</sub> and therefore has little or no need to develop CO<sub>2</sub> geologic storage sites. The province is also home to a relatively young oil and natural gas industry, mostly offshore. As a consequence, the province's focus has been on developing and managing this new resource. For these and other reasons there are no plans at the present for additional legislation or regulations to govern geologic storage of CO<sub>2</sub>.

### *Nova Scotia*

Summary: *No legislation. No regulations.*

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<sup>76</sup> Wisconsin Public Service Commission, An Investigation to Explore the Potential for Geologic Sequestration of Carbon Dioxide Produced by Wisconsin's Electricity Generation Fleet (2010), *available at:* [http://psc.wi.gov/apps35/ERF\\_view/viewdoc.aspx?docid=127780](http://psc.wi.gov/apps35/ERF_view/viewdoc.aspx?docid=127780).

<sup>77</sup> Energy Res. Conservation Bd., Bulletin 2010-22 (2010), *available at:* <http://groundwork.iogcc.org/sites/default/files/bulletin-2010-22.pdf>.

Nova Scotia has not enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>. It would appear that the only significant potential for CO<sub>2</sub> geologic storage in Nova Scotia would be more than 100 miles offshore. It is probable that any such storage would require additional legislation and regulations. At present, there are no plans for additional legislation or regulations.

### *Saskatchewan*

*Summary: No legislation. No regulations. However, new legislation and regulations may not be necessary in Saskatchewan other than for clarification purposes. One interpretation is that the existing legal framework in the province already covers the general framework for geologic storage, pore space ownership, aggregation of storage rights, and long-term liability.*

Saskatchewan has not yet enacted legislation or promulgated regulations pertaining specifically to the geologic storage of CO<sub>2</sub>. As in most states and provinces, Saskatchewan's existing laws and regulations provide the legal and regulatory framework for EOR-related CO<sub>2</sub> storage and the injection or deep disposal of other substances in the province. Saskatchewan's Weyburn project, making use of anthropogenic CO<sub>2</sub> originating in North Dakota, has been in operation for 10 years. Concerning non-EOR CO<sub>2</sub> storage, the province's existing laws and regulations<sup>78</sup> may be adequate, and no additional legislation may be necessary other than for clarification purposes.

### *Yukon*

*Summary: No legislation. No regulations.*

Yukon has not yet enacted legislation or promulgated regulations pertaining to the geologic storage of CO<sub>2</sub>.

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<sup>78</sup> Government. of Sask. Energy and Resources, <http://www.ir.gov.sk.ca/oilgas>.



## **Part 3: A Review of IOGCC Legal and Regulatory Guidance for States and Provinces for the Storage of Carbon Dioxide in Geologic Structures**

## Overview

As noted earlier, the Interstate Oil and Gas Compact Commission’s Task Force on Carbon Capture and Geologic Storage has prepared this Biennial Review that amends, in part, the guidance to states and provinces that it issued in its 2007 publication [Storage of Carbon Dioxide in Geologic Structures: A Legal and Regulatory Guide for States and Provinces](#).<sup>79</sup> Two principal components of the 2007 publication and this biennial report are the [Model Statute for the Geologic Storage of Carbon Dioxide](#) and the [Model General Rules and Regulations for the Geologic Storage of Carbon Dioxide](#).

The documents contained in Appendices I and II contain revised model documents. The overall rationale for the revisions is enunciated in Part 1. In this Part 3, the task force explains the specific reasons for each change made to the 2007 documents.

The purpose of the guidance document was to provide states or provinces that were contemplating adoption of legal and regulatory frameworks for the storage of carbon dioxide resources that would be helpful as they draft frameworks that meet the unique requirements of their particular jurisdictions. It was always anticipated that a state or province adopting a legal and regulatory framework for CO<sub>2</sub> storage would make changes to the model framework as necessary to conform to those unique circumstances. The result anticipated was a legal and regulatory system for the geologic storage of CO<sub>2</sub> that, while regulated at the state and provincial level, would nonetheless be substantially consistent from jurisdiction to jurisdiction in the U.S. and Canada. In the states that have moved forward enact laws and to draft regulations this has proved to be the case.

This guidance document is intended primarily for IOGCC member states, including its affiliate member provinces. Although references throughout this document are, for the most part, to “state” or “states,” the intent of the task force is that the comments and provisions are equally applicable to Canadian provinces. Specific notation of this is made in both the Model Statute and Model General Rules and Regulations attached. Additionally, in Canada, protection of both groundwater resources and deep injection fall entirely within provincial jurisdiction, and there is no federal equivalent of the U.S. Safe Drinking Water Act and the UIC program. Accordingly, regulations may vary from province to province, but their essence is the same and comparable with the U.S. regulations.

### *Explanation of Changes Made by the Task Force to the 2007 Model Statute (Reflected in the Model Statute in Appendix I)*

#### Section 1. Legislative Declaration; Jurisdiction.

Paragraph (c): The task force struck paragraph (c) because oil and gas agencies already have jurisdiction over enhanced oil recovery regardless of whether CO<sub>2</sub> storage is coincidental or occurring in association with EOR. Existing oil and gas statutes give this authority to state oil and gas agencies. It is also noted

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<sup>79</sup> *Supra* note 2.

that the issue of certification with regard to EOR-related carbon dioxide storage was addressed in Section 10 with new language giving the states the authority to determine certification for EOR-related storage.

Replacing the language that was struck from paragraph (c) was language that was previously contained in Section 10 of the 2007 Model Statute. The language was moved to paragraph (c) for two reasons: (1) Section 10 in the revised draft now covers only the issue of certification; and (2) the task force concluded that it would be more appropriately addressed in Section 1 covering jurisdictional issues.

## Section 2. Definitions.

Paragraph (a): The task force struck the words “anthropogenically sourced” from the definition of “carbon dioxide” and introduced instead the term “emissions stream”. The purpose behind the amended definition was to clarify that the term “carbon dioxide” referred to throughout the model statute was carbon dioxide that was derived from emissions streams or carbon dioxide that has been stripped, segregated, or divided from other fluids or gas production streams and does not include carbon dioxide that may be produced from naturally occurring carbon dioxide reservoirs.

Paragraph (d): The definition of “storage facility” was amended to be consistent with the Model Rules and Regulations which uses the term “CO<sub>2</sub> Storage Project”. “Storage facility” in the 2007 Model Statute and “CO<sub>2</sub> Storage Project” in the Model General Rules and Regulations were defined similarly. Consequently, a single term was decided upon for use in both the Model Statute and Model General Rules and Regulations. Other sections of the Model Statute, which were amended only to replace the term “storage facility”, will not be further addressed in this overview of amended sections.

## Section 3. State Regulatory Agency Approval; Recordation or Order, Certificate of Operation of CO<sub>2</sub> Storage Project.

Paragraph (d): The paragraph was amended to make clear that the administrative process for converting a previously established oil and gas field to geologic storage included public notice and hearing before the State Regulatory Agency (SRA) as part of the permit conversion process.

## Section 10. Certifying Storage Amounts.

As previously discussed, the original language contained in Section 10 of the 2007 Model Statute was moved to Section 1 (c) in the Revised Model Statute.

The new language in Section 10 addresses statutory authority that a state may wish to exercise for the purpose of certifying the amount of injected carbon dioxide stored in a permitted CO<sub>2</sub> Storage Project or carbon dioxide that is stored during or in connection with enhanced recovery of oil or natural gas. This statutory authority enables a state to determine if carbon dioxide used in EOR or enhanced gas recovery projects will qualify for certification purposes for carbon credits, allowances, trading, emissions allocations, offsets, or for other similar purposes.

## *Explanation of Changes Made by the Task Force to the 2007 Model General Rules and Regulations Statute (Reflected in the Model General Rules and Regulations in Appendix II)*

### Section 2.0. Definitions.

Paragraph (a): The definition of CO<sub>2</sub> was amended to bring it into conformance with the changes made by the task force to the definition of CO<sub>2</sub> in the revised Model Statute.

Paragraph (p): The definition of SRA was amended to clarify that the regulatory agency was responsible for administering the provisions of the revised Model General Rules and Regulations.

### Section 4.1. CSP Permit Requirements.

Paragraph (b) (2) (C): The application information required for a geologic and hydrologic evaluation of the Geologic Storage Unit (GSU) was amended to also require, in addition to general geologic information, information on the potential geochemical interactions that may occur as a result of the injection of CO<sub>2</sub> in the proposed reservoir. An error was also corrected by changing the word “absorption” to “sorption”.

Paragraph (b) (2) (F): The determination of the allowable proposed maximum bottom hole injection pressure was amended to allow the State Regulatory Agency additional flexibility in determining the pressure utilizing other sources of information.

Paragraph (b) (3): The paragraph was amended to expand the types of reservoir analyses that may be used to determine the storage capacity of the GSU.

Paragraph (b) (10): This section was clarified to establish that the CO<sub>2</sub> Storage Project (CSP) performance bond is required to remain in effect 10 years after injection ceases for purposes of well abandonment and site remediation should the CSP operator cease to exist.

Paragraph (b) (11): The word “well” was added before “performance bond” for purposes of clarification.

### Section 6.3. CSP Well Operation Standards.

Paragraph (c): The requirement to set a liner in a well was clarified to ensure that the entire annular space between the liner and the next larger casing was cemented over the entire length of the liner set in the well.

Paragraph (g): The term “cement bond log” was replaced with clarifying language describing the type of cement evaluation log required to ensure that the type of log to be run in the well would be sufficient to evaluate cement quality and identify any uncemented portions of the casing.

Paragraph (p): The paragraph was amended to remove the mandate to use downhole shutoff systems, and allowed other shutoff systems to be used.

## Section 8.0. Reporting Requirements.

The title of Section 8.0. was amended to “Operational Review and Reporting Requirements” to reflect a broadened scope of the section.

A section entitled “Section 8.1. Operational Injection Reports” was added. Section 8.0. (a) became Section 8.1. (a) and Section 8.0. (b) became Section 8.1. (b).

Paragraph (a): The paragraph was amended to remove the report requirement dealing with the withdrawal of CO<sub>2</sub>, because the purpose of the section was changed to deal only with the reporting of amounts injected. In addition, the paragraph was amended to include the necessary information required by the SRA to allow certification determination.

A section entitled “Section 8.2. Annual Operational Report and Review” was added to expand Section 8.0 to also include an annual review of all required operational monitoring and safety plans.

## Section 9.0 CSP Closure and Section 10.0. Post Closure Period.

Section 9 was amended to more clearly define when the closure of the CSP occurs. This section defines CSP closure as when injection ceases and all wells not to be used for future monitoring are plugged. Consequently, Section 10 was added to more clearly define the post closure period and specify the criteria that the SRA would use for the transition from the closure to post-closure period.

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## List of Acronyms and Abbreviations

CAA	Clean Air Act	IOGCC	Interstate Oil and Gas Compact Commission
CCGS	Carbon Capture and Geologic Storage	NEPA	National Environmental Policy Act
CO <sub>2</sub>	Carbon Dioxide	NETL	DOE National Energy Technology Laboratory
DOE	U.S. Department of Energy	RCSP	Regional Carbon Sequestration Partnership
EOR	Enhanced Oil Recovery	SDWA	Safe Drinking Water Act
EPA	U.S. Environmental Protection Agency	UIC	Underground Injection Control



# Appendix I: Model Statute for Geologic Storage of Carbon Dioxide

# Model Statute<sup>1</sup>

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## *Geologic Storage of Carbon Dioxide*

### **Section 1. Legislative Declaration; Jurisdiction.<sup>2</sup>**

(a) The Legislature of the State of \_\_\_\_\_ declares that (1) the geologic storage of carbon dioxide will benefit the citizens of the state and the state's environment by reducing greenhouse gas emissions; (2) carbon dioxide is a valuable commodity to the citizens of the state; and (3) geologic storage of carbon dioxide gas may allow for the orderly withdrawal as appropriate or necessary, thereby allowing carbon dioxide to be available for commercial, industrial, or other uses, including the use of carbon dioxide for enhanced recovery of oil and gas (EOR).

(b) The State Regulatory Agency shall have the jurisdiction and authority over all persons and property necessary to administer and enforce effectively the provisions of this article concerning the geologic storage of carbon dioxide. In exercising such jurisdiction and authority granted to it, the State Regulatory Agency may conduct hearings and promulgate and enforce rules, regulations, and orders concerning geologic storage of carbon dioxide.

(c) Nothing in this article shall apply to the use of carbon dioxide as a part of or in conjunction with any enhanced recovery methods where the sole purpose of the project is enhanced oil or gas recovery. The State Regulatory Agency is expressly authorized to develop rules to allow conversion of an existing enhanced recovery operation into a Carbon Dioxide Storage Project.

### **Section 2. Definitions.**

**Carbon dioxide.** For purposes of this statute, carbon dioxide is defined as an emissions stream containing carbon dioxide of sufficient purity and quality as to not compromise the safety and efficiency of the reservoir to effectively contain the carbon dioxide.

**Oil or gas.** Oil, natural gas, or gas condensate.

**Reservoir.** Any subsurface sedimentary stratum, formation, aquifer, or cavity or void (whether natural or artificially created) including oil and gas reservoirs, saline formations and coal seams, suitable for or capable of being made suitable for the injection and storage of carbon dioxide therein.

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<sup>1</sup> Canadian provinces should replace "state" with "province" as appropriate.

<sup>2</sup> The purpose of this section is to make clear that the primary goal is to permanently store carbon dioxide to mitigate its impact on global climate change; however, given the commodity status of carbon dioxide, under certain circumstances states need statutory authority to regulate withdrawal of previously stored carbon dioxide for EOR and other uses that do not involve release to the atmosphere.

**Carbon Dioxide Storage Project.** The underground reservoir, underground equipment, and surface buildings and equipment utilized in the storage operation, excluding pipelines used to transport the carbon dioxide from one or more capture facilities to the storage and injection site. The underground reservoir component of the Carbon Dioxide Storage Project includes any necessary and reasonable areal buffer and subsurface monitoring zones designated by the State Regulatory Agency for the purpose of ensuring the safe and efficient operation of the Carbon Dioxide Storage Project for the storage of carbon dioxide and shall be chosen to protect against pollution, invasion, and escape or migration of carbon dioxide.

**Storage operator.** Any person, corporation, partnership, limited liability company, or other entity authorized by the State Regulatory Agency to operate a Carbon Dioxide Storage Project.

