

**WRITTEN STATEMENT OF
ROCKY MOUNTAIN POWER**

for the

WYOMING JOINT JUDICIARY INTERIM COMMITTEE

October 2, 2007

Overview

Carbon sequestration has been a byproduct in the oil production industry in a process known as enhanced oil recovery (EOR) in which carbon dioxide (CO₂) is injected under the Earth and used to move oil to enhance oil extraction. An operator may attempt to extract the CO₂ and use it in another project in effect recycling the CO₂. CO₂ is captured and re-injected, and ultimately the CO₂ is permanently sequestered below the earth's surface. EOR is a widely utilized and well established technology, although the use of CO₂ for EOR is very site specific. It is expected that the demand for additional CO₂ will increase as production from existing oil, using conventional means, declines and oil prices continue to remain robust. Unfortunately, the demand for CO₂ for EOR is significantly less than the amount of CO₂ that is expected to be permanently sequestered to meet long-term target levels.

Applying this technology to the CO₂ emissions streams of fossil fuel-based electric generation represents a tremendous challenge for the United States and the world. The Electric Power Research Institute's August 2007 research paper, "The Power to Reduce CO₂ Emissions: The Full Portfolio," demonstrates that successfully deploying carbon capture and sequestration (CCS) technology provides the single largest "wedge" of carbon emissions reductions that could be achieved by the electric utility industry in meeting a goal of reducing 2030 emissions levels to

1990 levels.¹ However, broad commercial deployment of CCS technology is the critical component of achieving long-term reductions in greenhouse gas emissions, both domestically and internationally. The recent MIT study, “The Future of Coal,” also endorses this course of action, stating: “We conclude that CO₂ capture and sequestration (CCS) is the critical enabling technology that would reduce CO₂ emissions significantly while also allowing coal to meet the world’s pressing energy needs.”²

Applying CCS technology to the electric power sector will present at least three major challenges compared to the more limited use of the technology in EOR:

- 1) The volume of CO₂ that must be extracted from all power plant emissions streams is orders of magnitude greater than those captured in EOR processes. A single 800-megawatt coal-fired power plant will produce approximately 6.1 million tons of CO₂ annually, compared to the approximately 5 million tons of CO₂ used annually by the largest EOR projects.

- 2) An entirely new energy infrastructure will need to be built to compress and safely transport CO₂ to appropriate geological formations and inject it deep beneath the Earth’s surface. The United States is fortunate in that we appear to have the world’s greatest CO₂ sequestration potential. However, these formations are not evenly distributed throughout the country. Fully developing a system of permanent CO₂ geologic sequestration sites

¹ Electric Power Research Institute, “The Power to Reduce CO₂ Emissions: The Full Portfolio,” August 2007, p. 3-10. (see, <http://epri-report.org/DiscussionPaper2007.pdf>).

² “The Future of Coal: Options for a Carbon-Constrained World,” MIT Interdisciplinary Study, March 2007, Executive Summary, p. x.

will require the United States to build a vast interstate pipeline system somewhat similar to the natural gas pipeline system that has been created over the last 100 years. Injection wells must be drilled several thousands of feet below the Earth's surface. This will require massive investments in commodities, industrial products and manpower.

- 3) CO₂ injection for these purposes is designed to be complete and permanent, or nearly so. The goal of sequestration is to remove CO₂ from the atmosphere for centuries and in a manner that is as close to 100 percent certain to avoid leakage. In addition to the physical infrastructure that must be built to facilitate carbon capture and sequestration, the federal government and the states must develop a legal and regulatory framework to support these investments. Until a regulatory permitting legal structure is developed and the issue of liability risk is addressed, it is highly unlikely that large-scale carbon sequestration can be achieved.

I. CCS Regulatory, Ownership, Acceptance and Legal Issues

Rocky Mountain Power strongly believes there is a need for large-scale carbon storage demonstrations in multiple geologies (*i.e.*, deep saline reservoirs, depleted oil and gas reservoirs and deep coal seams) and from different capture and compression processes (*i.e.*, pre-combustion, post-combustion, chemical looping and oxy-fuel) in order to understand fully the technological issues associated with this task. However, there are also numerous practical, but non-technical issues – primarily in the transportation and storage phases – that must be addressed before CCS can be widely deployed. These issues relate to the siting, ownership and operation over the long term of carbon capture, transportation and storage facilities. **Many CCS technical**

matters will need to be fully developed and understood through demonstration projects before many of these matters can be properly identified and addressed.

