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## GUARDING THE VIABILITY OF COAL & COAL-FIRED POWER PLANTS: A ROAD MAP FOR WYOMING'S CRADLE TO GRAVE REGULATION OF GEOLOGIC CO<sub>2</sub> SEQUESTRATION

*Delissa Hayano\**

### I. INTRODUCTION

When Governor Dave Freudenthal signed House Bills 89 and 90 on March 4, 2008, Wyoming became the first state to adopt comprehensive geologic carbon sequestration (“GCS”) legislation. Given Wyoming’s position as the largest coal producing state in the nation, the haste to enact GCS legislation as part of a push for new clean coal technologies is no surprise.<sup>1</sup> Almost all western states have addressed GCS in some fashion—most by appointing legislative committees to study the issue—and since the enactment of legislation in Wyoming, Washington state has followed suit by passing GCS legislation and adopting rules imposing standards for carbon sequestration activities.<sup>2</sup>

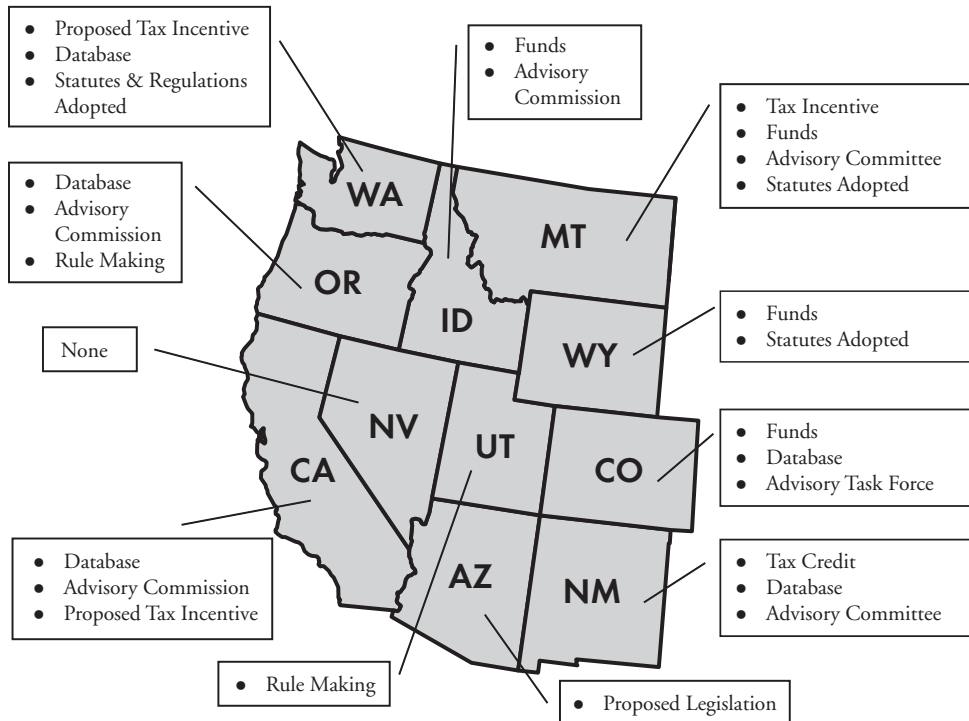
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<sup>1</sup> FRED FREME, ENERGY INFO. ADMIN., U.S. COAL SUPPLY AND DEMAND (Apr. 2008), <http://www.eia.doe.gov/cneaf/coal/page/special/feature.html> (last visited Nov. 4, 2008). Wyoming is the largest coal-producing state in the nation, a position it has held since 1988. *Id.* Wyoming produced 453.6 million short tons of coal in 2007. *Id.* This production was 73% of the Western Region production total. *Id.* Montana is the second largest coal-producing state in the Western Region, producing only 43.4 million short tons in 2007. *Id.* Wyoming’s estimated coal reserves total 66,643 million short tons. *Id.* at <http://www.eia.doe.gov/cneaf/coal/statepro/imagemap/wy4p1.html> (last visited Nov. 4, 2008).

<sup>2</sup> See Figure 1 and Appendix A.

FIGURE 1

CARBON SEQUESTRATION LEGISLATION IN THE WESTERN STATES<sup>3</sup>

The following examines Wyoming's House Bills 89 and 90 and places Wyoming's GCS efforts in the context of the current socio-political and environmental focus on global warming. A brief summary of the provisions found in House Bills 89 and 90 precedes an analysis of the scope of GCS legislation and regulation necessary to support commercial-scale carbon dioxide ("CO<sub>2</sub>") sequestration projects. The analysis includes a comparison of Wyoming's GCS legislation with the Interstate Oil and Gas Compact Commission's ("IOGCC's") Model Statute and Model Rules and Regulations for GCS. This backdrop reveals that Wyoming's pioneering legislation, while a step toward encouraging development of pilot-scale research projects, shares the IOGCC's naïveté in its underlying premise that a piecemeal, state-by-state approach to GCS can provide

<sup>3</sup> Current through September 2008. The author would like to recognize Tasha Newland, Don Quander, and Darcie Weingrad for their assistance in compiling the data contained in Figure 1 and Appendix A.

sequestration on the scale needed to address socio-political and environmental concerns about CO<sub>2</sub> emissions from coal-fired power plants. The costs and logistics of compressing, transporting, and sequestering CO<sub>2</sub> on the scale necessary to address these concerns requires a national interest parallel to that motivating the construction of equivalent-scale national infrastructure projects such as the interstate road system.