**Geologic storage.** Permanent or short-term underground storage of carbon dioxide in a reservoir.

### **Section 3. State Regulatory Agency Approval; Recordation or Order, Certificate of Operation of Carbon Dioxide Storage Project.**

The use of a reservoir for storage of carbon dioxide is hereby authorized, provided that the State Regulatory Agency shall first enter an order, after public notice and hearing, approving such proposed geologic storage of carbon dioxide and designating the horizontal and vertical boundaries of the geologic storage. In order to establish a Carbon Dioxide Storage Project for carbon dioxide, the State Regulatory Agency shall find as follows:

That the Carbon Dioxide Storage Project is suitable and feasible for the injection and storage of carbon dioxide;

That a good faith effort has been made to obtain the consent of a majority of the owners having property interests affected by the Carbon Dioxide Storage Project and that the operator intends to acquire any remaining interest by eminent domain or otherwise allowed by statute;

That the use of the Carbon Dioxide Storage Project for the geologic storage of carbon dioxide will not contaminate other formations containing fresh water or oil, gas, coal, or other mineral deposits; and

That the proposed storage will not unduly endanger human health and the environment and is in the public interest.

Upon the State Regulatory Agency's issuance of an order of approval as set forth above, said order, or a certified copy thereof, shall be filed for record in the probate court [or other appropriate entity of jurisdiction where land records are filed] of the county or counties in which the Carbon Dioxide Storage Project is to be located.

Prior to commencing injection of carbon dioxide, the storage operator shall record in the county or counties in which the Carbon Dioxide Storage Project is located, and with the State Regulatory Agency, a certificate, entitled "Certificate of Operation of Carbon Dioxide Storage Project," which shall contain a statement that the storage operator has acquired by eminent domain or otherwise all necessary ownership rights with respect to the Carbon Dioxide Storage Project, and the date upon which the Carbon Dioxide Storage Project shall be effective.

If any depleted pool for any previously established field(s) or producing unit(s) for hydrocarbons is contained within the boundaries of the geologic storage, the State Regulatory Agency may, after public notice and hearing, in its order of approval for such Carbon Dioxide Storage Project order that such field(s) or unit(s) shall be dissolved as of the effective date of the Carbon Dioxide Storage Project as set forth in the Certificate of Operation of Carbon Dioxide Storage Project.



## Section 4. Protection Against Pollution and Escape of Carbon Dioxide.

The State Regulatory Agency shall issue such orders, permits, certificates, rules, and regulations, including establishment of appropriate and sufficient financial sureties as may be necessary, for the purpose of regulating the drilling, operation, and well plugging and abandonment and removal of surface buildings and equipment of the Carbon Dioxide Storage Project to protect the Carbon Dioxide Storage Project against pollution, invasion, and the escape or migration of carbon dioxide or other formation fluids so as not to endanger USDWs.

## Section 5. Eminent Domain or Other Applicable Statutory Authority.<sup>3</sup>

- a) Any storage operator is hereby empowered, after obtaining approval of the State Regulatory Agency as herein required, to exercise the right of eminent domain provided by law, to acquire all surface and subsurface rights and interests necessary or useful for the purpose of operating the Carbon Dioxide Storage Project, including easements and rights-of-way across lands for transporting carbon dioxide among facilities constituting said Carbon Dioxide Storage Project. Such power shall be exercised under the procedure provided by other applicable laws relating to eminent domain.<sup>4</sup>
- b) No rights or interests in storage facilities acquired for the injection, storage, and state authorized withdrawal of carbon dioxide by a party who has obtained an order from the State Regulatory Agency under the provisions of Section 2, shall be subject to the exercise of the right of eminent domain authorized by the article. The State Regulatory Agency, however, may reopen an earlier order for the purpose of balancing the interests of both projects. Nothing in this article shall alter or revise any power of eminent domain that may exist under any other authority.
- c) The right of eminent domain granted in this section shall not prevent the right of the owner of said land or of other rights therein to drill through the geologic storage so appropriated in such manner as shall comply with the rules and regulations of the State Regulatory Agency issued for the purpose of protecting the Carbon Dioxide Storage Project against pollution or invasion and against the escape or migration of carbon dioxide. Furthermore, the right of eminent domain granted in this section shall not prejudice the rights of the owners of said lands or other rights or interests therein as to all other uses not acquired for the Carbon Dioxide Storage Project.

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<sup>3</sup> Although the Task Force determined that the most likely mechanism for amalgamating the property rights (surface or subsurface) necessary for the permitting and operation of a Carbon Dioxide Storage Project is eminent domain, the Task Force also recognizes that particular states might have other mechanisms more appropriate for this purpose, e.g., unitization. It is important to note, however, that the Task Force has concluded that the amalgamation of property rights is absolutely necessary to properly permit, construct and operate a carbon dioxide storage project. Further, the eminent domain power outlined in this model statute is an eminent domain authority solely authorized within the carbon dioxide storage statute and is in addition to any eminent domain authority that may already be possessed by a non-government entity such as a public utility.

<sup>4</sup>In the exercise of the power of eminent domain, a state might consider allowing a storage operator the right of early entry if such right is not otherwise specifically authorized in those circumstances where the eminent domain process may be lengthy..

## **Section 6. Establishment of Carbon Dioxide Storage Project Trust Fund. <sup>5</sup>**

There is hereby established the Carbon Dioxide Storage Project Trust Fund to be administered by the State Regulatory Agency. There is hereby levied on the storage operator <sup>6</sup> a tax or fee equal to \$----- on each ton of carbon dioxide injected for storage for the purpose of funding the Carbon Dioxide Storage Project Trust Fund. The trust fund shall be utilized solely for long-term monitoring of the site, including remaining surface facilities and wells, remediation of mechanical problems associated with remaining wells and surface infrastructure, repairing mechanical leaks at the site, and plugging and abandoning remaining wells under the jurisdiction of the State Regulatory Agency for use as observation wells. The trust fund shall be administered by the State Regulatory Agency.

## **Section 7. Administration Expenses for this Article Relating to Geologic Storage of Carbon Dioxide.**

For the purpose of funding the administration and enforcement of these laws relating to geologic storage of carbon dioxide by the State Regulatory Agency during the operational phase of the Carbon Dioxide Storage Project, and for the purpose of compliance inspections including the expense of inspecting, testing, and monitoring the geologic Carbon Dioxide Storage Project, there is hereby levied on the storage operator a per ton tax or fee collected as a percentage of the fee or tax levied in Section 6. The State Regulatory Agency may utilize these monies as it deems appropriate solely for administering and enforcing this article.

## **Section 8. Liability Release. <sup>7</sup>**

Ten years<sup>8</sup> (or other time frame established by rule) after cessation of storage operations, the State Regulatory Agency shall issue a Certificate of Completion of Injection Operations, upon a showing by the storage operator that the reservoir is reasonably expected to retain mechanical integrity and remain emplaced, at which time ownership to the remaining project, including the stored carbon dioxide, transfers to the state. Upon issuance of the Certificate of Completion of Injection Operations, the

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<sup>5</sup> The purpose of the Trust Fund will be to provide the State Regulatory Agency with sufficient funds to provide long-term “caretaking” of the facility and to allow the operator and the producer of carbon dioxide the necessary regulatory certainty that ultimately includes release from liability. Based on a particular state’s requirements, each state will have to determine the methodology used to provide adequate funding, which would need to include a detailed analysis of the costs anticipated over the lengthy project “caretaking” time frames contemplated.

<sup>6</sup> It is contemplated that the tax or fee will be assessed to and paid by the state-permitted entity. However, in all likelihood the facility operator would recover the tax or fee from the generator of the carbon dioxide.

<sup>7</sup> The intent of this section is to provide a methodology whereby the operator and the generator of the carbon dioxide can be released from future liability. This aspect of the statute will allow for regulatory certainty by the industry and help to promote the development of carbon dioxide storage.

<sup>8</sup> While the task force decided that a 10-year time frame prior to release of the operator and carbon dioxide generator from liability might allow adequate time to determine that there are no known issues as to the integrity of the Carbon Dioxide Storage Project, the amount of time prior to release of the operator and generator from liability is ultimately a state decision. Time periods ranging from 3 to 10 years were discussed, as well as times longer than 10 years. The task force, however, believed that a transfer of caretaking responsibility of a stabilized project would be necessary to encourage timely development.

operator and all generators of any injected carbon dioxide shall be released from all further State Regulatory Agency liability associated with the project. In addition, upon the issuance of the Certificate of Completion of Injection Operations, any performance bonds posted by the operator shall be released and continued monitoring of the site, including remediation of any well leakage, shall become the responsibility of the Carbon Dioxide Carbon Dioxide Storage Project Trust Fund.

## **Section 9. Cooperative Agreements.**

The State Regulatory Agency is authorized to enter into cooperative agreements with other governments or government entities for the purpose of regulating carbon dioxide storage projects that extend beyond state regulatory authority under this article.<sup>9</sup>

## **Section 10. Certifying Storage Amounts.**

- a) The State Regulatory Agency may also make such certification for carbon dioxide stored under this chapter. The State Regulatory Agency, under procedures and criteria it may adopt, may certify the amount of injected carbon dioxide stored in a Carbon Dioxide Storage Project or during or in connection with enhanced recovery of oil or natural gas.
- b) The purpose for certifying storage amounts is to facilitate using the stored carbon dioxide for such matters as reporting, carbon credits, allowances, trading, emissions allocations and offsets, and for other similar purposes.

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<sup>9</sup> Such an agreement might allow the state that hosts the injection well to take the lead in permitting and might allow other affected states the right to “certify” a project in much the same way as is done under the current program under Section 404 of the Clean Water Act in the United States.

# Appendix II: Model General Rules and Regulations

# General Rules and Regulations:

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## *Geologic Storage of Carbon Dioxide*

### **Section 1.0. Applicability**

The following rules and regulations shall govern the geologic storage of CO<sub>2</sub> in geologic reservoirs. These rules apply to all CO<sub>2</sub> storage operations occurring within the territorial jurisdiction of the state.<sup>1</sup>

### **Section 2.0. Definitions**

The following terms, as used in these regulations for geologic CO<sub>2</sub> storage facilities, shall have the following meanings:

**CO<sub>2</sub>** means an emissions stream containing carbon dioxide of sufficient purity and quality as to not compromise the safety and efficiency of the reservoir to effectively contain the CO<sub>2</sub>.

**CO<sub>2</sub> Facility (CF)** means all surface and subsurface infrastructure including wellhead equipment, down hole well equipment, compression facilities and CO<sub>2</sub> flow lines from injection facilities to wells within the Geological Storage Unit (GSU), monitoring instrumentation, injection equipment, and offices. CF does not include the main transportation pipeline to the GSU and pump stations along that pipeline.

**CO<sub>2</sub> Flow Lines** means the pipeline transporting the CO<sub>2</sub> from the CF injection facilities to the wellhead.

**CO<sub>2</sub> Injection Well** means a well used to inject CO<sub>2</sub> into and/or withdraw CO<sub>2</sub> from a reservoir.

**CO<sub>2</sub> Storage Project (CSP)** means the project in its entirety, including CF and GSU.

**CSP Closure Period** means that period of time (10 years unless otherwise designated by the State Regulatory Agency {SRA}) from the permanent cessation of active CSP injection operations until the expiration of the CSP performance bond, unless monitoring efforts following the operational period demonstrate to SRA that a different time frame is appropriate.

**CSP Operational Period** means the period of time in which injection occurs.

**CSP Operator** means that entity required by SRA to hold the permit.

**CSP Permit** means the permit issued by the state or province to operate a CSP.

**CSP Post Closure Period** means that period of time after the release of the CSP performance bond.

**Formation Fracture Pressure** means the pressure, measured in pounds per square inch, which, if applied to a subsurface formation, will cause that formation to physically fracture.

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<sup>1</sup> This document is drafted using the word “state.” Canadian provinces should substitute either the word “province” or “provincial” as required. Similarly, Canadian provinces should substitute as appropriate the definitions of Underground Sources of Drinking Water (USDW) and Safe Drinking Water Act (SDWA) here and in the following text.

**Fresh Water** means USDW unless otherwise defined by SRA.

**Geological Storage Unit (GSU)** means the reservoir used by an entity that holds the SRA permit authorizing CO<sub>2</sub> injection activities.

**Geologist or Engineer** means a person qualified by education and experience to be recognized as an expert by SRA.

**Reservoir** means for the purposes of these rules any subsurface sand, stratum, formation, or cavity or void (whether natural or artificially created), including oil and natural gas reservoirs, saline formations, and coal seams, suitable for or capable of being made suitable for the injection and safe and efficient storage of CO<sub>2</sub> therein.

**SRA** means the State Regulatory Agency designated by the state as responsible for administering these regulations.

**Subsurface Observation Well** means a well either completed or re-completed for the purpose of observing subsurface phenomena, including the presence of CO<sub>2</sub>, pressure fluctuations, fluid levels and flow, temperature, and in situ water chemistry.

Underground Sources of Drinking Water (USDW) means:

(1) An aquifer or its portion:

(A) Which supplies any public water system; or

(B) Which contains a sufficient quantity of ground water to supply a public water system; and

(i) Currently supplies drinking water for human consumption; or

(ii) Contains fewer than 10,000 mg/l total dissolved solids; and

(2) An aquifer or its portion which is not an exempted aquifer as defined in the U.S. Safe Drinking Water Act 2 (SDWA).

## Section 3.0. General Requirements

### Section 3.1. Site Access

SRA shall, at all times, have access to and may inspect all CO<sub>2</sub> storage operations and records for the purpose of determining that performance is being conducted in accordance with the CSP permit, or the requirements pursuant to Sections 3.0–9.0, or in accordance with the orders of SRA approving CO<sub>2</sub> storage operations.

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<sup>2</sup> 42 U.S.C. § 300(h)(1) (1976).

## Section 3.2. CSP Permit Transfer

Transfer Notification by Transferor: The CSP operator shall notify SRA, in writing, in such form as SRA may direct, of the sale, assignment, transfer, conveyance, exchange, or other disposition of the CSP by the operator of the CSP as soon as is reasonably possible, but in no event later than the date that the sale, assignment, transfer, conveyance, exchange, or other disposition becomes final. The operator shall not be relieved of responsibility for the CSP until SRA acknowledges the sale, assignment, transfer, conveyance, exchange, or other disposition, in writing, and the person or entity acquiring the CSP is in compliance with all appropriate requirements. The operator's notice shall contain all of the following:

- (1) The name and address of the person or entity to which the CSP was or will be sold, assigned, transferred, conveyed, exchanged, or otherwise disposed.
- (2) The name and location of the CSP, and a description of the land upon which the CSP is situated.
- (3) The date that the sale, assignment, transfer, conveyance, exchange, or other disposition becomes final.
- (4) The date when possession was or will be relinquished by the operator as a result of that disposition.