Carbon sequestration raises new legal and regulatory risks associated with siting and permitting projects, CO₂ transportation, injection and storage.³ These risks are not yet fully understood, nor are uniform standards or government regimes in place to address and mitigate them. Among the key questions to be addressed in the development of a consistent regulatory framework for CCS are: immunity from potentially applicable criminal and civil environmental penalties; property rights, including the passage of title to CO₂ (including to the government) during transportation, injection and storage; government-mandated caps on long-term CO₂ liability, insurance coverage for short-term CO₂ liability; the licensing of CO₂ transportation and storage operators, intellectual property rights related to CCS, and monitoring of CO₂ storage facilities.

A. Regulatory Issues

It is unclear how existing regulations for CO₂ storage (*i.e.*, CO₂ for enhanced oil recovery, natural gas storage and acid gas injection) would fit with CCS for power generating facilities. CO₂ is currently not regulated under the Clean Air Act or many other environmental laws. Under the Safe Drinking Water Act underground injection control (UIC) program, the Environmental Protection Agency (EPA) currently is issuing CO₂ permits for Class V pilot experimental projects. This is appropriate until the demonstrations provide enough information to determine what changes, if any, need to be made to regulations for existing CO₂ storage. **A federal regulatory framework is preferable to address CO₂ storage site selection, injection and**

³ Robertson, K., Findsen, J., Messner, S., Science Applications International Corporation. June 23, 2006. "International Carbon Capture and Storage Projects Overcoming Legal Barriers", prepared for the National Energy Technology Laboratory (see <http://www.netl.doe.gov/energy-analyses/pubs/CCSregulatorypaperFinalReport.pdf>)

monitoring, and conditions for liability transfer, however Rocky Mountain Power supports Wyoming moving forward with CCS legislation in the interim to clarify a regulatory process that supports early demonstration projects.

B. Long-term Ownership and Liability Issues

The issue of who will assume the responsibility for long-term CO₂ storage in underground reservoirs must be decided before storage technology can become widely deployed. Rocky Mountain Power believes long-term ownership of CO₂ is an issue that must be resolved, with ownership ultimately transferred to the federal government in order to provide an appropriate long-term incentive to site and store CO₂. **However, until federal legislation is passed, it may be appropriate for states to commit to ownership for initial demonstration projects.** Among the options Wyoming should explore is that adopted by Texas, which transfers the title (and any liability post-capture) to CO₂ captured by the proposed FutureGen project to the Railroads Commission of Texas.⁴

Although the prospect of a catastrophic leakage event from a well-selected, designed and managed storage reservoir is low, liability for such an event must be resolved. In addition, liability for other potential issues -- such as incremental leakage to the atmosphere and shallow water sources, contamination of deep water aquifers and ecosystems from the displacement of mineral and other solutions by CO₂ injection, concerns with ground heave or subsidence, and damage to unclaimed hydrocarbon reserves -- must also be resolved. **Additional experience with demonstrations of large-scale CCS will likely provide important guidance about which**

⁴ Texas H.B. 149 (2006).

of – and how -- these potential issues must be addressed to make CCS commercially feasible.

C. Pipeline Issues

When a suitable reservoir is not located near the power plant, CO₂ will have to be transported via pipeline to its final storage site. Although there are presently 3,000 miles of CO₂ pipelines in the U.S. for EOR purposes, additional and likely larger pipelines will be necessary. The MIT “Future of Coal” study⁵ estimated that CO₂ pipelines could approach one-third the amount of natural gas pipelines, which for interstate and intrastate purposes (not including local distribution) are currently about 325,000 miles. The siting of a CO₂ pipeline should be similar to siting a natural gas pipeline and will require federal eminent domain or rights-of-way in order to build, thus ensuring that sufficient pipeline can be constructed as needed. Currently, natural gas pipeline companies are required to secure rights to use private land (rights-of-way) through negotiation and payment for that right, with eminent domain as a last resort. The negotiations and payments cover everything from gaining access to the land, to laying the pipeline, to restoring the land to its former state. Building a natural gas pipeline can take years, even with eminent domain.