If Wyoming's state-based approach to GCS is to function as an effective first step toward the development of widespread, commercial-scale GCS projects, the statutory and regulatory framework requires a "cradle to grave" scope that encompasses capture, transportation, siting, operation, and closure. The framework must also recognize the enormous scale of GCS projects as even a pilot scale project associated with a single 1,000 megawatt ("Mw") coal-fired power plant could require acquisition of subsurface storage rights over a radius of six miles.<sup>4</sup> Given the scale of GCS projects and the need for a cradle to grave statutory regime, Wyoming's GCS legislation will need to further develop if it is going to position Wyoming "to play a major role hosting clean coal generation development with CO<sub>2</sub> capture and sequestration."<sup>5</sup>

## II. BACKGROUND

The carbon of interest in GCS is anthropogenic CO<sub>2</sub>, which is the CO<sub>2</sub> emitted by the burning of fossil fuels by humans.<sup>6</sup> GCS is the injection of compressed CO<sub>2</sub> into underground geologic formations that have the ability to accept the injected CO<sub>2</sub> and the integrity to contain the CO<sub>2</sub> over time. GCS has taken the stage nationally due to concerns about global warming caused by the emission of greenhouse gases ("GHG"). According to the United Nations Intergovernmental Panel on Climate Change ("IPCC"), warming of the climate system is unequivocal and most of the increase in global temperatures since the 1950s is "very likely" due to increased anthropogenic GHG concentrations.<sup>7</sup> CO<sub>2</sub> is the most significant GHG, and nearly 57% of the 2004 emissions of CO<sub>2</sub> are linked to the consumption of fossil fuels.<sup>8</sup> Global CO<sub>2</sub> emissions from coal-fired power plants exceed seven billion megatons per year—"about 41% of

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<sup>4</sup> Steven L. Bryant, *Geologic CO<sub>2</sub> Storage—Can the Oil and Gas Industry Help Save the Planet?*, 54 ROCKY MTN. MIN. L. INST. 2-1, 2-8 (2008).

<sup>5</sup> Marcin Skomial, *Wyoming seeks to put in place CO<sub>2</sub> storage laws*, COAL OUTLOOK, Mar. 3, 2008, at 11 (quoting Steve Waddington, Wyoming Infrastructure Authority Executive Director).

<sup>6</sup> Jerry R. Fish & Thomas R. Wood, *Geologic Carbon Sequestration: Property Rights and Regulation*, 54 ROCKY MTN. MIN. L. INST. 3-1, 3-1 (2008).

<sup>7</sup> United Nations Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report, Summary for Policymakers 2*, 5 (Nov. 2007), available at [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf) [hereinafter IPCC Report].

<sup>8</sup> IPCC Report, *supra* note 7, at 5.

the total energy-related CO<sub>2</sub> emissions.”<sup>9</sup> A study by the Massachusetts Institute of Technology declares carbon capture and sequestration “the critical enabling technology that would reduce CO<sub>2</sub> emissions significantly while also allowing coal to meet the world’s pressing energy needs.”<sup>10</sup> Wyoming is the nation’s largest producer of coal, and one of the largest suppliers of coal to coal-fired power plants.<sup>11</sup> Thus coal is a pillar of Wyoming’s economy, and the state’s haste to enact GCS legislation and to attract GCS projects is understandable.

Because of the perceived link between coal-fired power plants, CO<sub>2</sub> emissions, and global warming, coal-fired power plants have landed in the socio-political hot seat. Responding in part to this increased socio-political pressure, in February 2008, three of Wall Street’s seven largest financial backers of coal-fired power plant construction—Citigroup Inc., JP Morgan Chase & Co., and Morgan Stanley—announced “The Carbon Principles,” climate change guidelines for financial backers of power plant construction in the United States.<sup>12</sup> Though the principles do not preclude financing for coal-fired power plants, “they set up a more rigorous evaluation process includ[ing] the impact of future global warming legislation on the loan risk of building new coal-fired power plants.”<sup>13</sup>

New CO<sub>2</sub> regulations adopted by Washington State also require consideration of CO<sub>2</sub> emissions in power plant construction. All new fossil-fuel-fired generating plants producing more than 1,100 pounds of CO<sub>2</sub> per hour (i.e., more than a natural-gas-fired plant) are required to sequester their carbon emissions within five years of plant operation.<sup>14</sup> This requirement already has caused Washington regulators to reject an application for a power plant where plant backers failed to submit a plan for capturing and storing the excess CO<sub>2</sub> emissions and asserted that it was impossible to comply with the new state law requiring it to do so.<sup>15</sup> Wyoming has a vested interest in ensuring that coal-fired power plants in

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<sup>9</sup> James R. Katzer, *The Future of Coal-Based Power Generation*, CHEM. ENG’G PROGRESS, Mar. 2008, at S15.

<sup>10</sup> THE FUTURE OF COAL: OPTIONS FOR A CARBON-CONSTRAINED WORLD X (James R. Katzer et al. eds., 2007), [http://web.mit.edu/coal/The\\_Future\\_of\\_Coal.pdf](http://web.mit.edu/coal/The_Future_of_Coal.pdf) (last visited Nov. 5, 2008). See also Fish & Wood, *supra* note 6 at 3-2.

<sup>11</sup> FREME, *supra* note 1.