Transfer Notification by Transferee: Every person or entity that acquires the right to operate a CSP, whether by purchase, transfer, assignment, conveyance, exchange, or other disposition, shall, as soon as it is reasonably possible, but not later than the date when the acquisition of the CSP becomes final, notify SRA in writing, of the person's or entity's operation. The acquisition of a CSP shall not be recognized as complete by SRA until the new operator provides all of the following material:

- (1) The name and address of the person or entity from which the CSP was acquired.
- (2) The name and location of the CSP, and a description of the land upon which the CSP is situated.
- (3) The date when the acquisition becomes final.
- (4) The date when possession was or will be acquired.
- (5) Performance bonds required by Geologic CO<sub>2</sub> Storage regulations 4.0 (10) and (11).

## Section 4.0. CO<sub>2</sub> Storage Project (CSP) Permit

### Section 4.1. CSP Permit Requirements

No CSP shall be constructed or operated without:

- (1) The CSP operator holding the necessary and sufficient property rights for construction and operation of the CSP. The CSP operator is deemed to be holding such rights for any individual property to the extent that the applicant has initiated unitization or eminent domain proceedings related to that property and thereby gained the right of access to the property. The intention of the CSP operator to employ unitization or eminent domain to acquire property rights shall be included in public notice as defined in Section 5.0; and
- (2) Obtaining a license from SRA.

Application for a CSP permit shall be submitted to SRA as required and shall include the following:

(1) A current site map showing the boundaries of the GSU, the location and well number of all proposed CO<sub>2</sub> injection wells, including any subsurface observation wells and the location of all other wells, including cathodic protection boreholes, and the location of all pertinent surface facilities within the boundary of the CSP;

(2) A technical evaluation of the proposed CSP, including but not limited to, the following:

(A) The name of the GSU;

(B) The name, description, and average depth of the reservoir or reservoirs to be utilized for geologic CO<sub>2</sub> storage;

(C) A geologic and hydrogeologic evaluation of the GSU, including an evaluation of all existing information on all geologic strata overlying the GSU, including the immediate caprock containment characteristics and all designated subsurface monitoring zones. The evaluation shall include any available geophysical data and assessments of any regional tectonic activity, local seismicity, and regional or local fault zones, and a comprehensive description of local and regional structural or stratigraphic features. The evaluation shall focus on the proposed CO<sub>2</sub> storage reservoir or reservoirs and a description of mechanisms of geologic confinement, including but not limited to, rock properties, geochemical interactions, regional pressure gradients, structural features, and sorption characteristics with regard to the ability of that confinement to prevent migration of CO<sub>2</sub> beyond the proposed storage reservoir. The evaluation shall also identify any productive oil and natural gas zones occurring stratigraphically above, below, or within the GSU and any freshwater-bearing horizons known to be developed in the immediate vicinity of the GSU. The evaluation shall include exhibits and plan view maps showing the following:

(i) All wells, including but not limited to, water, oil, and natural gas exploration and development wells, and other man-made subsurface structures and activities, including coal mines, within one mile of the outside boundary of the GSU;

(ii) All manmade surface structures that are intended for temporary or permanent human occupancy within the GSU and within one mile of the outside boundary of the GSU;

(iii) Any regional or local faulting;

(iv) An isopach map of the proposed CO<sub>2</sub> storage reservoir or reservoirs;

(v) An isopach map of the primary and any secondary containment barrier;

(vi) A structure map of the top and base of the storage reservoir or reservoirs;

(vii) Identification of all structural spill points or stratigraphic discontinuities controlling the isolation of stored CO<sub>2</sub> or associated fluids;



(viii) An evaluation of the potential displacement of in situ water and the potential impact on groundwater resources, if any; and

(ix) Structural and stratigraphic cross-sections that describe the geologic conditions at the reservoir.

A geologist or engineer shall conduct the geologic and hydrogeologic evaluation required under this paragraph. As appropriate, existing geologic, geophysical, or engineering data available on the proposed GSU may be incorporated into the evaluation;

(D) A review of the data of public record for all wells within the CSP Permit, which penetrate the reservoir or primary and/or secondary seals overlying the reservoir designated as the CO<sub>2</sub> storage reservoir, and those wells that penetrate the geologic CO<sub>2</sub> storage reservoir within one mile, or any other distance as deemed necessary by SRA, of the boundary of the GSU. This review shall determine if all abandoned wells have been plugged in a manner that prevents the movement of CO<sub>2</sub> or associated fluids from the geologic CO<sub>2</sub> storage reservoir. A geologist or engineer shall conduct the review required under this paragraph;

(E) The proposed calculated maximum volume and areal extent for the proposed GSU using a method acceptable to and filed with SRA;

(F) The proposed maximum bottom hole injection pressure to be utilized at the reservoir. The maximum allowed injection pressure, measured in psig, shall be approved by the SRA and specified in the permit. In approving a maximum injection pressure limit, the SRA shall consider the results of well tests and, where appropriate, geomechanical or other studies that assess the risks of tensile failure and shear failure. The SRA shall approve limits that, with a reasonable degree of certainty, will avoid initiation or propagation of fractures in the confining zone or cause otherwise non-transmissive faults transecting the confining zone to become transmissive. In no case may injection pressure cause movement of injection or formation fluids in a manner that endangers a USDW.

(3) The extent of the CO<sub>2</sub>, determined by utilizing, as appropriate, all available geologic and reservoir engineering information and reservoir analysis, and the projected response and storage capacity of the GSU; 3

(4) A detailed description of the proposed CF public safety and emergency response plan. The plan shall detail the safety procedures concerning the facility and residential, commercial, and public land use within one mile, or any other distance as deemed necessary by SRA, of the outside boundary of the CSP Permit. The public safety and emergency response procedures shall include contingency plans for CO<sub>2</sub> leakage from any well, flow lines, or other permitted facility. The public safety and emergency response procedures also shall identify specific contractors and equipment vendors capable of providing

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<sup>3</sup> Reservoir analysis may include but not be limited to the use of any of various computational type models, if appropriate for characterization.

necessary services and equipment to respond to such CO<sub>2</sub> injection well leaks or loss of containment from CO<sub>2</sub> injection wells or the CO<sub>2</sub> storage reservoir. These emergency response procedures should be updated as necessary throughout the operational life of the permitted storage facilities.

(5) A detailed worker safety plan that addresses CO<sub>2</sub> safety training and safe working procedures at the CF;

(6) A corrosion monitoring and prevention plan for all wells and surface facilities;

(7) A CF leak detection and monitoring plan for all wells and surface facilities. The approved leak detection and monitoring plan shall address:

(A) Identification of potential release to the atmosphere;

(B) Identification of potential degradation of groundwater resources with particular emphasis on USDWs; and

(C) Identification of potential migration of CO<sub>2</sub> into any overlying oil and natural gas reservoirs.

(8) A GSU leak detection and monitoring plan utilizing subsurface observation wells to monitor any movement of the CO<sub>2</sub> volume outside of the permitted GSU. This may include the collection of baseline information of CO<sub>2</sub> background concentrations in groundwater, surface soils, and chemical composition of in situ waters within the GSU. The approved subsurface leak detection and monitoring plan shall be dictated by the site characteristics as documented by materials submitted in support of the application with regard to CO<sub>2</sub> containment and address:

(A) Identification of potential release to the atmosphere;

(B) Identification of potential degradation of groundwater resources with particular emphasis on USDWs; and

(C) Identification of potential migration of CO<sub>2</sub> into any overlying oil and natural gas reservoirs.

(9) The proposed well casing and cementing program detailing compliance with Section 6.0;

(10) A CSP performance bond shall be sufficient to provide financial assurance to SRA to cover the abandonment or remediation of the CSP should the CSP operator not perform as required or cease to exist. The CSP bond shall be maintained after closure of the facility in accordance with Section 9.0 below;

(11) A well performance bond for each CO<sub>2</sub> injection and subsurface observation well to SRA in an amount established by SRA. The amount of the bond shall be sufficient to provide financial assurance to SRA to cover the plugging and abandonment or the remediation of a CO<sub>2</sub> injection and/or subsurface observation well should the CSP operator not perform as required in accordance with the permit or cease to exist;

(12) The payment of the application fee;

(13) Any other information that SRA requires; and

(14) A closure plan.

## **Section 4.2. Amendment to CSP Permit**

The following changes to the original CSP permit conditions will require compliance with all the provisions of Section 4.1 above:

- (1) Any change in the original areal extent of the CSP permit;
- (2) Utilization of other reservoirs not specified in the original CSP permit;
- (3) Any proposed increase in the permitted CO<sub>2</sub> storage volume; and
- (4) Any change in the chemical composition of the injected CO<sub>2</sub> from the CO<sub>2</sub> composition at the time of permitting.

Other significant changes to approved operational parameters contained in the original CSP permit will require compliance with Section 4.1(b).

## **Section 5.0. Amalgamation of Subsurface Rights to Operate GSU**

Each application required under Section 4 shall include a public hearing before SRA for the purposes of joining the necessary property ownership rights, as defined by the state or before the state regulatory agency responsible for amalgamating these rights. These hearings at the discretion of the state regulatory agencies may be combined and heard simultaneously.

Each applicant for a CSP shall give notice of the filing of an application on or before the date the application is filed with SRA by mailing notice via first class mail to the following:

- (1) Each operator of hydrocarbon or other mineral extraction activities, or mineral lessee of record within one-half mile external to the boundary of the proposed CSP Permit;
- (2) Each owner of record of the surface property and minerals within the boundaries of the proposed CSP Permit;
- (3) Each owner of record of the surface property and minerals within one-half mile external to the boundary of the proposed CSP Permit; and
- (4) Any other parties as required by SRA.

The above notice shall contain a legal description of the proposed CSP Permit along with the date, time, and place of the hearing before SRA and include notice of the right to file comments.

In addition to mail notice to the above parties, public notice via publication shall be required. The public notice shall indicate that an application has been filed with SRA for a CSP and indicate the location of the proposed project and the date, time, and place of the hearing before SRA to determine issuance of the application. Publication shall be in a newspaper of statewide circulation and in a local newspaper in a county or parish newspaper of each county/parish in which the CSP is located. The notice shall indicate that objections may be filed within 15 days of the date of publication.

Objections received by SRA shall be in writing and specify the nature of the objection.

Upon review of the application submitted in accordance with Section 4 and following the Rights Amalgamation Hearing specified in this section, authorization to commence construction of the CSP shall be issued following approval by SRA.

## Section 6.0. CSP Wells

### Section 6.1. CSP Well Permit Application Requirements

Following receipt of authorization to commence the CSP issued by SRA in accordance with Section 4, the applicant shall submit applications to drill, convert, or, upon demonstration of mechanical integrity, re-enter a previously plugged and abandoned well for CO<sub>2</sub> storage purposes.

Application for permits to drill, deepen, convert, re-enter (drill out a previously plugged well) or operate a well shall be submitted on a form prescribed by SRA and shall include at a minimum:

(1) A plat prepared by a licensed land surveyor showing the location of the proposed CO<sub>2</sub> injection or subsurface observation well. The plat shall be drawn to the scale of one (1) inch equals one thousand (1,000) feet, unless otherwise stipulated by SRA and shall show distances from the proposed well to the nearest GSU boundary. The plat shall show the latitude and longitude of the well in decimal degrees to five (5) significant digits. The plat shall also show the location and status of all other wells that have been drilled within one-fourth (1/4) mile, or any other distance deemed necessary by SRA, of the proposed CO<sub>2</sub> injection or subsurface observation well;

(2) A prognosis specifying the drilling, completion, or conversion procedures for the proposed CO<sub>2</sub> injection or subsurface observation well;

(3) A well bore schematic showing the name, description, and depth of the proposed reservoir and the depth of the deepest USDW; a description of the casing in the CO<sub>2</sub> injection or subsurface observation well, or the proposed casing program, including a full description of cement already in place or as proposed; and the proposed method of testing casing before use of the CO<sub>2</sub> injection well;

(4) A geophysical log, if available, through the reservoir to be penetrated by the proposed CO<sub>2</sub> injection well or if a CO<sub>2</sub> injection or subsurface observation well is to be drilled, a complete log through the reservoir from a nearby well is permissible. Such log shall be annotated to identify the estimated location of the base of the deepest USDW, showing the stratigraphic position and thickness of all confining strata above the reservoir and the stratigraphic position and thickness of the reservoir.

No later than the conclusion of well drilling and completion activities, a permit application shall be submitted to operate a CO<sub>2</sub> injection well and shall include at a minimum:

(1) A schematic diagram of the surface injection system and its appurtenances;

(2) A final well bore diagram showing the name, description, and depths of the reservoir and the base of the deepest USDW; a diagram of the CO<sub>2</sub> injection well depicting the casing, cementing, perforation, tubing, and plug and packer records associated with the construction of the CO<sub>2</sub> injection well;

(3) A complete dual induction or equivalent log through the reservoir of the CO<sub>2</sub> injection well. Such log for wells drilled for CO<sub>2</sub> injection operations shall be run prior to the setting of casing through the CO<sub>2</sub> storage reservoir. Logs shall be annotated to identify the estimated location of the base of the deepest USDW, showing the stratigraphic position and thickness of all confining strata above the reservoir and the stratigraphic position and thickness of the reservoir unless previously submitted. When approved in advance by SRA, this information can be demonstrated with a dual induction or equivalent log run in a nearby well or by such other method acceptable to SRA;

- (4) An affidavit specifying the chemical constituents of the injection stream other than CO<sub>2</sub> and their relative proportions;
- (5) Proof that the long string of casing of the CO<sub>2</sub> injection well is cemented adequately so that the CO<sub>2</sub> is confined to the GSU. Such proof shall be provided in the form of a cement bond log or the results of a fluid movement study or such other method specified by SRA; and
- (6) The results of a mechanical-integrity test, if applicable to well type, of the casing in accordance with the pressure test requirements, of this section, if a test was run within one calendar year preceding the request for issuance of a conversion permit for a previously drilled well.

## **Section 6.2. Permit Issuance**

Upon review and approval of the application to drill, deepen, convert, re-enter, (drill out a previously plugged well) or operate a CO<sub>2</sub> injection well, submitted in accordance with Section 6.1, SRA shall issue permits to drill and operate.

A permit shall expire twelve (12) months from the date of issuance if the permitted well has not been drilled or converted.

## **Section 6.3. CSP Well Operational Standards**

Surface casing in all newly drilled CO<sub>2</sub> injection and subsurface observation wells drilled below the USDW shall be set 100 feet below the lowest USDW and cemented to the surface or other protective measures as deemed appropriate by SRA.

The long-string casing in all CO<sub>2</sub> injection and subsurface observation wells shall be cemented with a sufficient volume of cement to fill the annular space to a point 500 feet above the top of the storage reservoir.

Any liner set in the well bore shall be cemented with a sufficient volume of cement to fill all of the annular space between the liner and the adjacent casing.