D. Property Rights

The ownership of underground pore space or “voids” (*i.e.*, potential reservoirs for CO₂ storage) varies from state to state. In states with past or current oil and gas exploration and production, underground property rights are well established. However, even in these states, agreement by all affected parties may be required. For example, in Illinois, there are 69 owners of the storage

⁵ See n. 7, *supra*.

reservoir that the potential FutureGen plant would utilize, and all owners must agree before the reservoir can be accessed. Rocky Mountain Power supports legislation clarifying ownership of subsurface pore space or “voids”. An assessment of the geologic storage capacity in Wyoming that includes an assessment of the legal accessibility to the sites should be undertaken. **Greater certainty about property ownership rules for potential CO₂ storage sites in Wyoming is critical to supporting early demonstration projects.**

E. Public Acceptance and Communications Issues

Public awareness of CCS technologies is low. There is a need for public education about the potential benefits and impacts of CCS technologies. The experience of successful large-scale storage demonstrations, together with a sound and reasonable regulatory framework, are needed to give the public confidence in the safety of storage. Otherwise, failure to gain public acceptance could jeopardize timely deployment of CCS technologies.

Currently, in each of the Department of Energy’s (DOE) Regional Carbon Sequestration Partnerships outreach teams are developing educational materials and conducting meetings both with stakeholders and as part of the Underground Injection Control (UIC) CO₂ injection permit regulatory process. These initiatives are providing early insights about the implications of large-volume geologic storage of CO₂, and secondarily about the public’s awareness of CCS. DOE and EPA will need to broaden these efforts in working with industry to educate the public.

In addition, it is important to communicate the importance of each project within the RD&D umbrella. Data collection and framework development are essential to move CCS technologies to commercial deployment.

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Attachments

Specific Comments on the Draft Wyoming Legislation

Consider the Use of Additional Terms/Definitions

“Caprock” means the geologic formation that prevents the upward migration of injected carbon dioxide.

“Geologic sequestration of carbon dioxide” means the injection of carbon dioxide, usually from human sources like burning coal or oil, into subsurface geologic formations intended to limit its release into the atmosphere for a defined length of time.

“Geologic sequestration target formation” means the geologic layer with sufficient porosity and permeability to inject the carbon dioxide for sequestration.

“Permanent/Permanently”, is defined by site-specific criteria;⁶ however, it at a minimum means the fraction of CO₂ retained on the order of 90-99% for 100 years or 60-95% for 500 years.⁷

“Site Characterization Plan” means a plan - to be further defined through rulemaking - used to describe all available site-specific geologic information. The plan at a minimum describes site-specific drilling, hydrologic testing, geophysical surveys, lab tests, mechanical properties, maximum working pressure, migration monitoring, and the anticipated evolution of the CO₂ plume, in order to establish the capacity, injectivity and acceptable risk of leakage over the lifetime of the project.

Draft 0080.W2 – Ownership of Subsurface Voids

Draft 0080.W2 states that “[t]he ownership of all voids in all strata below the surface lands and waters of this state is declared to be vested in the several owners of the surface above the strata.” Presumably, this provision is intended to clarify that the surface owner has the exclusive right to use the voids or to contract with others to use the voids.

Although this approach is consistent with the initial preference of Rocky Mountain Power, it may not have much practical significance in the long run. This is because: (i) it is not always clear who owns the surface⁸; and (ii) even if it is clear, use of the “voids” below the surface may

⁶ Derived from the “**IPCC Special Report on Carbon Dioxide Capture and Storage**” Chapter 5: Underground geological storage: 7.3.5 *Assessing the ability of operational geological storage projects to retain CO₂ for long time periods*; “Assessment of the fraction retained for geological storage projects is highly site-specific, depending on (1) the storage system design, including the geological characteristics of the selected storage site; (2) the injection system and related reservoir engineering; and (3) the methods of abandonment, including the performance of well-sealing technologies.”