<sup>12</sup> Lisa Lee, *Banks to weigh CO<sub>2</sub> emissions in power lending*, REUTERS, Feb. 4, 2008, available at <http://www.reuters.com/article/environmentNews/idUSWNAS913620080205>. Citigroup Inc., JP Morgan Chase & Co, and Morgan Stanley are three of the so-called “Wall Street Seven”—the seven financial institutions in the United States financing most coal-fired power plant construction. Megan Tady, *Activists Target Big Banks for Financing Climate Change*, THE NEW STANDARD, Apr. 11, 2007, <http://newstandardnews.net/content/index.cfm/items/4650> (last visited Nov. 5, 2008).

<sup>13</sup> Lee, *supra* note 12.

<sup>14</sup> WASH. REV. CODE § 80.80.040 (2007).

<sup>15</sup> Erik Robinson, *State rejects proposal for coal plant in Kalama*, VANCOUVER COLUMBIAN, Nov. 28, 2007, at C1 (discussing impact of Washington’s new geologic sequestration legislation on new coal-fired power plants); Daniel Jack Chasan, *Changing and challenging winds in the power*

Washington and elsewhere remain a viable source of electricity generation, and the State's GCS legislation is an attempt to ensure this future by paving the way for the development of GCS projects.

### III. WYOMING HOUSE BILLS 89 & 90

#### A. *House Bill 89*

House Bill 89, titled "Ownership of Pore Space," created Wyoming Statute § 34-1-152 and amended Wyoming Statute § 34-1-202. With this legislation, Wyoming heeded commentators' suggestions that the determination of the ownership of subsurface pore space is an essential step in creating a statutory and regulatory framework for the development of GCS projects.<sup>16</sup>

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*industry*, CROSSCUT (Mar. 17, 2008), <http://www.crosscut.com/energy-utilities/12625/Changing+a+nd+challenging+winds+in+the+power+industry> (last visited Nov. 5, 2008) (discussing Washington legislature's desire "to push development of sequestration technology, not wait until the technology was available off the shelf").

<sup>16</sup> Steven Bryant, *Geologic CO<sub>2</sub> Storage—Can the Oil & Gas Industry Help Save the Planet?*, 54 ROCKY MTN. MIN. L. INST. 2-1, 2-8 (2008); Elizabeth J. Wilson & Mark A. de Figueredo, *Geologic Carbon Dioxide Sequestration: An Analysis of Subsurface Property Law*, 36 ENVTL. L. REV. 10114, 10115 (2006); Interstate Oil & Gas Compact Commission Task Force on Carbon Capture & Geologic Storage: A Legal and Regulatory Guide for States & Provinces, Sept. 25, 2007, at 15, 22 [hereinafter *IOGCC Guide*]; Owen L. Anderson, *Geologic CO<sub>2</sub> Sequestration: Who Owns the Pore Space?*, 9 WYO. L. REV. 97, 98 (2009) [above]. Pore space ownership is an unsettled question in many jurisdictions and authorities are split on whether the rights to subsurface pore space remain with the surface owner when the mineral estate is severed from the surface estate or if the pore space rights transfer with the mineral estate. Authority appearing to support the surface owners' retention of the pore space rights when the mineral interest is conveyed include: *Int'l Salt Co. v. Geostow*, 878 F.2d 570 (2d Cir. 1989); *Miss. River Transp. Corp. v. Tabor*, 757 F.2d 662 (5th Cir. 1985); *United States v. 43.42 Acres of Land*, 520 F. Supp. 1042 (W.D. La. 1981); *Ellis v. Ark. La. Gas Co.*, 450 F. Supp. 412, 421 (E.D. Okla. 1978), *aff'd*, 609 F.2d 436 (10th Cir. 1979); *Emeny v. United States*, 412 F.2d 1319 (1969); *Dep't of Transp. v. Goilke*, 560 N.W.2d 365 (Mich. App. 1996); *Miles v. Home Gas Co.*, 316 N.Y. Supp.2d 908 (N.Y. Sup. Ct. App. Div. 1970); *Sunray Oil Co. v. Cortez Oil Co.*, 112 P.2d 792 (Okla. 1941); *Getty Oil Co. v. Jones*, 470 S.W.2d 618 (Tex. 1971); *Makar Prod. Co. v. Anderson*, No. 07-99-0050-CV, 1999 WL 1260015 (Tex. App. 1999) *no writ*; *FLP Farming, Ltd. v. Tex. Nat. Res. Conservation Comm'n*, 2003 WL 247183 (Tex. App. 2003) (mem. op., not designated for publication); *Humble Oil & Ref. Co. v. West*, 508 S.W.2d 812 (Tex. 1974); *Tate v. United States Fuel Gas Co.*, 71 S.E.2d 65 (W. Va. 1952). Authority appearing to support the conveyance of pore space rights with the mineral interest conveyance include: *Grynberg v. City of Northglenn*, 739 P.2d 230 (Colo. 1987); *Jilek v. Chicago, Wilmington & Franklin Coal Co.*, 47 N.E.2d 96 (Ill. 1943); *Mound City Brick & Gas Co. v. Goodspeed Gas & Oil Co.*, 109 P. 1002 (Kan. 1910); *Grey-Mellon Oil Co. v. Fairchild*, 292 S.W. 743 (Ky. 1927); *Cent. Ky. Natural Gas Co. v. Smallwood*, 252 S.W.2d 866 (Ky. 1952); *United States Steel Corp. v. Hoge*, 468 A.2d 1380 (Pa. 1983); *Mapco, Inc. v. Carter*, 808 S.W.2d 262 (Tex. Civ. App. 1991); HOWARD R. WILLIAMS & CHARLES J. MEYERS, *OIL & GAS LAW* § 222 at 335 (2007) ("[M]ineral severance should be construed as granting exclusive rights to subterranean strata for all purposes relating to minerals, whether 'native' or 'injected,' absent contrary language in the instrument severing the minerals.").