All cements used in the cementing of casings in CO<sub>2</sub> injection and subsurface observation wells shall be of sufficient quality to maintain well integrity in the CO<sub>2</sub> injection environment.

All casings shall meet the standards specified in either of the following documents, which are hereby adopted by reference:

- (1) "The most recent American Petroleum Institute (API) Bulletin on performance properties of casing, tubing, and drill pipe; or
- (2) "Specification for casing and tubing (U.S. customary units)," API specification 5CT, as published by the API in October 1998; or
- (3) Other casing as approved by SRA.

All casings used in new wells shall be new casing or reconditioned casing of equivalent quality that has been pressure-tested in accordance with the requirements of paragraph (e). For new casings, the pressure test conducted at the manufacturing mill or fabrication plant may be used to fulfill the requirements of paragraph (e).

The location and amount of cement behind casings shall be verified by a cement evaluation log, or any other evaluation method approved by SRA, that is capable of evaluating radial cement quality and identifying the location of any channels.

All CO<sub>2</sub> injection wells shall be completed with and injection shall be through tubing and packer.

All tubing strings shall meet the standards contained in paragraph (e) of this regulation. All tubing shall be new tubing or reconditioned tubing of equivalent quality that has been pressure-tested. For new tubing, the pressure test conducted at the manufacturing mill or fabrication plant may be used to fulfill this requirement.

All wellhead components, including the casing head and tubing head, valves, and fittings, shall be made of steel having operating pressure ratings sufficient to exceed the maximum injection pressures computed at the wellhead and to withstand the corrosive nature of CO<sub>2</sub>. Each flow line connected to the wellhead shall be equipped with a manually operated positive shutoff valve located on or near the wellhead.

All packers, packer elements, or similar equipment critical to the containment of CO<sub>2</sub> shall be of a quality to withstand exposure to CO<sub>2</sub>.

An accurate, operating pressure gauge or pressure recording device shall be available at all times, and all injection wells shall be equipped for installation and operation of such gauge or device. Gauges shall be calibrated as required by SRA and evidence of such calibration shall be available to SRA upon request.

All newly drilled wells shall establish internal and external mechanical integrity as specified by SRA and demonstrate continued mechanical integrity through periodic testing as determined by SRA. All other existing wells to be used as CO<sub>2</sub> injection wells will demonstrate mechanical integrity as specified by SRA prior to use for CO<sub>2</sub> injection and be tested on an ongoing basis as determined by SRA using these methods:

(1) Pressure tests. CO<sub>2</sub> injection wells, equipped with tubing and packer as required, shall be pressure-tested as required by SRA. A testing plan shall be submitted to SRA for prior approval. At a minimum, the pressure shall be applied to the tubing casing annulus at the surface for a period of 30 minutes and shall have no decrease in pressure greater than 10% of the required minimum test pressure. The packer shall be set at a depth at which the packer will be opposite a cemented interval of the long string casing and shall be set no more than 50 feet above the uppermost perforation or open hole for the CO<sub>2</sub> storage reservoir; and

(2) SRA may require additional testing such as bottom hole temperature and pressure measurements, tracer survey, temperature survey, gamma ray log, neutron log, noise log, casing inspection log, or a combination of two or more of these surveys and logs, to demonstrate mechanical integrity.

Supervision of mechanical integrity testing. SRA may witness all mechanical integrity tests conducted by each CSP operator for regulatory purposes.

If a CO<sub>2</sub> injection well fails to demonstrate mechanical integrity by an approved method, the operator of the well shall immediately shut in the well, report the failure to SRA, and commence isolation and repair of the leak. The operator shall, within 90 days or as otherwise directed by SRA, perform one of the following:

(1) Repair and re-test the well to demonstrate mechanical integrity;

- (2) Plug the well in accordance with state requirements; or
- (3) Comply with alternative plan as approved by SRA.

All CO<sub>2</sub> injection wells shall be equipped with shutoff systems designed to alert the operator and shut in wells when necessary.

Additional requirements may be required by SRA to address specific circumstances and types of projects not specified in these rules.

#### **Section 6.4. Amendment to CSP Well Permits**

An amendment to the CSP Well Permit for: (1) a change in injection formation, and/or (2) a modification of maximum allowable injection rate and pressure, shall comply with the provisions of Section 6.1 (c)(5) and (6), 6.3 (b), (g), (h), (i), (l) and (m) above.

Modification of well construction shall comply with the provisions of Section 6.1 (b)(3) and 6.3 (m).

### **Section 7.0. CSP Operational Standards**

#### **Section 7.1. Safety Plans**

Each operator of a CSP shall implement a SRA-approved CF public safety and emergency response plan and the worker safety plan proposed in Section 4. This plan shall include emergency response and security procedures. The plans, including revision of the list of contractors and equipment vendors, shall be updated as necessary or as SRA requires. Copies of the plans shall be available at the CF and at the nearest operational office of the holder of the CSP Permit.

#### **Section 7.2. Leak Detection and Reporting**

Leak detectors or other approved leak detection methodologies shall be placed at the wellhead of all CO<sub>2</sub> injection and subsurface observation wells. Leak detectors shall be integrated, where applicable, with automated warning systems and shall be inspected and tested on a semi-annual basis and if defective, shall be repaired or replaced within 10 days. Each repaired or replaced detector shall be re-tested if required by SRA. An extension of time for repair or replacement of a leak detector may be granted upon a showing of good cause by the operator of the CSP. A record of each inspection, which shall include the inspection results, shall be maintained by the operator for at least five years and shall be made available to the state oil and natural gas regulatory agency upon request.

The operator of a CSP shall immediately report to SRA any leaks detected at the surface facility and associated well equipment specified in (a) above.

The operator of a CSP shall immediately or, as soon as practicable, report to SRA any pressure changes or other monitoring data from subsurface observation wells that indicate the presence of leaks in the GSU indicating the lack of confinement within the reservoir of the CO<sub>2</sub>.

The operator of a CSP shall immediately report to SRA any other indication of lack of containment of CO<sub>2</sub> to the reservoir not associated with wells and surface equipment.

### **Section 7.3. Other General Requirements**

Each operator shall be required to conduct a corrosion monitoring and prevention program approved by SRA.

Identification signs shall be placed at each facility in a centralized location and at each well site and show the name of the operator, the facility name, and the emergency response number to contact the operator.

## **Section 8.0. Operational Review and Reporting Requirements**

### **Section 8.1. Operational Injection Reports**

The volume of CO<sub>2</sub> injected since the last reporting, the average injection rate, average composition of the CO<sub>2</sub> stream, wellhead and down hole temperature and pressure data and/or other data pertinent to or storage certification as required by SRA shall be reported quarterly or as required by SRA.

These quarterly reports shall be compiled and summarized annually to provide updated projections of the response and storage capacity of the GSU. The projections shall be based on actual GSU operational experience, including all new geologic data and information. All anomalies in predicted behavior as indicated in the most current permit conditions shall be explained and, if necessary, the permit conditions amended in accordance with Section 4.1.

### **Section 8.2. Annual Operational Report and Review**

An annual operational report shall be required by the SRA and include:

- (1) A comprehensive review of all monitoring and operational data to determine whether a re-evaluation of the area of review is required; and
- (2) Whether an update of any required monitoring, safety, corrosion, or other required operational plans are necessary or warranted.

An annual operational report and its findings may be submitted to the SRA as an affidavit signed by an appropriate company official confirming that the company has conducted the required annual review, which will include the submission of any updated or modified plan for the review and approval of the SRA.

Following the annual review the SRA may require additional information, modification, or revision of the submitted plans before approval.

## **Section 9.0. CSP Closure**

Prior to the conclusion of the operational period the CSP permit holder shall provide an assessment of the operations conducted during the operational period, including but not limited to, the volumes injected, extracted, any and all chemical analyses conducted, summary of all monitoring efforts, etc. The report shall also document the position and characteristics of the areal extent of the CO<sub>2</sub> and a prediction of the extent and movement of the CO<sub>2</sub> volume anticipated during the CSP closure period.



The permittee shall submit a monitoring plan for the CSP closure period for approval by SRA, including but not limited to a review and final approval of which wells will be plugged and which wells will remain unplugged to be used as CSP closure and post-closure period subsurface observation wells.

Following well plugging, all associated surface equipment shall be removed and the well site returned to its original land use to the extent possible.

The well casing shall be cut off at a depth of 5 feet below the surface and a steel plate shall be welded on top identifying the well name and that it was used for CO<sub>2</sub> injection.

In conjunction with the permittee, SRA shall develop a continuing monitoring plan for the CSP Closure Period, including but not limited to, a review and final approval of which wells shall remain unplugged for use as monitoring wells.

All remaining wells not used for monitoring purposes shall be properly plugged and abandoned, all CF equipment and facilities shall be removed, and the CSP site reclaimed in accordance with SRA requirements.

## **Section 10.0. Post-Closure Period**

Prior to authorization to begin the Post-Closure Period, the owner or operator must demonstrate to the SRA, based on monitoring, other site-specific data, and appropriate modeling, that no additional monitoring is needed to assure that the CSP does not pose an endangerment to USDWs.

The SRA shall approve the transition to the Post-Closure Period if the owner or operator demonstrates the following:

- (1) the estimated extent of the CO<sub>2</sub> plume and the area of elevated pressure; and
- (2) that there is no significant leakage of either CO<sub>2</sub> or displaced formation fluids endangering USDWs; and
- (3) that the injected or displaced fluids are not expected to migrate in the future in a manner that encounters a potential leakage pathway into a USDW; and
- (4) that the injection wells at the site completed into or through the injection zone or confining zone are plugged and abandoned in accordance with these requirements.

SRA shall have full control of and responsibility for the remaining unplugged wells to be used by SRA as CSP post-closure period subsurface observation wells or for other purposes as deemed necessary by SRA.

At the conclusion of the CSP closure period, the CSP performance bond maintained by the CSP operator may be released, and continued monitoring of the site, remediation of any well leakage, including wells previously plugged and abandoned by the CSP operator, shall become the responsibility of designated state or federal agency programs and the CSP operator and generator of the CO<sub>2</sub> shall be released from further SRA regulatory liability relating to the CF.



## **Appendix III: Bibliography of State Reports, Legislation, and Regulations Pertaining to the Storage of Carbon Dioxide in Geologic Structures**



**Bibliography of State Reports, Legislation, and Regulations Pertaining to the Storage of Carbon Dioxide in Geologic Structures, September 2010**

State	Category	Title/Topic	Citation	Effective Date
AK	Report	Alaska Subcabinet for Climate Change report examining issues related to carbon capture and storage		Anticipated September 2010
IA	Report	Iowa Climate Change Advisory Council Final Report		December 2008
IL	Limited substantive legislation	Establishing the Carbon Capture and Storage Legislative Commission	HB 3854 Carbon Capture and Sequestration Legislation Commission Act, Public Act 096-0754 (2009).	August 2009
KS	Regulation	Rules on Carbon Dioxide Storage Facilities	General Rules, 82-3-1100 through 82-3-1120	February 10, 2010
LA	Law	AN ACT relative to the storage of carbon dioxide	H.R. 660 Act No. 517, Reg. Sess. (La. 2009). Enacted by the Legislature of the Louisiana as House Bill 661, Act 517, "AN ACT to enact R.S. 19:2(12) and Chapter 11 of Title 30 of the Louisiana Revised Statutes of 1950, to be comprised of R.S. 30:1101 through 1111, relative to the storage of carbon dioxide; to provide for expropriation; to provide for the duties and powers of the commissioner of conservation; to provide for definitions; to provide for public hearings; to provide for enforcement; to provide for compliance orders; to provide for penalties; to provide for certificates of public convenience and necessity; to provide for certificates of completion; to provide for liability; to provide for the Geologic Storage Trust Fund; to provide for fees; to provide for uses of the fund; to provide for accounting and reports of the fund; to provide for site-specific trust accounts; and to provide for related matters."	August 15, 2009

State	Category	Title/Topic	Citation	Effective Date
MT	Law	An act regulating carbon sequestration	S. 498, 61 <sup>st</sup> Leg. (Mont. 2009). Enacted by the Legislature of the State of Montana as Senate Bill 498, approved on April 22, 2009 entitled "AN ACT REGULATING CARBON SEQUESTRATION; ...AMENDING SECTIONS 70-30-105, 75-5-103, 75-5-401, 77-3-430, 82-10-402, 82-11-101, 82-11-104, 82-11-111, 82-11-118, 82-11-122, 82-11-123, 82-11-127, 82-11-136, 82-11-137, 82-11-161, 82-11-163, 82-11-201, 82-11-204, 82-11-205, AND 82-11-214, MCA; AND PROVIDING EFFECTIVE DATES. Sections 1 and 27 through 31 were effective May 6, 2009. The remaining sections (2 through 26) will be effective on the date that the board of oil and gas conservation is granted primacy to administer activities at carbon dioxide sequestration wells by the United States Environmental Protection Agency	May 6, 2009
NV	Report	Preliminary Assessment of the Potential for Carbon Dioxide Disposal by Sequestration in Geological Settings in Nevada	Nevada Bureau of Mines and Geology, Report 51	2005
NV	Report	Assessment for the Potential for Carbon Dioxide Sequestration with Enhanced Oil Recovery in Nevada	Nevada Bureau of Mines and Geology, Report 07-7	2007
ND	Law	Relating to the geologic storage of carbon dioxide	<sup>1</sup> S. 2095, 61 <sup>st</sup> Leg., 2009 Regular Sess. (N.D. 2009). Enacted by the Legislature of the State of North Dakota as Senate Bill 2095, to create and enact chapter 38-22 of the North Dakota Century Code, relating to the geologic storage of carbon dioxide; to repeal section 38-08-24 of the North Dakota Century Code, relating to priorities in permitting carbon dioxide geologic storage projects; to provide	July 1, 2009