⁷ Derived from the “**IPCC Special Report on Carbon Dioxide Capture and Storage: Technical Summary**”, pg 43, specifically, “A fraction retained on the order of 90-99% for 100 years or 60-95% for 500 years could still make such impermanent storage valuable for the mitigation of climate change. All studies imply that, if CCS is to be acceptable as a mitigation measure, there must be an upper limit to the amount of leakage that can take place.”

⁸ For example, many lands (including federal lands) consist of “split estates” such that one person/entity government owns the surface rights, and another owns associated mineral or water rights -- or some other combination of the

so dramatically impact other subsurface rights that permission from such subsurface right holders also may be necessary before using the voids. Thus, clarifying void ownership may not always equate to the exclusive right of the surface owner to use, or contract for the use of, the voids.

Recommendations for draft 0080.W2 are **noted in bold**:

- **The Wyoming legislature should determine, through a review of state case law, whether it is even necessary to pass a statute stating that “voids” are owned by surface rights holders.** In general, the legal title to subsurface mineral formations (including depleted oil/gas reservoirs) belongs to the surface holder. It is not clear if this general rule applies in Wyoming.⁹ If this general rule is firmly established by case law in Wyoming, then there may not be any need for draft 0080.W2 because the legal principle of surface ownership already is in place. **Alternatively, the Wyoming legislature may want to state its intent in draft 0080.W2 that the principles established in such case law simply are extended to carbon sequestration.**
- **The term “voids” is not defined in the draft legislation. This key term must be defined in order to properly evaluate the impact of the draft bill.** Without defining this term, attaching the ownership of “voids” to the surface owner may not be meaningful.
- **Using a more descriptive term, such as “subsurface formation CO₂ storage rights” rather than “voids,” may be a more useful approach in defining which subsurface areas are intended to be covered by draft 0080.W2.**
- **The term “voids” should be defined consistently with the defined term “Geologic sequestration facility” in draft 0047.W4 as the two terms seem to be intended to mean the same thing.** The latter term is defined to include “*underground geologic formations, strata, reservoirs or caverns*” for CO₂ storage.
- **If possible, it should be determined in advance of passing the bills which subsurface areas in Wyoming will actually qualify as “voids.”** Knowing this will make the defined term “voids” more meaningful. Subsurface minerals (oil/gas) and underground water may have separate ownership and they certainly have independent value. The term “voids” cannot be defined to include such rights because that would be an improper attempt to shift ownership of those rights to the surface owner. This leads to a practical dilemma in preparing a meaningful definition of “voids.” Without advance site-specific studies, it is difficult to know whether any “voids” (defined to exclude subsurface minerals/water) even exist in a desirable geographic location. Even so-called depleted

foregoing. In some cases, subsurface mineral and water rights holders may have a legal right to control what happens to the surface when that impacts their subsurface interests. It is not clear whether this right will rise to the level of ownership under the draft bill. In addition, many surface lands are leased, licensed or otherwise transferred by the owner in a manner not amounting to full ownership. The draft bill does not address the fact that the surface owner, by contract with a surface lessee/licensee, may not have the ability to own, use or transfer the voids independent of the surface rights granted to others.

⁹ An argument could be made to the contrary that a mineral rights owner has the right to use the subsurface mineral formations for re-injection of other substances (such as CO₂) in order to maximize the recovery of the minerals (oil/gas).

oil/gas reservoirs are which are presumed to be “voids” may not be physically depleted of oil/gas because new technology (including carbon sequestration itself) could allow for further oil/gas production – thus eliminating those areas as potential “voids.”