Wyoming Statute § 34-1-152 specifies that the surface owner owns the pore space underlying its lands.<sup>17</sup> The statute also provides that ownership of pore space is conveyed with the overlying real property unless the pore space has been previously conveyed or is excluded from the conveyance.<sup>18</sup> With the enactment of this legislation, pore space ownership can be conveyed in the same manner as mineral interests, but no conveyance of mineral interests shall convey the pore space unless the conveyance expressly so states.<sup>19</sup> In addition, legal requirements for notice to surface owners and/or mineral interest owners shall not be construed to require notice to the pore space owner unless the law specifies that such notice to the pore space owner is required.<sup>20</sup> The statute expressly recognizes the dominance of the mineral estate and does not alter the common law as it relates to the rights of the mineral estate.<sup>21</sup>

Significantly, Wyoming Statute § 34-1-152 requires that a transfer of pore space be accompanied by a description of any right to use the overlying surface estate and that the pore space owners' right to use the surface is restricted to what is described in a properly recorded instrument.<sup>22</sup> Transfers of pore space rights made after July 1, 2008, are null and void at the option of the surface owner if the instrument of conveyance does not include a specific description of the location of the transferred pore space.<sup>23</sup> If a surface description is used to describe the location of the transferred pore space, the pore space conveyance shall include all strata underlying the surface, unless specifically excluded.<sup>24</sup>

House Bill 89 also amended the Uniform Conservation Easement Act.<sup>25</sup> This amendment provides that the mineral interest owners' rights to use the surface are not limited by a conservation easement "unless the owners and lessees of the entire mineral estate and geologic sequestration right are a party to" or consent to the conservation easement.<sup>26</sup>

The legislature specified that all conveyances of real property on or after July 1, 2008, shall be construed in conformity with this legislation. Conveyances prior to July 1, 2008, also shall be construed in conformity with this legislation unless a party claiming an ownership interest contrary to the provisions of the legislation

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<sup>17</sup> WYO. STAT. ANN. § 34-1-152(a) (2008).

<sup>18</sup> *Id.* § 34-1-152(b).

<sup>19</sup> *Id.*

<sup>20</sup> *Id.* § 34-1-152(c).

<sup>21</sup> *Id.* § 34-1-152(e).

<sup>22</sup> WYO. STAT. ANN. § 34-1-152(f).

<sup>23</sup> *Id.* § 34-1-152(g).

<sup>24</sup> *Id.*

<sup>25</sup> *Id.* § 34-1-202.

<sup>26</sup> *Id.* § 34-1-202(e).

can establish such ownership by “a preponderance of the evidence in an action to establish ownership of such interest.”<sup>27</sup>

*B. House Bill 90*

House Bill 90, entitled “Carbon capture and sequestration,” created Wyoming Statute §§ 30-5-501 and 35-11-313 and amended Wyoming Statute § 35-11-103(c). Like the pore space ownership bill (HB 89), Wyoming’s carbon capture and sequestration legislation recognizes the continuing dominance of the mineral estate.<sup>28</sup> Wyoming Statute § 30-5-501 states specifically that the carbon sequestration legislation enacted by Wyoming Statute § 35-11-313 shall not “affect the otherwise lawful right of a surface or mineral owner to drill or bore through a geologic sequestration site” so long as the drilling is conducted in conformity with rules for protecting the sequestration site against the escape of CO<sub>2</sub>.<sup>29</sup>

Wyoming’s GCS legislation calls for the management of CO<sub>2</sub> sequestration under the Underground Injection Control (“UIC”) program of Part C of the United States Environmental Protection Agency’s Safe Drinking Water Act (“SDWA”).<sup>30</sup> Wyoming’s legislation specifically calls for the Wyoming Department of Environmental Quality (“DEQ”) to create subclasses of wells within the UIC program for the injection of CO<sub>2</sub> that will protect “human health, safety and the environment and allow for the permitting of the geologic sequestration of carbon dioxide.”<sup>31</sup>

Wyoming’s legislation also contains an overt attempt to attract pilot-scale GCS projects. This is found in a provision that allows the DEQ to issue “temporary time limited permits for pilot scale testing of technologies for geologic sequestration” under the department’s “current rules and regulations.”<sup>32</sup> Thus a pilot scale project can proceed at this time in Wyoming under the current UIC rules and regulations without the imposition of any GCS-specific permit or bonding requirements. This enticement presumably will be short-lived and eliminated once the DEQ adopts rules and regulations setting forth sequestration permit requirements.

The GCS legislation charges the DEQ water quality administrator with recommending permit requirements to the DEQ director.<sup>33</sup> The permit requirements shall include:

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<sup>27</sup> H.B. 89 § 3, 59th Leg. (Wyo. 2008).

<sup>28</sup> WYO. STAT. ANN. § 30-5-501.

<sup>29</sup> *Id.*

<sup>30</sup> *Id.* § 35-11-313(f)(i); 42 U.S.C. § 300h (2006); Wyo. Dep’t Env’tl. Quality, Water Quality Div. Rules & Regulations Ch. 8 & Ch. 12 (2008).