State	Category	Title/Topic	Citation	Effective Date
			a penalty; and to provide a continuing appropriation.	
ND	Law	Relating to the ownership of subsurface pore space.	S. 2139, 61 <sup>st</sup> Leg., 2009 Regular Sess. (N.D. 2009). Enacted by the Legislature of the State of North Dakota as Senate Bill 2139, to create and enact a new chapter to title 47 of the North Dakota Century Code, relating to ownership of subsurface pore space; to provide for application; and to declare an emergency.	April 9, 2009
ND	Regulation	Geologic Storage of Carbon Dioxide	N.D. Admin Code §43-05-01	April 1, 2010
OH	Law	An ACT to amend sections of the Revised Code to revise the Oil and Gas Law.	S.B. 165, 128 <sup>th</sup> Gen. Ass, (Ohio 2010)	June 30, 2010
OK	Law	Oklahoma Carbon Capture and Geologic Sequestration Act	S. 610, 52 <sup>nd</sup> Leg. (Okla. 2009). Enacted by the Legislature of the Oklahoma as Senate Bill 610, An Act relating to environment and natural resources creating the Oklahoma Carbon Capture and Geologic Sequestration Act. The bill was effective upon signing by the governor on June 1, 2009	June 1, 2009
OK	Regulation	Carbon Sequestration Verification Program	Title 155 Chapter 30	July 1, 2009
OK	Report	Report of the Oklahoma Geologic Storage of Carbon Dioxide Task Force		2008
TX	Law	Relating to the establishment of incentives by this state for the implementation of certain projects to capture and sequester carbon dioxide that would otherwise be emitted into the atmosphere	H.R. 469, 81 <sup>st</sup> Leg. (Tex. 2009). Enacted by the Legislature of the State of Texas as House Bill 469 and approved on May 31, 2009. It amends portions of the Texas Government Code, the Health and Safety, the Natural Resources Code, and the Tax Code, Tex. Tax Code Ann	September 1, 2009
TX	Law	Relating to the development of carbon dioxide capture and sequestration in	H.R. 1796, 81 <sup>st</sup> Leg. (Tex. 2009). Enacted by the Legislature of the State of Texas as House Bill 1796	September 1, 2009

State	Category	Title/Topic	Citation	Effective Date
		this state (Offshore)	and approved by the House on May 31, 2009, and the Senate on June 1, 2009. It amends portions of the Texas Health and Safety Code, the Tax Code, and the Transportation Code	
TX	Law	Relating to the implementation of projects involving the capture, injection, sequestration, or geologic storage of carbon dioxide	S. 1387, 81 <sup>st</sup> Leg. (Tex. 2009). Enacted by the Legislature of the State of Texas as Senate Bill 1387 and approved by the Senate on April 22, 2009, and the House on May 18, 200. It amends portions of the Texas Water Code and the Natural Resources Code	September 1, 2009
UT	Law	Mandated the development of rules pertaining to carbon capture and geologic storage by January 1, 2011	S.B. 202. 2008 General Sess. (Utah 2008), <i>available at:</i> <a href="http://le.utah.gov/~2008/bills/sbillenr/sb0202.pdf">http://le.utah.gov/~2008/bills/sbillenr/sb0202.pdf</a>	2008
WA	Law	An Act relating to mitigating the impact of climate change	S. 6001, 60 <sup>th</sup> Leg., 2009 Regular Sess. (Wash. 2007)	July 7, 2007
WA	Regulation	Geologic Sequestration rules	Chapter 173-407 WAC	July 7, 2008
WA	Regulation	UIC rules for the Geologic Sequestration of Carbon Dioxide	Chapter 173-218 WAC	July 20, 2008
WI	Report	An Investigation to Explore the Potential for Geologic Sequestration of Carbon Dioxide produced by Wisconsin's Electricity Generation Fleet		Draft issued for public comment March 2010
WV	Law	Mandates creation of a carbon dioxide sequestration working group and the promulgation of legislative rules to implement the provisions of the statute. The statute also requires the working group to prepare an interim report for the legislature by July 1, 2010, and a final report by July 1,	H.B. 2860. 79 <sup>th</sup> Leg.; 2d Sess. (W.Va. 2009)	April 11, 2009



State	Category	Title/Topic	Citation	Effective Date
		2011, that includes, among other things, any recommendations for legislation addressing ownership of pore space.		
WY	Law	Ownership of Subsurface Pore Space	H.R. 89, 59 <sup>th</sup> Leg., 2008 Budget Sess. (Wyo. 2008). Enacted by the Legislature of the State of Wyoming as House Bill 89, approved on March 4, 2008, creating W.S. 34-1-152 and amending W.S. 34-1-202(e)	July 1, 2008
WY	Law	Carbon Capture and Sequestration	<sup>1</sup> H.R. 90, 59 <sup>th</sup> Leg., 2008 Budget Sess. (Wyo. 2008). Enacted by the Legislature of the State of Wyoming as House Bill 90, approved March 4, 2008, creating W.S. 30-5-501 and 35-11-313 and amending W.S. 35-11-103(c)	July 1, 2008
WY	Law	Ownership of Pore Space-Dominance of Mineral Estate	H.R. 57, 60 <sup>th</sup> Leg., 2009 Gen. Sess. (Wyo. 2009). Enacted by the Legislature of the State of Wyoming as House Bill 57, approved on February 26, 2009, amending W.S. 34-1-152 (e)	July 1, 2009
WY	Law	Responsibilities of Injectors and Pore Space Owners	H.R. 58, 60 <sup>th</sup> Leg., 2009 Gen. Sess. (Wyo. 2009). Enacted by the Legislature of the State of Wyoming as House Bill 58, approved on February 26, 2009, creating W.S. 34-1-153.	July 1, 2009
WY	Regulation	Chapter 3, Operation Rules, Drilling Rules		August 16, 2010

*Download full text of laws/regulations from the CCGS State Progress Map: <http://groundwork.ioacc.org/topics-index/carbon-sequestration/state-progress>*

## **Appendix IV: Lessons Learned by the DOE Regional Carbon Sequestration Partnerships in the Permitting and Licensing of Validation Phase (Phase II) Pilot Projects**

# *Lessons Learned by the DOE Regional Carbon Sequestration Partnerships in the Permitting and Licensing of Validation Phase (Phase II) Pilot Projects*

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*Storage of Carbon Dioxide in Geologic Structures Biennial Review Subreport*

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**September 30, 2010**

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In July of 2002, the Interstate Oil and Gas Compact Commission (IOGCC) gathered states, represented by oil and natural gas regulators and/or state geologists, to inquire as to their level of interest in being directly involved in the regulation of the geologic storage of carbon dioxide (CO<sub>2</sub>) should the federal government implement legislation to limit the quantity of CO<sub>2</sub> released into the atmosphere.

It was becoming clear that geologic storage of carbon likely would be one of the most efficacious means of limiting the release of CO<sub>2</sub>, a greenhouse gas, into the atmosphere. Participants were not required to make a decision on the reality of climate change to realize that states needed to be deeply involved in the regulation of the emplacement of carbon into the subsurface. In part, this was based on the participants' understanding of state expertise in the regulation of regulatory analogues: oil and natural gas development, natural gas storage, acid gas injection, and CO<sub>2</sub> enhanced oil recovery (EOR).

Based on the decisions reached at that meeting, the IOGCC formed a "Geological CO<sub>2</sub> Sequestration Task Force" that produced, in early 2005, a report that examined the technical, policy, and regulatory issues related to the safe and effective storage of CO<sub>2</sub> in subsurface geological media (oil and natural gas fields, coal seams, and deep saline formations) for both enhanced hydrocarbon recovery and long-term CO<sub>2</sub> storage. This report came to be known as the IOGCC Task Force "Phase I" Report. Although the task force recognized in the report that states and provinces with Oil and Natural Gas Conservation Acts and states and provinces with natural gas storage statutes might be able to utilize those statutory and regulatory frameworks for CO<sub>2</sub> injection and storage, it concluded that some modification of those frameworks might be advisable or necessary.

As a result of the recommendations of the task force, the IOGCC re-commissioned the group under a new name -- the IOGCC Carbon Capture and Geologic Storage [CCGS] Task Force --- to create a "guidance document" for states and provinces. The most critical component of the document would be a Model CO<sub>2</sub> Storage Statute and Model Rules and Regulations governing the storage of CO<sub>2</sub> in geologic media. In September of 2007, the IOGCC formally approved A Legal and Regulatory Guide for States and Provinces, otherwise known as the IOGCC Task Force "Phase II" Report.

In the spring of 2010, the IOGCC CCGS Task Force published a "Biennial Report" that made minor adjustments to the model documents contained in the Phase II Report and reviewed the progress of states and provinces in establishing a legal and regulatory infrastructure for the geologic storage of carbon.



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In this report the task force turns its attention to the experience of early geologic carbon storage (GCS) projects in the U.S. in seeking licenses and permits to store CO<sub>2</sub> in the subsurface. It is largely the product of a meeting organized by the IOGCC of representatives of the seven Regional Carbon Sequestration Partnerships in Santa Fe, New Mexico, in January 2010. Planning of the Santa Fe meeting was aided by an informal survey of the Regional Carbon Sequestration Partnerships conducted by the IOGCC. The goal of this document is to discuss the issues encountered by the partnerships in licensing their Phase II “Validation Phase” pilot projects and, more importantly, to distill valuable lessons from the experience of these early projects with an eye to helping to ensure that succeeding projects and their regulators will benefit from this experience. This report will contain a number of recommendations to policymakers in both state and federal governments that it is hoped will make licensing and permitting of future CO<sub>2</sub> pilot and commercial projects an easier and smoother process.

In all of its phases, the task force has included representatives from IOGCC member states and international affiliate provinces, state and provincial oil and gas agencies, Department of Energy, DOE-sponsored Regional Carbon Sequestration Partnerships, the Association of American State Geologists (AASG), and observer-participants from the oil and natural gas industry. In Phase II, it has also included observer-participants from the U.S. Environmental Protection Agency (EPA), the U.S. Bureau of Land Management (BLM) and the environmental organization, Environmental Defense.

The task force gratefully acknowledges the support of the U.S. Department of Energy, the National Energy Technology Laboratory, and the New Mexico Institute of Mining and Technology. It also acknowledges the critical support of the states and provinces and other entities, including the seven Regional Carbon Sequestration Partnerships that so generously contributed their employees’ time to the creation of this document.

Lawrence Bengal  
Chairman,  
IOGCC CCGS Task Force

## DISCLAIMER

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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the New Mexico Institute of Mining and Technology or of The Department of Energy.

## ABSTRACT

This “Lessons Learned” report represents the efforts of the IOGCC Carbon Capture and Geological Storage (CCGS) Task Force review of the work of the seven Department of Energy-sponsored Regional Carbon Sequestration Partnerships’ (RCSPs) pilot projects. In working with the RCSPs, the IOGCC Task Force on Carbon Capture and Geological Storage compiled challenges – along with recommendations to address the challenges -- reported by the RCSPs. This report highlights the legal and regulatory hurdles faced during the pilot projects and identifies key areas where improvements can be made. In addition to the recommendations of the RCSPs, the IOGCC CCGS Task Force created its own distinct set of recommendations that identify actions that should be taken in the future to make licensing and permitting of CCGS projects more streamlined and efficient, thus guiding government and business through the initial phases toward commercialization.

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>EXPERIMENTAL METHODS .....</b>	<b>2</b>
<b>Section 1: Introduction.....</b>	<b>2</b>
<b>Section 2: Challenges Encountered and Lessons Learned by the Partnerships.....</b>	<b>5</b>
<b>Section 3: Recommendations and Conclusions of the IOGCC Carbon Capture and Geologic Storage Task Force.....</b>	<b>9</b>
<b>REFERENCES .....</b>	<b>11</b>
<b>LIST OF ACRONYMS AND ABBREVIATIONS .....</b>	<b>12</b>
<b>APPENDICES .....</b>	<b>12</b>

## EXECUTIVE SUMMARY

This “Lessons Learned” report represents the efforts of the IOGCC Carbon Capture and Geological Storage (CCGS) Task Force review of the work of the seven Department of Energy-sponsored Regional Carbon Sequestration Partnerships’ (RCSPs) pilot projects. The report documents the obstacles that the RCSPs faced and the efforts taken to overcome those obstacles. More importantly, for the purpose of this report and going forward, are the recommendations put forth in the report. Recommendations on streamlining project development came not only from the RCSPs but also from the IOGCC CCGS Task Force. The recommendations reflect a collective effort by the states, industry, and other key stakeholders to develop viable and comprehensive solutions to the institutional hurdles that have to be overcome before large-scale CCGS projects can commence.

In working with the RCSPs, the IOGCC Task Force on Carbon Capture and Geological Storage compiled challenges – along with recommendations to address the challenges -- reported by the RCSPs. Challenges and recommendations, which are discussed in-depth in this subreport, were categorized into five key areas: (1) Technical Capacity of the Regulator; (2) Regulatory Infrastructure and Systems; (3) Regulatory Jurisdiction; (4) Cooperation and Coordination among Regulatory Entities; (5) Stakeholder Buy-In.

In addition to the recommendations of the RCSPs, the IOGCC CCGS Task Force created its own distinct set of recommendations that identify actions that should be taken in the future to make licensing and permitting of CCGS projects more streamlined and efficient, thus guiding government and business through the initial phases toward commercialization. The key task force recommendations include the following:

***Training of regulatory officials is critically important.*** The lack of experience with CCGS on the state and federal level can cause significant delays in the permitting and licensing of CCGS projects. The IOGCC recommends that it, in partnership with one or more of the RCSPs, works to develop and implement a CCGS training program for state and federal officials.

To facilitate development of large-scale CCGS projects, ***states should adopt the IOGCC model regulatory framework issued in 2007.*** The framework represents the collective efforts of the states to develop comprehensive CCGS guidelines that would be relevant to all states regardless of regulatory capacity or experience.

Similar to the findings and recommendations of the RCSPs, the IOGCC CCGS Task Force also recommends that ***state and federal governments and agencies work together in the licensing, permitting, and active stages of CCGS projects.*** Regulatory streamlining is key to the successful development of CCGS projects.

The task force also recognizes the critical importance of all stakeholders in the successful development of CCGS projects. ***All stakeholders should be engaged on every level, with efforts especially directed at public outreach and education.***



The IOGCC CCGS Task Force hopes these recommendations will facilitate development of large-scale CCGS projects with rational regulatory oversight that is responsive to both market forces and national carbon management policies.

## EXPERIMENTAL METHODS

The data for this study were gathered through informal surveys, letters, personal interviews, site visits, and published reports. Sources include government officials, regulatory agency employees, private oil and gas company owners and employees, oil and gas service-industry owners and employees, academics, trade publications, and government documents. Necessarily, much of the information is anecdotal and somewhat subjective. Statistics cited are identified by source. Estimates are based on published statistical evidence with the methodology and source identified.

**In many instances, the actions of a particular state, or several states, are cited as examples of approaches to challenges faced by oil and gas development. It should be noted that in most of these cases, other oil- and gas-producing states are using similar approaches; the cited examples are deemed to be the most representative or inclusive.**

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### Section 1: Introduction

This report of the Interstate Oil and Gas Compact Commission (IOGCC), and specifically its Task Force on Carbon Capture and Geologic Storage (CCGS), constitutes a review of the experience of the U.S. Department of Energy's seven [Regional Carbon Sequestration Partnerships](#) (RCSPs) in seeking licenses and permits for their CO<sub>2</sub> geologic storage pilot projects in the second or "validation" phase of the work of the partnerships.<sup>1</sup> Appendix I to this report contains a list of those partnership pilot projects.