- **Wyoming should establish a fast-track method to determine ownership of “voids.”** The draft bill allows for those who claim an ownership in “voids,” based on events prior to the bill’s effective date, to demonstrate such ownership. In that case, until a matter is finally resolved in litigation, it may not be possible to determine ownership of certain “voids.” Because the carbon sequestration bills will create instant value within such “voids” (in the potential for the sale/lease of the voids for carbon sequestration), litigation over void ownership is almost certain to occur on a wide-scale basis. This could take a significant amount of time to resolve, thus delaying plans to acquire or use disputed areas for carbon sequestration.
- Draft 34-1-152(c) states that notice requirements for surface and mineral rights owners do not apply to those holding ownership of “voids.” Notice typically is required someone takes action that may impact surface of mineral ownership rights. Rocky Mountain Power presumes, but does not know, that this “no notice” requirement for “voids” simply means that surface owners will receive notice so separate notice is not needed for void owners. It is possible; however, that an ownership interest of some kind in “voids” can be conveyed separately so that notice to void owners makes sense for the same reason it makes sense for surface and mineral rights owners. **Therefore, to the extent Rocky Mountain Power intends to hold ownership of “voids,” we request this provision be changed to require notice to the owners of “voids” similar to notice provisions for surface and mineral rights owners.**
- The power of eminent domain may render as moot many of the concerns about ownership of “voids” and the impact such ownership status will have on other subsurface interests. This is because Rocky Mountain Power (or others) may simply condemn whatever rights are needed to assure ownership of “voids” rather than be left with the uncertainty associated with trying to work around or purchase those other rights. Although eminent domain is provided for in draft 0047.W4 (draft 1-26-815), it is uncertain whether the scope of that power will address all issues associated with ownership of “voids.” **Draft 0047.W4, which addresses eminent domain, should be broad enough to cover all rights which may interfere with ownership of “voids.”**

Draft 0047.W4 -- Carbon Capture and Sequestration

- The introduction to this bill states it relates to “*carbon capture and sequestration*,” but in fact it does not address carbon capture activities at all. **The reference in the introduction to carbon capture should be dropped or the bill expanded to include capture activities.**
- The definition of “*carbon dioxide*” seems unusually detailed for the purposes of the proposed bill. This type of detailed definition is best reserved for regulations which are

intended to be developed after the legislation. **The definition of “carbon dioxide” should be more general or should be reserved until regulations are developed following the legislation.** Draft 30-9-101(a)(ii).

- **The term “voids” in draft 0080.W2 should be defined consistently with the defined term “Geologic sequestration facility” in draft 0047.W4 as the two terms seem to be intended to mean the same thing.** The latter term is defined to include “*underground geologic formations, strata, reservoirs or caverns*” for CO₂ storage. Compare draft 30-9-101(a)(iv).
- **The term “sequestration” should be modified to state: (i) whether “retention” is intended to be permanent; (ii) replace “place of injection” with the defined term “geologic sequestration facility”; and (iii) if retention is intended to be permanent, delete the word “immediate” after “foreseeable.”** These changes will clarify this defined term. Draft 30-9-101(a)(v).
- Draft 30-9-102(a) states one purpose of the bill is to “*prevent waste of . . . resources contained within those facilities*” (meaning with the “*geologic sequestration facilities*”). The term “voids” under draft 0080.W2, however, implies that there will be no other resources (i.e., mineral resources) within the “voids.” **The concept of resources within “geologic sequestration facilities” must be reconciled with the definition of “voids” under draft 0080.W2.** Draft 30-9-102(a).
- Granting “*jurisdiction and authority*” to the to-be-formed Wyoming Conservation Commission over “*all persons and property necessary to effectuate the purposes and intent of this article*” may be impermissibly broad. **The Conservation Commission’s authority may best be limited to those who qualify as “CCGS operators” rather than anyone who may contribute in any way to sequestration activities.** Draft 30-9-102(a).
- **Draft 0047.W4 excludes the injection of CO₂ for enhanced oil recovery from the coverage of the bill. It is not clear whether this is necessary** as it is likely that any early sequestration efforts for existing facilities likely will have some involvement with enhanced oil recovery. If this bill does not apply, it may be less clear what the “rules of the game” will be for those early efforts. Draft 30-9-102(c).
- Receipt of a “*certificate*” for a carbon sequestration facility is contingent on first proving the amount of “*commercially producible accumulations of oil of native gas, or both, if any, remaining*” in the facility. **Because the definition of “voids” cannot include mineral rights (or subsurface water rights), and because the definition of “voids” must be consistent with “geologic sequestration facility,” draft 30-9-103(a)(ii) should perhaps require that, rather than prove the amount, a facility should prove that it does not have any commercially producible oil/gas.** Draft 30-9-103(a)(ii).
- The grounds for finding of suitability of a “*geologic sequestration facility*” under draft 30-9-103(b)(i – iii) may best be left for development of regulations to follow the legislation. The concepts of “*will not contaminate,*” “*will not materially impair,*” and “*will not unduly endanger*” are vague and will be difficult to interpret without further

rulemaking. **Draft 30-9-103(b)(i – iii) should state simply that suitability will include specific findings “based on rules, regulations and orders promulgated under Section 30-9-102(b) that the geologic sequestration facility will be protective of human health and the environment and will not materially impair oil, gas or other mineral production in areas adjacent to the geologic sequestration facility.”** A requirement for the Commission to make such findings is a positive aspect of this bill because it will help protect against claims by others that injury or damage has occurred. Draft 30-9-103(b)(i – iii).