<sup>31</sup> WYO. STAT. ANN. § 35-11-313(f)(i).

<sup>32</sup> *Id.* § 35-11-313(d).

<sup>33</sup> *Id.* § 35-11-313(f)(ii).



- (1) a description of the geology of the area to be affected by the injection of CO<sub>2</sub>;
- (2) characteristics of the injection zone and overlying and underlying aquifers;
- (3) identification of existing well holes within and adjacent to the sequestration site;
- (4) assessment of impacts of CO<sub>2</sub> injection and storage and mitigation measures;
- (5) plans for environmental surveillance and excursion detection, prevention, and control programs;
- (6) site and facilities description and documentation of applicants' rights to sequester CO<sub>2</sub> into the proposed injection zone;
- (7) proof that injection wells meet the design and construction standards set forth by the Wyoming oil and gas conservation commission;<sup>34</sup>
- (8) mechanical integrity testing plan;
- (9) monitoring plan;
- (10) proof of adequate bonding or financial assurance;
- (11) post-closure monitoring, verification, maintenance, and mitigation;
- (12) proof of applicant's notice of subsurface interests to surface owners, mineral claimants, mineral owners, lessees, and other owners of record. Such notice shall:
  - (a) be published once a week for four (4) weeks in a newspaper in the county where sequestration is to occur;
  - (b) be mailed to all surface owners, mineral claimants, mineral owners, lessees, and other owners of record that

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<sup>34</sup> See Wyo. Oil & Gas Conservation Comm'n Rules & Regulations, Ch. 3 & Ch. 4 (2008), for injection well design and construction requirements.

are located within one (1) mile of a proposed boundary of the sequestration site;

(c) contain a statement of the DEQ requirement that immediate verbal notice be given to the DEQ of any excursion and that this verbal notice be followed by written notice to all surface owners, mineral claimants, mineral owners, lessees, and other owners of record within thirty (30) days of the discovery of the excursion;

(d) contain procedures for termination or modification of any applicable UIC permit if an excursion cannot be controlled or mitigated; and

(e) contain any other necessary conditions and requirements.

In addition to permit requirements, Wyoming Statute § 35-11-313 also creates a working group comprised of the state oil and gas supervisor, the state geologist, and the director of the DEQ.<sup>35</sup> This working group is charged with consulting on the draft permit requirements proposed by the administrator of DEQ's Water Quality Division. The working group also is tasked with developing appropriate bonding procedures and other financial assurance methods to ensure that any GCS-related reclamation or mitigation costs incurred by the state are covered.<sup>36</sup> The bond shall remain in place during operations as well as during the post-closure care period, and the working group is charged with recommending an appropriate duration for the post-closure care period to the joint minerals, business, and economic development and the joint judiciary interim committees on or before September 30, 2009.<sup>37</sup>

Wyoming Statute § 35-11-313 also articulates the role of the Wyoming Oil and Gas Conservation Commission ("WOGCC") in CO<sub>2</sub> injection and subsequent withdrawal. Historically, CO<sub>2</sub> injection for enhanced oil recovery ("EOR") has fallen within the jurisdiction of the WOGCC and this remains unchanged by the new GCS legislation.<sup>38</sup> However, once a program initiated as EOR ceases and becomes CO<sub>2</sub> storage, the injection program moves to the jurisdiction of the DEQ and is monitored under the UIC program.<sup>39</sup> If sequestered CO<sub>2</sub> is

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<sup>35</sup> WYO. STAT. ANN. § 35-11-313(g).

<sup>36</sup> *Id.*

<sup>37</sup> *Id.*

<sup>38</sup> *Id.* § 35-11-313(b); Wyo. Oil & Gas Conservation Comm'n Rules & Regulations, Ch. 4.

<sup>39</sup> WYO. STAT. ANN. § 35-11-313(c).

withdrawn from storage, the withdrawal program reverts back to the jurisdiction of the WOGCC so long as the extracted CO<sub>2</sub> is intended for commercial or industrial purposes.<sup>40</sup>

Though House Bill 90 evidences Wyoming's embrace of a state-based approach to GCS, Wyoming's legislation also recognizes the possible role the United States Environmental Protection Agency ("EPA") may play in GCS.<sup>41</sup> Wyoming's legislation requires the DEQ's director "to recommend to the [environmental quality counsel] any changes that may be required to provide consistency and equivalency between the rules or regulations promulgated [under Wyoming's GCS legislation] and any promulgated for the regulation of carbon dioxide sequestration by the" EPA.<sup>42</sup> Thus Wyoming is forging ahead with GCS, but at the same time remains cognizant of the possible implications of any federal program adopted by the EPA.

#### IV. CRADLE TO GRAVE— THE NECESSARY SCOPE OF GCS LEGISLATION & REGULATION

A "cradle to grave" statutory and regulatory framework addressing the rights, responsibilities, and liabilities associated with carbon capture and storage is a necessary precursor to commercial-scale development of GCS in Wyoming and elsewhere. This is the approach advocated by the IOGCC in its Model Statute and General Rules and Regulations prepared by the Commission's Task Force on Carbon Capture and Geologic Storage.<sup>43</sup> Though the cradle to grave scope is advocated by the IOGCC, its Model Statute and Rules and Regulations lack this scope as does Wyoming's current GCS legislation. In addition, both Wyoming and the IOGCC embrace a state-based approach to GCS that may lack recognition of the necessary scale of GCS. If the motivation behind GCS is to ensure the future viability of coal-generated electricity, GCS projects need to capture and sequester, or at least demonstrate the potential to capture and sequester, CO<sub>2</sub> in amounts

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<sup>40</sup> *Id.* § 35-11-313(k).