The information contained in this report is largely the product of a meeting of the representatives of the seven RCSPs and IOGCC CCGS Task Force Chairman Lawrence Bengal in Santa Fe, New Mexico, on January 21-22, 2010.

The majority of the licensing and permitting work by the partnerships on these pilot projects took place between 2005 and 2009, although at least two of the validation phase pilot projects have not yet commenced.<sup>2</sup> An examination of the table in Appendix I reveals that most of the pilot projects involved enhanced oil recovery (EOR), and were thus licensable in most of the relevant states under existing laws and regulations pertaining to such wells. For the remaining projects involving non-EOR storage, unfortunately none of the host states at the time of project licensing or permitting had new laws and/or regulations on the books similar to the Model CO<sub>2</sub> Storage Statute and Model Rules and Regulations

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<sup>1</sup> Information of the DOE-sponsored Regional Carbon Sequestration Partnerships can be found at: [http://www.netl.doe.gov/technologies/carbon\\_seg/partnerships/partnerships.html](http://www.netl.doe.gov/technologies/carbon_seg/partnerships/partnerships.html)

<sup>2</sup> These include a Big Sky Regional Carbon Sequestration Partnership pilot project in eastern Wyoming and a West Coast Regional Carbon Sequestration Partnership pilot project in California.

described in [Storage of CO<sub>2</sub> in Geologic Structures: Legal and Regulatory Guide for States and Provinces](#)<sup>3</sup>, published by the IOGCC Task Force in 2007.

In addition to state law, there was also the need to comply with federal law<sup>4</sup>, in particular the [Underground Injection Control \(UIC\) Program](#)<sup>5</sup> of the [United States Safe Drinking Water Act](#) (SDWA)<sup>6</sup>. In some states the UIC program is enforced by the state acting under “primacy” authority from the U.S. Environmental Protection Agency (EPA). In other states, the EPA enforces the UIC program through its relevant regional office.<sup>7</sup> Also affecting licensing and permitting of these wells under the UIC program, was [guidance](#)<sup>8</sup> that had been issued by EPA in March 2007 pertaining to use of a “Class V Experimental Technology Well Classification” for pilot geologic sequestration projects. Additionally, if the land on which the pilot project was located was federal or Indian land, federal/tribal involvement in the license/permit approval process was also necessary. Because all of the partnership pilot projects received federal funding, they needed to meet the requirements of the National Environmental Policy Act (NEPA).<sup>9</sup>

Although not explicitly affecting the efforts of the RCSPs in their validation phase efforts to secure licenses and permits to inject CO<sub>2</sub>, it is important to recognize that the EPA is actively engaged in a process to develop a rule<sup>10</sup> that will govern the underground storage of CO<sub>2</sub> under the SDWA and the

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<sup>3</sup> Storage of Carbon Dioxide in Geologic Structures: A Legal and Regulatory Guide for States and Provinces, September 25, 2007, available at: <http://groundwork.iogcc.org/sites/default/files/2008-CO2-Storage-Legal-and-Regulatory-Guide-for-States-Full-Report.pdf>.

<sup>4</sup> In some cases applicable federal legislation also included the Endangered Species Act, Archaeological and Historical Preservation Act, Clean Air Act and Clean Water Act.

<sup>5</sup> Information on the Underground Injection Control Program can be found at: <http://www.epa.gov/safewater/uic/basicinformation.html>

<sup>6</sup> Information on the Safe Drinking Water Act can be found at: <http://www.epa.gov/safewater/sdwa/basicinformation.html>

<sup>7</sup> In some states, officials have agreed to assume enforcement responsibility under the UIC program. This is referred to as “primacy”. In other states, enforcement responsibility remains with the EPA through the applicable EPA regional office. More detailed information on primacy can be found at: <http://www.epa.gov/safewater/uic/primacy.html>

<sup>8</sup> The guidance was issued jointly by the Director of the Office of Ground Water and Drinking Water and the Director of the Office of Atmospheric Programs at EPA. A copy of the guidance concerning “Using the Class V Experimental Technology Well Classification for Pilot Geologic Sequestration Projects – UIC Program Guidance (UICPG #83)” can be found at: [http://www.epa.gov/safewater/uic/pdfs/guide\\_uic\\_carbonsequestration\\_final-03-07.pdf](http://www.epa.gov/safewater/uic/pdfs/guide_uic_carbonsequestration_final-03-07.pdf)

<sup>9</sup> More information on National Environmental Policy Act can be found at: <http://ceq.hss.doe.gov/index.html>

<sup>10</sup> EPA is presently developing a rule under the UIC Program to cover CO<sub>2</sub> Geologic Sequestration Wells. More information on this rule development process can be found at: [http://www.epa.gov/safewater/uic/wells\\_sequestration.html](http://www.epa.gov/safewater/uic/wells_sequestration.html) The EPA rule development process is anticipated to conclude in late 2010 or early 2011 with the publication of a final rule.

SDWA's UIC program. Most Phase III (validation phase) licensing and permitting is expected to take place with the new EPA rule in effect.

As of the date of this report, laws governing aspects of CO<sub>2</sub> geological storage have been passed and are in effect in eight states,<sup>11</sup> yet the only overlap with states that have partnership pilot projects is Wyoming, North Dakota, and Texas. As noted above, none of these three states had either the legislation or implementing regulations on the books and effective at the time of the pilot project deployment.<sup>12</sup> The possibility exists, however, that one of the validation phase projects that has yet to commence, the Big Sky Carbon Sequestration Partnership pilot project located in Wyoming, could potentially find itself governed by Wyoming's new carbon sequestration laws or its impending rules and regulations for carbon sequestration. To be so governed, the project would have to be a non-EOR project because the new Wyoming sequestration laws apply only to non-EOR projects.<sup>13</sup> As of the writing of this report it is not known whether the project will be a non-EOR or an EOR storage project. In either case, the project well(s) also will be governed under the UIC program. These new rules will not initially affect projects that include an EOR component. It is yet to be determined what approach EPA will take when EOR operations cease and the project operator seeks to convert to a storage-only project. It should be noted, some states have addressed this issue in their regulations.

It is the goal of this document in the sections that follow to distill the valuable lessons from the experiences of these early projects with an eye to helping ensure that the partnerships implementing succeeding projects (in the third or "development phase"), and their federal and state regulators, will benefit from this experience. The report will both identify the challenges encountered by the partnerships in the validation phase (Phase II) and, more importantly, the remedies and solutions offering the most potential to make the process work more smoothly and in a timelier manner in the future.

In Section 2, the report will identify and discuss the principal challenges encountered and the lessons learned by the seven RCSPs in licensing and permitting their validation phase pilot projects. It will also make some specific recommendations.

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<sup>11</sup> Washington, effective in July 2007; Wyoming, effective in July 2008 and July 2009; North Dakota, effective in April and July 2009; Montana, effective in May 2009; Texas, effective September 2009; Oklahoma, effective June 2009; Louisiana, effective August 2009; and Ohio, effective June 30, 2010. While each of these states' legislation addresses the basic legal framework for CO<sub>2</sub> storage in the state, there is considerable variation among the statutes and the degree to which the states have addressed issues such as pore space ownership, aggregation of storage rights, and long-term liability. It should also be noted that a ninth state, Kansas, has put into place through regulations a basic framework for the geologic storage of CO<sub>2</sub>. That regulatory framework was effective on February 25, 2010.

<sup>12</sup> North Dakota's regulations became effective on April 1, 2010. Wyoming and Texas will not have regulations covering the geologic storage of CO<sub>2</sub> in place until later in 2010.

<sup>13</sup> The IOGCC Model Statute (*supra* note 2) and most, if not all, of the state statutes being enacted, including Wyoming, pertain to the geological sequestration of CO<sub>2</sub> that does not involve EOR. This is in large part because oil and natural gas producing states almost all have laws and regulations already on the books that govern the licensing of CO<sub>2</sub> EOR wells.

Section 3 of the report will summarize and expand upon the recommendations made in Section 2. It will identify actions that could be taken in the coming months and years that have the most potential for ensuring that the licensing and permitting process will run more smoothly in the development phase projects to follow. The appendices will contain, respectively, a listing of the validation phase pilot projects (Appendix I), a bibliography of Best Practice Manuals produced by the partnerships (Appendix II) and the results of a survey of the RCSPs conducted by the IOGCC in advance of the Santa Fe Meeting (Appendix III).

## **Section 2: Challenges Encountered and Lessons Learned by the Partnerships**

The purpose of this section is to identify and discuss the principal challenges encountered and the lessons learned by the seven RCSPs in seeking licenses and permits for 22 CO<sub>2</sub> geologic storage pilot projects. What the partnerships were ultimately seeking from government regulators were the rights to drill and inject CO<sub>2</sub> into geologic formations.

Each license or permit had the potential to involve multiple state regulatory agencies, federal departments, agencies, and regional offices as well as local governments. Most of the pilot projects involved a different amalgam of research partners, many with little or no experience in seeking regulatory approval. As might be expected, the challenges that were encountered by the seven partnerships were numerous and varied. For the purposes of this report those challenges have been synthesized into five principal categories.

Each will be addressed in turn. For each, lessons learned by the partnerships will be identified and some recommendations proffered. If heeded, it is hoped the recommendations will improve the efficiency of the licensing and permitting experience going forward.

### **Challenge #1: Technical Capacity of the Regulator**

There were a number of both state and federal regulatory organizations with insufficient technical expertise to grant the licenses or permits requested in a timely and efficient manner.

One of the most common experiences of the partnerships in their development phase work was working with state and/or federal regulatory personnel with an inadequate understanding of the subject matter of the request. The experience of one of the partnerships (Partnership X) is offered to illustrate this challenge.

The first issue encountered by Partnership X was uncertainty within the state as to whether the oil and natural gas regulatory agency or the environmental agency had responsibility for permitting the well. Eventually, the oil and gas agency demurred and the environmental agency assumed jurisdiction. That agency decided to permit the well as a Class I non-hazardous well. However, the agency had not permitted such a class of well since the late 1970s and the last career employee who had institutional memory of the well had retired. As a consequence, it took the environmental agency 11 months to permit the well.

In this example, the permit applicant was a company with employees experienced in securing state environmental permits. It is possible to conclude that there would have been even greater delay with an inexperienced permit applicant, something likely to happen as the partnerships move into the

licensing and permitting of development phase projects. Other partnerships experienced similar delays due to state and federal unfamiliarity with the permitting process.

One clear observation or lesson learned was that at both state and federal levels of regulatory oversight, there was a great deal of difference among the states and EPA regions in terms of the organizational capacity to license these development phase pilot project wells.

In states with active oil and natural gas regulatory programs in place, the regulators were much less daunted by the licensing and permitting of CO<sub>2</sub> geologic storage wells and were able to issue permits and licenses in a more timely manner. States with little or no oil and natural gas regulatory experience had a great deal more difficulty.

Similarly, concerning administration of the UIC program, states and EPA Regional Offices with experience licensing Class II (oil and natural gas waste) wells under the UIC program had much faster and more efficient processes. This lesson learned supports a recommendation contained in the IOGCC 2007 [Legal and Regulatory Guide for States and Provinces](#)<sup>14</sup> that the state oil and natural gas regulatory agency, by virtue of its experience licensing and regulating similar wells, should be given first consideration by a state legislature as the most appropriate state agency to designate as the lead regulator of the geologic storage of CO<sub>2</sub>.<sup>15</sup>

Another lesson-learned is that there are states and EPA regional offices with significant experience licensing these kinds of wells. That expertise could be leveraged to train and support capacity-building in states and regions with less or no experience.

**Recommendation:** Training programs should be created and conducted at the state, federal, and local levels where regulators do not possess the necessary technical expertise to permit and license CO<sub>2</sub> geologic storage wells in an efficient and timely manner. (Modeling analysis expertise in particular was noted as a common technical deficiency in regulatory offices.)

**Recommendation:** In some states, in addition to training, it may be necessary to add staff to license and permit these new wells in a timely matter, especially when commercial-scale development begins.

## **Challenge #2: Regulatory Infrastructure and Systems**

The partnerships encountered a number of state and federal regulatory systems where deficiencies, at times very minor, in systems and procedures for permitting and licensing CO<sub>2</sub> storage wells led to significant delays in issuing the permit/license.

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<sup>14</sup> *Supra* note 3.

<sup>15</sup> It is also clear that whether it is the state oil and natural gas regulatory agency or the state environmental agency that is given authority over CO<sub>2</sub> storage wells, the other agency must play a key role in the process.

One example of this would be a state where the rules specify that a particular agency may issue a permit only when the application is “complete.” The problem is that the rules do not adequately define what constitutes an adequate or “complete” application. This leads to uncertainty and delay.

Another common observation of the partnerships was that the projects for which permits were being sought were small-scale “pilot” projects, designed to allow all parties, regulated and regulator, to learn from the experience. The problem was that the rules and systems in place didn’t recognize the “pilot” nature of the project and forced the permit applicant to comply with rigid and inflexible permitting requirements that were inappropriate for small-scale “test” projects. An additional observation of the partnerships was that overly prescriptive regulations, state and federal, were observed to have had the effect of encouraging inefficiency and unnecessary delay.

Based on their development phase experience, partnerships were generally of the opinion that principle or performance-based regulatory frameworks would be much more efficient and timely for the oversight of CO<sub>2</sub> geologic storage projects. Overly prescriptive regulations for project development, and particularly for research projects, were not flexible enough to account for the unknowns that will inevitably be encountered during project development.

**Recommendation:** EPA and state regulatory agencies should develop a streamlined permit process for small-scale (validation phase) projects for the evaluation of geologic properties at potential CO<sub>2</sub> storage sites.

**Recommendation:** States should tighten up on the definition and/or explanation as to what constitutes a “complete” or adequate permit application.

**Recommendation:** States should implement principle or performance-based regulatory frameworks for CO<sub>2</sub> geologic storage. Additionally, a “waste-disposal” orientation in the regulatory frameworks likely will be more prescriptive and inflexible.

**Recommendation:** States should pursue the adoption of legislation and the promulgation of regulations for the geologic storage of CO<sub>2</sub> along the general lines of the IOGCC model regulatory framework issued in 2007 and updated in 2009.

### **Challenge #3: Regulatory Jurisdiction**

In a number of states the partnerships encountered uncertainty as to which state agency had jurisdiction over the permitting and licensing of pilot project wells.

An example of this was set forth above. In some states with primacy under the UIC program this manifested as uncertainty between state agencies over which had the lead responsibility for different classes of wells and/or different components of a project. The net result was delay in the ability of a partnership project to acquire a permit to drill or inject.