- Making the applicant responsible for “*all costs*” of a public hearing is like asking an applicant to write a blank check. There should be some limits placed on this requirement. **Rather than require an applicant for a certificate to be responsible for all costs of any public hearing (including, presumably, legal challenges), the bill should direct the commission to determine by rule the appropriate charge for applicants based on how the state charges applicants in other permit settings (i.e, air permits, water discharge permits, industrial siting permits, etc.)**
- Draft 30-9-104 allows, but does not require, the commission to require a surety bond or other guaranty from injectors or facility owners to cover any potential liability associated with those activities. It is unknown whether and bond or insurance company would be willing to provide a bond and on what terms. In that sense, this requirement may not be possible to meet. **The details of the bond/guaranty requirements under draft 30-9-104 should be worked out in regulations to be developed after the legislation.** Draft 30-9-104.
- The bond/guaranty requirements relate only to a CO₂ injectors and facility owners. They do not relate to a person or entity, such as a utility, which first produces the CO₂. Moreover, draft 0047.W4 does not attempt at all to limit liability associated with carbon sequestration in general. Thus, the bill does not meet one of Rocky Mountain Power’s primary goals for the bill which is to specifically limit the liability of CO₂ producers for any risk associated with the entire range of carbon sequestration activities. Absent such liability limitation, CO₂ producers will have less incentive to engage in carbon sequestration. **The bill should limit the liability of those associated with all carbon sequestration activities, including CO₂ producers such as Rocky Mountain Power as a matter of public policy and as a means to encourage carbon sequestration.**
- Draft 30-9-105 may inadvertently provide a way for facility owners and others to escape long-term liability associated with carbon sequestration activities. If this it inadvertent, then it likely will be corrected and/or courts likely will construe this provision so as not to allow an unintended escape from liability. This provision contemplates the transfer of a closed sequestration facility to “*a successor owner with approval of the commission.*” Depending on the commission approval requirements, this may provide a ready way for an owner to simply transfer its liability along with the assets to a successor owner, even one with limited ability to meet liability obligations. **The bill should either make clear what requirements will apply to the ownership transfer of a closed facility, or state that such requirements will be developed by rule after the legislation.** Draft 30-9-105.

- The bill intends for the injector to maintain ownership of injected CO₂ forever. It may be difficult to get an injector to agree by contract to accept long-term liability, as between Rocky Mountain Power and the injector, even if the statute deems the injector to be the owner of the CO₂. **The Wyoming legislature and utility industry groups should give careful consideration to all of the implications of ownership by the injector of sequestered CO₂.** Draft 30-9-201. Compare draft 30-9-203(a and b).
- Allowing further drilling by others through a carbon sequestration facility seems antithetical to the bill's purpose of "*safe and effective sequestration.*" **The Wyoming legislature and utility industry groups should give careful consideration to all implications of allowing anyone to "drill or bore through geologic sequestration facilities" and should determine specific limits on such drilling to be used in the development of rules on this subject.** Draft 30-9-202.
- Draft 30-9-203(c) seems to impose strict liability on the injector (who, by statute, owns all injected CO₂) if any sequestered CO₂ migrates onto adjoining property. **Imposing strict liability on the injector for migrating CO₂ will discourage carbon sequestration.** Draft 30-9-203.
- By not referencing the defined term "*carbon sequestration facility,*" the eminent domain provisions seem too narrow to allow for the acquisition of all necessary "*voids*" and other property to allow for the full range of carbon sequestration activities. **The eminent domain provisions should be expanded to facilitate the acquisition of all properties, including "voids," necessary for the full range of carbon sequestration activities.** Draft 1-26-815(a).