<sup>41</sup> *Id.* § 35-11-313(j).

<sup>42</sup> *Id.* On July 25, 2008, the EPA issued proposed federal requirements under the Safe Drinking Water Act's UIC program for CO<sub>2</sub> geologic sequestration wells. 73 Fed. Reg. 43,492 (July 25, 2008) (to be codified at 40 C.F.R. pt. 144, 146). The proposed requirements are "based on the existing UIC regulatory framework, with modifications to address the unique nature of CO<sub>2</sub> injection for [GCS]." *Id.* The proposal calls for the creation of a new class of wells (Class VI) for the injection of CO<sub>2</sub> for sequestration, but maintains Class II wells for the injection of CO<sub>2</sub> for enhanced oil recovery operations. *Id.* The proposed requirements also establish "minimum technical criteria for the geologic site characterization, fluid movement, area of review ("AoR") and corrective action, well construction, operation, mechanical integrity testing, monitoring, well plugging, post-injection site care, and site closure for the purposes of protecting underground sources of drinking water ("USDWs)." *Id.* The deadline for comments on the proposal was November 24, 2008. *Id.*

<sup>43</sup> *IOGCC Guide, supra* note 16; Fish & Wood, *supra* note 6, at 3-2.

sufficient to temper concerns about the use of coal in power generation. Some consensus has coalesced around the idea that stabilizing GHG concentrations around 550 parts per million (“ppm”) by 2050 would “prevent most damaging climate change.”<sup>44</sup> To attain this goal, the scale of GCS needs to reach 3.6 gigatons (“Gt”) of CO<sub>2</sub> annually and enormous development is needed to sequester GCS on this scale.<sup>45</sup>

The cradle to grave scope of legislation and regulation necessary to foster the development of GCS on a commercial scale should address five broad and somewhat fluid categories: capture, transportation, siting, operation, and closure. Capture issues include the appropriate technology for determining and monitoring the concentrations of CO<sub>2</sub> in the post-combustion gas stream and the levels of other constituents that can be sequestered with the CO<sub>2</sub> without compromising the safety and integrity of the GCS project. Transportation includes the composition of the gas stream that can be safely transported via pipeline, as well as the location and acquisition of rights-of-way to build the necessary pipeline infrastructure to transport CO<sub>2</sub> from the power plant to the sequestration location. Siting issues are some of the most pressing and most contentious in the development of GCS. These issues include the applicability of eminent domain and/or unitization to the procurement of subsurface pore space on a scale sufficient to accommodate CO<sub>2</sub> sequestration projects, resolving multiple-use conflicts between various interest holders in and around the GCS site, and defining the characteristics of geologic formations sufficiently isolated and secure to contain injected CO<sub>2</sub> indefinitely. Operation issues include the mechanics of injection, such as the placement and drilling of injection and monitoring wells, as well as measurement, monitoring, and verification (“MMV”) procedures. Finally, closure issues include the determination of long-term liability and adequate bonding amounts and timeframes.

The following discusses, in turn, the five categories included in a cradle to grave statutory and regulatory framework—capture, transportation, siting, operation, and closure. The coverage each category receives in the IOGCC Model Statute and Model Rules and Regulations is compared to the treatment

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<sup>44</sup> S. Pacala & R. Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, 13 *SCIENCE* 968, 968 (2004); see Fish & Wood, *supra* note 6, at 3-1.

<sup>45</sup> Fish & Wood, *supra* note 6, at 3-1 to 3-2.

As an example, two of the largest current GCS experiments in the North Sea (Statoil's Sleipner Project) and Alberta (EnCana's Weyburn Project) each inject about a million metric tonnes (Mt) of CO<sub>2</sub> per year. A single 1,000 megawatts (Mw) coal-fired electrical facility emits between 5 Mt and 8 Mt of CO<sub>2</sub> per year. To reach the target of sequestering 3.6 Gt of CO<sub>2</sub> per year, the world would need 3,600 Sleipner- or Weyburn-size projects.

*Id.* at 3-1.

each category receives in Wyoming's GCS statutes. This analysis will illustrate the strengths and shortcomings of Wyoming's current GCS legislation, and with the IOGCC model provisions as a guide, provide a roadmap for developing the statutory and regulatory scope necessary for the commercial-scale development of GCS in Wyoming. Where the joint judicial interim committee has drafted GCS legislation likely to be introduced in the 2009 legislative session, this information will be included in the analysis.<sup>46</sup>

### A. Capture

In the cradle to grave scope of GCS legislation and regulation, capture issues include the requisite technology for determining and monitoring the concentrations of CO<sub>2</sub> in the post-combustion gas stream and the levels of other constituents that can be sequestered with the CO<sub>2</sub> without compromising the safety and integrity of the GCS project. The IOGCC addresses issues of capture in broad terms by defining CO<sub>2</sub> in the context of GCS as "anthropogenically sourced CO<sub>2</sub> of sufficient purity and quality as to not compromise the safety and efficiency of the reservoir to effectively contain the CO<sub>2</sub>."<sup>47</sup> The IOGCC's prior report had defined CO<sub>2</sub> more specifically as "a direct emissions stream with purity in excess of 95 percent or a processed emission stream with commercial value."<sup>48</sup> The IOGCC's most recent definition is intended to accommodate evolving capture technologies and new research regarding transportation and reservoir storage capabilities.<sup>49</sup> Ultimately, the IOGCC advocates a determination on a state-by-state basis as to how CO<sub>2</sub> suitable for sequestration will be defined and acknowledges this definition will evolve with the evolution of capture technologies.