**Recommendation:** Relevant state agencies should be encouraged to work together to clarify, via interagency agreement or otherwise, agency jurisdiction with respect to the licensing and permitting of CO<sub>2</sub> storage wells. This will be especially important once a final EPA rule for the underground storage of CO<sub>2</sub>, expected in late 2010 or early 2011, is promulgated.

**Recommendation:** In states with agencies that regulate oil and gas operations and have UIC primacy, the oil and gas agencies should be given authority to regulate CO<sub>2</sub> injection into saline formations for non-EOR projects.

#### **Challenge #4: Cooperation and Coordination among Regulatory Entities (state/state, state/federal, state/local, federal/federal)**

The partnerships experienced a number of instances where cooperation or coordination among federal, state, and/or local authorities (with a role to play in the process of license/permit issuance) was lacking, resulting in a delay in permit/license issuance.

In the course of securing licenses and permits for their validation phase CO<sub>2</sub> pilot projects, the partnerships often had to deal with multiple layers of government, all with a role to play before a license or permit could be issued. There was also the potential for the involvement of more than one agency at each level of government (federal or state), each operating under its own statutory authority. As noted earlier, because of the fact that all of the partnership pilot projects were federally funded, there was always the necessity of complying with NEPA. State NEPA equivalents also potentially came into play. Given the particular circumstances, there also could be issues pertaining to endangered species, fish and wildlife, cultural and heritage sites, wetlands, and air emissions, all potentially requiring the involvement of different federal and state agencies. In some cases there was the need to work with local (municipal or county) agencies on issues such as building codes, storm water runoff and noise.<sup>16</sup> If the project was on tribal lands, there were tribal authorities with which the partnerships had to work.

The problem was that there rarely was coordination or cooperation among the various regulatory entities involved. This translated into delay in securing the ultimate approval to drill or inject.

Among the lessons learned by the partnerships from their experiences was that they needed to be much more proactive in communicating with and encouraging communication and cooperation among the government agencies and affected stakeholders. Additionally, it was clear to the partnerships that this work needed to begin early --- as early as the planning process.

**Recommendation:** Efforts should be undertaken to encourage standardization of permit response times at state and federal levels.

**Recommendation:** Joint task forces should be formed to encourage interagency collaboration and streamlining of permit processes with the aim of developing a “one-stop-shopping” approach where feasible.

**Recommendation:** States should be encouraged to designate a single state agency to act as the lead agency for CO<sub>2</sub> storage-related licenses and permits.

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<sup>16</sup> In California, neither the state’s environmental agency nor its oil and natural gas regulator regulate saline injection. Rather this is the responsibility of municipalities.

**Recommendation:** Encourage state and federal agencies to incorporate into their processes and systems expedited permitting/licensing procedures for small-scale research projects. Agency personnel need to better understand the goal of such research projects in the timely collection of knowledge so as to better educate federal and state policymakers.

**Recommendation:** Partnerships going forward should establish timelines and communicate expectations as to those timelines with government counterparts.

### **Challenge #5: Achieving Stakeholder Buy-In**

Lack of stakeholder buy-in has the potential to delay or prevent the permitting and/or licensing of an underground CO<sub>2</sub> storage project.

In both its [Phase I](#)<sup>17</sup> and [Phase II](#)<sup>18</sup> CO<sub>2</sub> reports, the IOGCC CCGS Task Force noted the importance of active public and other stakeholder involvement in the process of developing both the laws and the regulations for CO<sub>2</sub> geologic storage and throughout the CCGS regulatory process.<sup>19</sup> The experience of the RCSPs in the validation phase work continues to make clear that lack of public education, knowledge, and acceptance will continue to pose significant barriers to CCGS development nationally. It is a clear lesson-learned or at least “lesson-reiterated” that stakeholders need to be included in the process from development of the legislation through implementation of the projects. Without adequate efforts in this regard, even small-scale research projects can be delayed or “vetoed” by an unsupportive public.

**Recommendation:** Incorporate stakeholder input in statute, rule, and regulation development and throughout the development of CCGS projects.

**Recommendation:** Even if there is no formal process, stakeholders need to be engaged from the earliest stages in the planning of even small-scale research projects. This will certainly be true of the Phase III development phase projects.

**Recommendation:** Stakeholder education is essential in building knowledge and acceptance. Misinformation needs to be neutralized with unbiased, scientifically based information. The participation of public utilities and public utility commissions in the dialogue needs to be encouraged.

## **Section 3: Recommendations and Conclusions of the IOGCC Carbon Capture and Geologic Storage Task Force**

This section takes the recommendations and lessons learned by the partnerships in Section 2 and synthesizes those recommendations and lessons into recommendations of the IOGCC CCGS Task Force.

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<sup>17</sup> A copy of IOGCC’s Phase I Report can be found at: [http://groundwork.iogcc.org/sites/default/files/09IOG5571\\_CO2\\_GeologicalSequestrationTaskForce.pdf](http://groundwork.iogcc.org/sites/default/files/09IOG5571_CO2_GeologicalSequestrationTaskForce.pdf)

<sup>18</sup> *Supra* note 3.

<sup>19</sup> *See supra* note 3.



These recommendations identify actions that should be taken in the coming months and years that the task force believes offer the most potential to make the licensing and permitting process run more smoothly in developing phase projects on to commercialization.

### **Recommendation 1: Technical Training and Expertise is Key to CCGS**

Training programs should be created and conducted at the local, state, and federal levels where regulators do not possess the necessary technical expertise to permit CO<sub>2</sub> geologic storage wells in an efficient and timely manner. The task force suggests that the IOGCC consider working with one or more partnerships to establish training programs making use of personnel from state and federal regional offices where expertise and experience already reside. These programs could be conducted regionally to facilitate participation from the widest number of participants.

### **Recommendation 2: To Facilitate Early Development of CCGS, States Should Utilize the IOGCC Model Framework**

The task force recommends that states should continue to pursue the adoption of legislation and the promulgation of regulations for the geologic storage of CO<sub>2</sub> utilizing the IOGCC model regulatory framework issued in 2007 and updated in 2009. Additionally, once the EPA releases a final rule for the underground storage of CO<sub>2</sub> under the UIC program, states that agree to such storage should take immediate steps to amend their internal regulations accordingly. To facilitate this effort the IOGCC CCGS Task Force in the 2nd Biennial Report will conform the model rules and regulations to the new EPA rule. In the interim, the IOGCC should continue to advocate for state and, where appropriate, federal implementation of principle or performance-based regulatory frameworks utilizing resource management as opposed to “waste-disposal” approaches to regulatory frameworks as enunciated in the IOGCC publication [Road to a Greener Energy Future](#)<sup>20</sup>

### **Recommendation 3: Regulatory Streamlining is Critical**

With respect to research projects, state and federal agencies should incorporate expedited permitting/licensing procedures for small-scale research projects. Regulatory agency personnel need to better understand that the goal of research projects is timely collection of knowledge necessary to facilitate further development of commercial CCGS projects and to better educate federal and state policymakers. Following release of the new-EPA CO<sub>2</sub> rules, states should make every effort to clarify which state agency has primary authority and which agencies have secondary authority for the permitting of CO<sub>2</sub> storage wells.

### **Recommendation 4: Stakeholder Buy-in is Vital to the Acceptance and Success of CCGS**

The task force encourages the incorporation of stakeholder input in statute, rule, and regulation development and throughout the development of CCGS projects. Even if there is no formal process, stakeholders need to be engaged from the earliest stages in the planning of even a small-scale research

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<sup>20</sup> Interstate Oil and Gas Compact Commission – CO<sub>2</sub> Storage: A Legal and Regulatory Guide for States, *available at:* <http://iogcc.publishpath.com/Websites/iogcc/pdfs/Road-to-a-Greener-Energy-Future.pdf>.

project. This will certainly be true of the Phase III development projects. Stakeholder education will be essential in building knowledge and acceptance. Misinformation needs to be neutralized with unbiased, scientifically based information. The participation of public utilities and public utility commissions in the dialogue should also be encouraged.

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## LIST OF ACRONYMS AND ABBREVIATIONS

CCGS	Carbon Capture and Geological Storage
CO <sub>2</sub>	Carbon Dioxide
EOR	enhanced oil recovery
EPA	U.S. Environmental Protection Agency
IOGCC	Interstate Oil and Gas Compact Commission
NEPA	National Environmental Policy Act
RCSPs	Regional Carbon Sequestration Partnerships
SDWA	Safe Drinking Water Act
UIC	Underground Injection Control

## APPENDICES

Appendix A: Regional Carbon Sequestration Partnerships

Appendix B: Bibliography of Best Practice Manuals Prepared by the RCSPs

Appendix C: Survey Results



## Appendix A: Regional Carbon Sequestration Partnerships

The U.S. DOE NETL has formed a nationwide network of regional partnerships to help determine the best approaches for capturing and permanently storing gases that can contribute to global climate change. The Regional Carbon Sequestration Partnerships (RCSPs) are a government/ industry effort tasked with determining the most suitable technologies, regulations, and infrastructure needs for carbon capture, storage, and sequestration in different areas of the country.

The seven [partnerships](#) that comprise the RCSPs represent more than 350 organizations in 40 states, three Indian nations, and four Canadian provinces.<sup>1</sup>

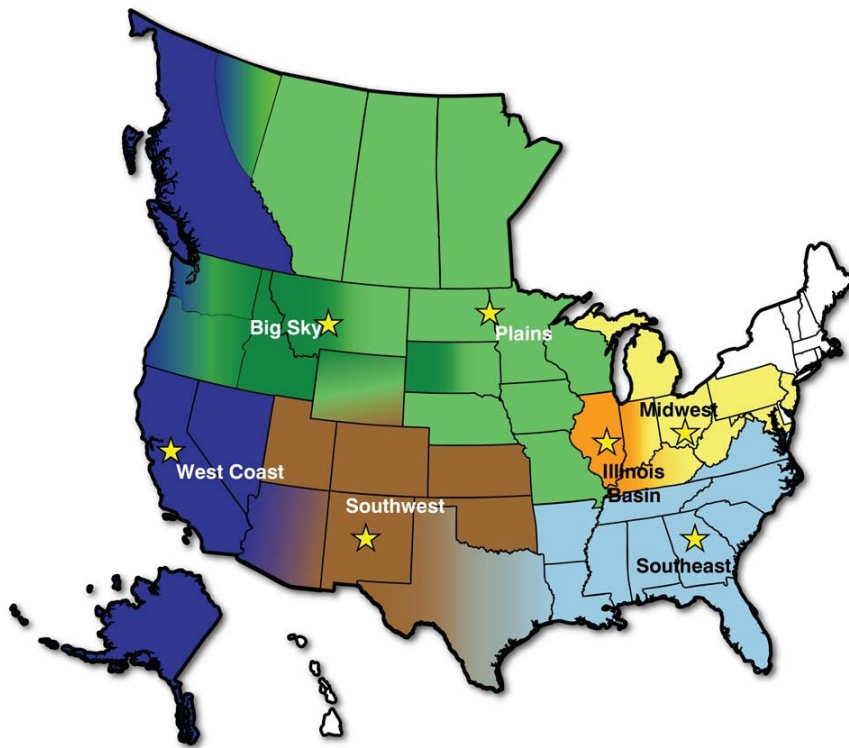


Figure 1. US DOE NETL's Regional Carbon Sequestration Partnerships

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<sup>1</sup> NETL: Regional Carbon Sequestration Partnerships. (n.d.). DOE - National Energy Technology Laboratory: Home Page. Retrieved July 28, 2010, from [http://www.netl.doe.gov/technologies/carbon\\_seq/partnerships/partnerships.html](http://www.netl.doe.gov/technologies/carbon_seq/partnerships/partnerships.html)

Table 5. Table of Phase II “Validation” Projects by Regional Carbon Sequestration Partnerships<sup>2</sup>

Partnership	Geologic Province/ Location	Geologic	
		Total CO <sub>2</sub> Injection (metric tons)	Approximate Depth (feet)
Big Sky Regional Carbon Sequestration Partnership (Big Sky) Montana State University <a href="http://www.bigskyCO2.org/">http://www.bigskyCO2.org/</a>	Columbia Basin	0”	2,500 – 4,000
Midwest Geological Sequestration Consortium (MGSC) University of Illinois, Illinois State Geological Survey <a href="http://www.sequestration.org/">http://www.sequestration.org/</a>	Loudon Oil Field	39	1,550
	Mumford Hills Oil Field	2,850*	1,551
	Sugar Creek Oil Field	5,850*	1,548
	Illinois Basin	0*	6,650 – 7,050
	Illinois Basin	91	1,000
Midwest Regional Carbon Sequestration Partnership (MRCSP) Battelle Memorial Institute <a href="http://www.mrcsp.org">http://www.mrcsp.org</a>	Appalachian Basin	<50	5,900 – 8,300
	Cincinnati Arch	1,000	3,200 – 3,500
	Michigan Basin	60,000	3,200 – 3,500
Plains CO <sub>2</sub> Reduction Partnership (PCOR) University of North Dakota, Energy & Environmental Research Center <a href="http://www.undeerc.org/pcor/">http://www.undeerc.org/pcor/</a>	Zama Oil Field	25,400	5,000
	Williston Basin	400	10,000 – 10,500
	Williston Basin – Coal Seam	80	1,600 – 1,800
Southeast Regional Carbon Sequestration Partnership (SECARB) Southern States Energy Board <a href="http://www.secarbon.org/">http://www.secarbon.org/</a>	Gulf Coast	1,355,385	10,304
	Gulf Coast		10,400
	Mississippi Coastal Plain	2,740	8,600
	Central Appalachian	907	1,600 – 2,300
	Black Warrior Basin	0*	1,500 – 2,500
Southwest Regional Partnership on Carbon Sequestration (SWP) New Mexico Institute of Mining and Technology <a href="http://www.southwestcarbonpartnership.org/">http://www.southwestcarbonpartnership.org/</a>	Paradox Basin-Aneth Field	630,000	5,600 – 5,800
	Permian Basin	86,000	5,800
	San Juan Basin	16,700	3,000
West Coast Regional Carbon Sequestration Partnership (WESTCARB) California Energy Commission <a href="http://www.westcarb.org/">http://www.westcarb.org/</a>	Sacramento Basin	0*	8,000
	Colorado Plateau	0	4,000

\*Currently injecting or will begin injecting in 2010

<sup>2</sup> U.S. DOE NETL

## Appendix B: Bibliography of Best Practice Manuals Prepared by the Regional Carbon Sequestration Partnerships

- U.S. Department of Energy, National Energy Technology Laboratory. (2009, December). *Best Practices for Public Outreach and Education for Carbon Storage Projects* (Rep.). Retrieved from [http://www.netl.doe.gov/technologies/carbon\\_seq/refshelf/BPM\\_PublicOutreach.pdf](http://www.netl.doe.gov/technologies/carbon_seq/refshelf/BPM_PublicOutreach.pdf)
- U.S. Department of Energy, National Energy Technology Laboratory. (2009, January). *Best Practices for Monitoring, Verification, and Accounting of CO<sub>2</sub> Stored in Deep Geologic Formations* (Rep.). Retrieved from [http://www.netl.doe.gov/technologies/carbon\\_seq/refshelf/MVA\\_Document.pdf](http://www.netl.doe.gov/technologies/carbon_seq/refshelf/MVA_Document.pdf)
- U.S. Department of Energy, National Energy Technology Laboratory. (2010, June). *Best Practices for Site Screening, Site Selection, and Initial Characterization for Storage of CO<sub>2</sub> in Deep Geologic Formations* (Rep.). Retrieved [http://www.netl.doe.gov/technologies/carbon\\_seq/refshelf/BPM-SiteScreening.pdf](http://www.netl.doe.gov/technologies/carbon_seq/refshelf/BPM-SiteScreening.pdf)

**Appendix C: Survey Results**



**1. Of the applications made by your partnership for permits to drill and/or inject, please indicate:**

***a. To which agencies, federal and state, the applications were made and from which agencies were the permits subsequently granted.***

WESTCARB	EPA Region 9 DOE for NEPA Arizona Department of Environmental Quality (ADEQ) Arizona Oil & Gas Conservation Commission (AZOGCC)
BIG SKY	With regards to the "Basalt Field Validation Test" ("Phase 2" work), a UIC Class-V Well Registration Packet was prepared and submitted to the Washington Department of Ecology. A mix of in-team and out-of-team stakeholders was involved in securing the permit. Securing the permit itself as a procedural process was not complicated compared to the negotiations over the actual scope of work and site selection. With regards to "Phase 3" work, BSCSP is still negotiating with an industry partner and so cannot begin application procedures until those negotiations are finalized.
SECARB	Project 1: Injection Permits: EPA Region III (They have primacy in Virginia), Drilling Permits for Monitor Wells: Virginia Division of Gas and Oil  Project 2: Mississippi Oil and Gas Board for class II injection and production wells; NEPA questionnaire and Environmental Assessment
MGSC	Illinois Environmental Protection Agency
PCOR	Permits to drill and inject were made to and received from the North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division (NDIC DMR OGD). An aquifer exemption was requested and received from the United States Environmental Protection Agency (US EPA). An aquifer exemption was required because injection was to occur in an unmineable coal seam which could be presumed to be a fresh water aquifer.
MRCSP	The following responses are in reference to a recent pilot-scale (1,000 tons) CO <sub>2</sub> injection test conducted at the Duke Energy East Bend generating station, located in Boone County, Kentucky.  USEPA Region 4 (Atlanta) for the UIC permit; Kentucky Oil and Gas for the drilling permit.
SWP	BLM: EA from Price Field Office Cooperating agencies would have included a broad segment of State of Utah, federal and county participation Injection

Permit State of Utah, Division of Water Quality (UDWQ), Groundwater Protection Section, State of Utah School and Trust Lands Administration. Note: SWP has written a Best Practices Manual that outlines needed permitting activities, agency contacts, etc. This document will prove useful for future permitting efforts.

*b. The class of permit (UIC) for which the applications were made.*

WCR CSP	EPA UIC – Class V, Experimental Injection Well Permit DOE NEPA– Categorical Exclusion ADEQ – Aquifer Protection Permit AZOGCC – Permit to Drill
SECARB	Project 1: Class V  Project 2: Class II
MGSC	Class I Nonhazardous
PCOR	A Class II application was made along with an aquifer exemption request.
MRC SPO	Class V Experimental
SWP	Class V??

*c. The class of permit you ultimately received and the length of time it took to receive it.*

WCR CSP	EPA UIC – Class V, Experimental Injection Well Permit – 5 months DOE NEPA– Categorical Exclusion – 2 months ADEQ – Aquifer Protection Permit – 5 months AZOGCC – Permit to Drill – 3 weeks
SECARB	Project 1: Class V, 5 months  Project 2: Class II, less than 1 month
MGSC	Class I Nonhazardous 12 months
PCOR	A Class II permit and an aquifer exemption were received. It took approximately 8 months to receive them.
MRC SPO	Class V Experimental – about 1 year
SWP	I presume Utah Division of Water Quality ultimately issued a Class V permit, but am not sure of this.

*d. The kind of information that you were requested to provide by the regulatory agencies and the level of detail that was required.*

WCR CSP	<p>EPA – Extensive data on regional and local geology, extensive description of well design and drilling operations (casing program, cementing program) extensive description of all logging and testing, detailed modeling of injection DOE Environmental Questionnaire – Evaluation of all potential environmental impacts. We hired a consulting firm to prepare this. ADEQ – Most of the info provided to EPA, plus water sampling and testing, info on purity of CO<sub>2</sub> to be injected, estimate of point of compliance (distance at which reservoir conditions would return to background) AZOGCC – Simple application describing location, purpose, plugging &amp; abandonment plan, and depth of well. Required a bond.</p>
SECARB	<p>Project 1: Geology and Hydrology of the site, including Freshwater Aquifers in the area, monitoring program details and information on all wells in the Area of Review, including specifics on the injection well (stimulation records, casing records, cementing records, cement bond log).</p> <p>Project 2: Location plat, depth, formation, well design</p>
MGSC	<p>Extensive detail on all aspects of the site, well construction, and the characteristics CO<sub>2</sub> to be injected, as much as for any Class I well.</p>
PCOR	<p>The injection application included the following:</p> <ul style="list-style-type: none"><li>• Surface and bottom hole location.</li><li>• Appropriate geologic data on the injection zone and the confining zones including geologic names, litho logic descriptions, thicknesses and depths.</li><li>• Estimated bottom hole fracture pressure of the top confining zone. Average and maximum daily rate of fluids to be injected.</li><li>• Average and maximum requested surface injection pressure.</li><li>• Geologic name and depth to base of the lowermost underground source of drinking water which may be affected by injection.</li><li>• Existing or proposed casing, tubing, and packer data.</li></ul> <p>In addition, a plat depicting the area of review (1/4-mile radius) detailing the location, well name, and operator of all wells in the area of review including: injection wells, producing wells, plugged wells, abandoned wells, drilling wells, dry holes, and water wells was included.</p> <p>A quantitative water analysis from the two nearest fresh water wells was required.</p>

A legal description of land ownership within the area of review and an affidavit of mailing certifying that all landowners within the area of review were notified of the proposed injection well were required as part of the injection application.

Schematic drawings of the injection system including current and proposed well bore construction and surface facility construction as well as the proposed injection procedure were included in the injection application.

A public hearing was required.

The aquifer exemption request required information regarding the following:

- The current and future use of the aquifer.
- Aquifer water quality and potential influence of the injectate on water quality.
- The radius of influence and distance of the requested exempted aquifer from public water supplies.
- Analysis of future water supply needs within the area.

SWP Standard Class V permit application. A moderately rigorous application dealing with regional and local geology, surface and ground water, casing program, etc.

*e. The level of experience on your partnership regulatory team with securing permits or working with state and federal regulatory agencies or processes.*

WCRCSP Three consulting firms on the project team were necessary to provide the extensive amount of required information:

1. Geology/hydrology – local company dealing with groundwater and hydrology in the state. Also, had experience working with the state regulators.
2. Drilling and site operations manager – developed all detailed drilling and operations plans. Also, had experience obtaining UIC permits from EPA.
3. Environmental firm had experience with NEPA applications.

SECARB Project 1: Some experience on UIC permits for disposal wells in Virginia.  
Project 2: Denbury Onshore LLC applied for and holds the permits on behalf of the SECARB. It is routine for them

MGSC	We have gained extensive experience through this process, but this was the first permit of this type for the team. Had assistance from Archer Daniels Midland Company, our project partner, who actually holds the permit, because they own the site we are working at.
PCOR	Our partnership regulatory team had substantial experience in securing permits of this type; in addition our team had a great deal of experience working with state and federal regulatory agencies and processes.
MRCSP0	Medium to high
SWP	My impression is that permitting was assigned a low priority early in SWP's Utah activities, and the early inability to understand the complexities of dealing with diverse requirements of tribal, federal, state and county entities cost SWP time in the early phases of the project. Of course the involved agencies were equally inexperienced with the specific regulatory requirements for experimental CO2 injection, but experienced permitting staff at the inception of Utah activity could have greatly reduced the lead time for the various activities proposes by SWP in Utah. When SWP began to concentrate on the Farnam Dome SWP initially planned to drill the experimental well on State lands, and had not investigated NEPA actions that BLM would require on surrounding lands. When the decision was made to site the well on BLM lands the time line was further extended.

*f. Once the permit was obtained, please detail what, if any, additional information was required by the regulatory agencies in order for you to actually begin injection.*

WCRCSP	ADEQ – required detailed water sampling and analysis plan. The well found no permeability in the intended reservoir formations, so the project was stopped before anything was injected.
SECARB	Project 1: Mechanical Integrity Test on the well was performed and documented and submitted to EPA for approval prior to injection. Information on the amount of CO2 injected per month, maximum injection pressure and pressure of annulus of the injection wellbore was submitted to EPA.  Project 2: None
MGSC	We are asking now for a permit modification to drill and observation well with a novel fluid and pressure sampling regime that requires a major modification to our permit. That is taking substantial additional time. The IEPA is extensively concerned with well construction details and sampling processes.
PCOR	The North Dakota Industrial Commission Field Inspector needed to be notified 24 hours prior to injection. Additionally, the injection well had to comply with all North Dakota Administrative Code injection well requirements.

MRCSP0 It was necessary to submit a well completion report that described the data collected during drilling and the well construction as built.

It was also necessary to conduct a fracture test to demonstrate fracture pressure of the injection formation because the permit prohibited injecting CO<sub>2</sub> at pressures above fracture pressure.

It was also necessary to conduct an annulus pressure test once the well was completed to demonstrate that there were no internal leaks that could potentially impact USDWs. This test had to be witnessed by the regulator.

SWP I am not sure if an injection permit was actually approved by the state of Utah, nor am I sure what the final decision by BLM was with respect to the EA that analyzed environmental ramifications of SWP's various proposals.

*g. The regulatory agencies (federal and/or state) with which you worked and the degree of familiarity within those regulatory agencies with the UIC program and specifically the classes under which the partnership was seeking permission to drill and/or inject.*

WCRCSF All agencies were familiar with UIC classifications and agreed with the Class V application. However, ADEQ regulations are different from DOE regulations – Arizona protects all groundwater, regardless of TDS.

SECARB Project 1: EPA Region III, some familiarity with the agency, Class V.  
Project 2: Mississippi Oil and Gas Board for class II injection and production wells, routine

MGSC IEPA has extensive agency experience with the UIC program but not with CO<sub>2</sub> as an injectant. Staff is only generally familiar with sequestration site issues and we needed to provide much supporting information.

PCOR The NDIC DMR OGD had a great deal of familiarity with the UIC program and the classes under which we were seeking permission for injection. The US EPA seemed to be unsure of the procedure required in order for us to receive an aquifer exemption.

MRCSP0 USEPA Region 4 (Atlanta) for the UIC permit – seemed to have low level of familiarity with UIC (esp. CO<sub>2</sub>) permitting  
Kentucky Oil and Gas for the drilling permit – seemed to have high level of familiarity with drilling permits

SWP See question 1, above. Normally oilfield UIC activities are regulated by the Utah Division of Oil, Gas and Mining, while other UIC activities fall under the authority of the Utah Division of Water Quality. Since the proposed experimental injection well did not involve activity normally permitted by DOGM, it was logical for

UDWQ to assume responsibility for this particular UIC permit. Good communication exists between the 2 state agencies, and I don't think the ultimate class of permit proved to be a major issue in SWP's application process.

**2. In your opinion, assuming that EPA approves a new “Class VI” for the injection of carbon dioxide, which regulatory entities in your state(s) will likely be tasked with regulatory responsibility (DEQ, Oil and Gas Regulator, EPA, etc.)?**

- |         |  |
|---------|--|
| WCRSP   | In California, the Division of Oil, Gas and Geothermal Resources (DOGGR) may take regulatory responsibility.   |
| Big Sky | Since BSCSP is still negotiating with an industry partner (location in terms of which State is TBD) and so cannot begin application procedures until those negotiations are finalized, BSCSP is not yet in a position to respond to the query for "Phase 3" work.  |
| SECARB  | Project 1: In my opinion, EPA Region III will still have primacy in Virginia for approving Class VI wells.<br><br>Project 2: In Texas, it has not been determined. I have no information on Mississippi's plans  |
| MGSC    | Illinois EPA, because they now do UIC wells, everything except Class II.   |
| PCOR    | The oil and gas regulators will likely be tasked with regulatory responsibility in PCOR Partnership states with oil & gas production (excepting WY – DEQ for non-EOR), while it is less clear in those states without oil & gas production. However, should US EPA adopt the waiver process for injection depth requirements as proposed in their Notice of Data Availability dated August 31, 2009, additional state regulatory agencies would be involved in that process.   |
| MRCSP   | I live in Ohio, so I will answer for that state. Ohio EPA will have responsibility.  |
| SWP     | I believe the location of the Regulatory Authority for geologic sequestration of CO <sub>2</sub> in Utah is currently under discussion. Given the longstanding authority for the Division of Oil, Gas and Mining (DOGGM) for oilfield UIC, and its staff familiarity with the technical aspects of this activity this division may ultimately become the RA. DOGM and UDWQ have discussed the ultimate assignment informally, and have been involved with discussions re how to promulgate rules for a Utah CO <sub>2</sub> program. |

**3. With respect to the permits that were issued, what pore space ownership issues were encountered, if any, and how were they resolved in order to begin injection.**

WCRCS	The surface owner also owned the pore space, and models showed that the CO2 plume would not extend beyond the property, so it did not come up as an issue.
Big Sky	For "Phase 2" work, the State of Washington claimed pore space ownership.
SECARB	Project 1: The landowner, mineral owner and gas lessee signed an agreement to allow for the injection at the site.  Project 2: The injection was handled under normal oil field flood rules with royalties paid to mineral owners and access fees paid for surface site use.
MGSC	Pore space ownership is not an issue because the plume is expected to stay on the property of Archer Daniels Midland Company who owns the site and is our partner in the project
PCOR	No pore space issues were encountered.
MRCSP	No pore space issues were encountered because the CO2 was contained entirely on the power plant property.
SWP	I have made some inquiries, but no response to date.