In contrast to the IOGCC, Wyoming's GCS legislation does not address capture issues even in broad terms. Neither the current legislation nor the

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<sup>46</sup> Fifty-ninth Wyoming Legislature Approved Interim Committee Studies: 2008 Interim, Joint Judiciary Interim Committee, <http://legisweb.state.wy.us/2008/Interim/2008studies.htm>. The legislature has assigned the joint judiciary interim committee the task of examining "eminent domain and forced pooling issues" and has requested the joint minerals, business, and economic development committee "consider ways to promote and provide incentives for the development of commercial clean coal facilities in Wyoming." *Id.*

<sup>47</sup> *IOGCC Guide*, *supra* note 16, at 37. The IOGCC Model Statute and Rules and Regulations are the culmination of a two-phase, five-year process. *Id.* at 3. The Phase I report was released in 2005 and examined the "technical, policy, and regulatory issues related to the safe and effective storage of CO<sub>2</sub> in subsurface geological media" including oil and natural gas fields, coal seams, and deep saline formations. *Id.* The Phase II report was released in September 2007 and included a Model CO<sub>2</sub> Statute, Model Rules and Regulations governing CO<sub>2</sub> geologic storage, an explanation of the various components of each, and a report addressing ownership and injection issues associated with CO<sub>2</sub> sequestration. *Id.*

<sup>48</sup> *Id.* at 10.

<sup>49</sup> *Id.*

regulations it requires the DEQ to implement address CO<sub>2</sub> concentration or the permissible level of other constituents in the captured gas stream. Capture issues are not listed as a topic of consideration in the joint judiciary interim committee study of carbon capture and sequestration. Given the committee's discussions and draft legislation to date, it does not appear likely that capture issues will appear in legislation proposed by the committee during the 2009 legislative session. Wyoming needs to address capture issues via legislation or regulation. Under the current GCS statutes, the concentration of CO<sub>2</sub> in the gas stream and the permissible level of other constituents could be addressed as a component of the statutory mandate to create new subclasses of wells for CO<sub>2</sub> sequestration under the UIC program.<sup>50</sup> These subclasses of wells could include constituent standards establishing the gas stream composition suitable for underground injection.

### *B. Transportation*

At least two areas of concern exist with transportation: (1) the concentration of CO<sub>2</sub> and the level of other constituents in the gas stream that can be safely transported via pipeline and (2) the acquisition of rights-of-way for CO<sub>2</sub> pipelines. As with capture, new technologies may impact the ability to safely and cost effectively transport CO<sub>2</sub> over long distances. The IOGCC recognizes the role emerging technologies may play in regulation of the transportation of CO<sub>2</sub> for GCS and advocates a regulatory scheme that evolves to accommodate these technologies.<sup>51</sup> However, the IOGCC stops short of addressing either transportation of CO<sub>2</sub> from the site of production to the site of sequestration or acquisition of rights-of-way for CO<sub>2</sub> sequestration pipelines.

Like the IOGCC, Wyoming's GCS legislation does not address transportation issues associated with CO<sub>2</sub> sequestration. The current GCS provisions do not specify the concentration of CO<sub>2</sub> or the level of other constituents in the gas stream that may be transported via pipeline. In addition, the state's GCS provisions do not address acquisition of sequestration pipeline rights-of-way, and under Wyoming's current constitutional and statutory provisions, it is not clear whether a right-of-way for a CO<sub>2</sub> sequestration pipeline could be acquired absent the surface owner's consent. Though Wyoming Statute § 1-26-814 grants the right of eminent domain to "petroleum and other companies," the Wyoming Supreme Court has not determined whether CO<sub>2</sub> sequestration pipeline companies are "pipeline companies" within the meaning of the statute. And even if this question is answered in the affirmative, the sequestration pipeline company must meet the

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<sup>50</sup> WYO. STAT. ANN. § 35-11-313(f)(i) (2008).

<sup>51</sup> IOGCC *Guide*, *supra* note 16, at 10.

requirements of Wyoming Statute § 1-26-504(a) before a pipeline right-of-way can be condemned.<sup>52</sup> These requirements include:

- (i) The public interest and necessity require the project or the use of eminent domain is authorized by the Wyoming Constitution;
- (ii) The project is planned or located in the manner that will be most compatible with the greatest public good and the least private injury; and
- (iii) The property sought to be acquired is necessary for the project.<sup>53</sup>

The project-specific requirements of planning for the greatest public good and least private injury as well as acquiring only the property necessary for the project necessarily will be evaluated by Wyoming's courts on a case-by-case basis, and thus an analysis of these requirements is not included here. However, the requisite showing that "[t]he public interest and necessity require the project" will remain relatively consistent across the majority of CO<sub>2</sub> sequestration projects and warrants further consideration. The Wyoming Supreme Court "has ascribed a broad meaning to the phrase 'public interest and necessity,' and that is consistent with the overall tenor of Wyoming's eminent domain statutes."<sup>54</sup> A condemnor seeking "to establish the requirement of necessity in an eminent domain proceeding . . . need only show a reasonable necessity for the project."<sup>55</sup> "Necessity" in this context means "reasonably convenient or useful to the public."<sup>56</sup> The Wyoming Supreme Court specifically has "acknowledged that condemnation in aid of mineral development is in the public interest."<sup>57</sup> The Court has recognized "the great public interest in an imminent need for energy," and that the urgency of this need "has now become one of survival."<sup>58</sup> The Court "think[s] it plain beyond any doubt that the intended purpose of the [eminent domain] constitutional provision and statutes was to facilitate the development of our state's resources," and that such development serves "the common good."<sup>59</sup> The state's and the

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<sup>52</sup> See Matt Micheli & Mike Smith, *The More Things Change, the More Things Stay the Same: A Practitioner's Guide to Recent Changes to Wyoming's Eminent Domain Act*, 8 WYO. L. REV. 1 (2008) for a discussion of Wyoming's constitutional and statutory eminent domain requirements.

<sup>53</sup> WYO. STAT. ANN. § 1-26-504(a)(i)–(iii).

<sup>54</sup> *Bridle Bit Ranch Co. v. Basin Electric Power Coop.*, 118 P.3d 996, 1014 (Wyo. 2005).

<sup>55</sup> *Board of County Comm'rs of Johnson County v. Atter*, 734 P.2d 549, 553 (Wyo. 1987).

<sup>56</sup> *Id.* (quoting *City of Dayton v. Keys*, 252 N.E.2d 655, 659 (Ohio 1969)).

<sup>57</sup> Micheli & Smith, *supra* note 52, at 5.

<sup>58</sup> *Coronado Oil Co. v. Greives*, 603 P.2d 406, 411 (Wyo. 1979).

<sup>59</sup> *Id.* at 410.



nation's need for energy, the need to reduce CO<sub>2</sub> emissions in order for coal to remain a viable source of energy given current socio-political and environmental concerns, and the state's economic dependence on coal all support an argument that CO<sub>2</sub> sequestration and related pipelines are required by the public interest and necessity.

Thus it appears that a CO<sub>2</sub> sequestration pipeline may satisfy the first requirement of Wyoming Statute § 1-26-504(a), and if the pipeline is planned in accordance with the greatest good and least harm and the property sought to be condemned is necessary to the project, a CO<sub>2</sub> sequestration pipeline company may be able to condemn a pipeline right-of-way under Wyoming's existing eminent domain provisions.

### C. Siting

The issues surrounding the siting of CO<sub>2</sub> sequestration reservoirs are some of the most challenging for GCS legislation and regulation. These challenges include the need to determine all surface and subsurface interest owners, including interest owners in the subsurface pore space, and the need to acquire storage rights in the subsurface pore space on a scale sufficient to accommodate CO<sub>2</sub> sequestration projects. Siting challenges also include resolving multiple-use conflicts between various interest holders in and around the GCS site. And, of course, siting legislation and regulation must address the characteristics of storage formations that have the geologic integrity to contain injected CO<sub>2</sub> indefinitely.

The IOGCC adopts the position that the surface owner owns the subsurface pore space unless this ownership interest specifically has been conveyed,<sup>60</sup> and the IOGCC addresses the need for eminent domain and/or unitization so that storage rights can be acquired on the scale necessary for GCS.<sup>61</sup> The IOGCC also sets out a regulatory framework and public hearing process whereby the conflicting property rights of various interest holders in and around a proposed reservoir are settled via a Rights Amalgamation Hearing.<sup>62</sup> In addition, the IOGCC focuses on the need to locate GCS in geologically isolated formations capable of containing the CO<sub>2</sub> for an indefinite period and proposes specific regulatory requirements to ensure this need is met.<sup>63</sup> Like the IOGCC, Wyoming's legislature has recognized the need to address siting issues. As stated above, Wyoming Statute § 34-1-152 declares the subsurface pore space is owned by the surface owner.<sup>64</sup> And though the current GCS legislation does not address the use of eminent domain or

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<sup>60</sup> *IOGCC Guide*, *supra* note 16, at 22.

<sup>61</sup> *Id.* at 25, 27, 33.

<sup>62</sup> *Id.* at 42.

<sup>63</sup> *Id.* at 26, 28, 33, 39–40.

<sup>64</sup> WYO. STAT. ANN. § 34-1-152(a) (2008).



unitization to acquire the rights to the pore space, the legislature recognizes the need to address this topic and has assigned it as the first priority of the 2008 joint judiciary interim committee. Wyoming's legislature also has attempted to address conflicts between multiple interest owners in and around proposed GCS reservoirs by asserting that the dominance of the mineral estate remains unaltered by the GCS legislation.<sup>65</sup> Despite this declaration, further legislation or regulation may be needed to address the complex conflicts that may arise between multiple interest owners. In addition, Wyoming's current GCS legislation specifies the geologic information that must accompany a permit application and mandates the development of regulations to further clarify requirements for geologic isolation of proposed reservoirs.<sup>66</sup>

### 1. *Eminent Domain/Unitization*

Wyoming has resolved the question of ownership of subsurface pore space in favor of the surface owner; however, Wyoming's GCS legislation leaves unanswered how these rights are to be amalgamated so that the storage space can be acquired on a scale sufficient to allow GCS. In an effort to address this issue, the joint judiciary committee has voted to sponsor pore space unitization legislation during the 2009 legislative session.<sup>67</sup> This proposed legislation applies the oil and gas unitization model to the unitization of pore space, and several issues are raised by this approach.<sup>68</sup>

First and foremost, amalgamation of pore space for GCS by its very nature has constitutional implications. The draft unitization legislation recognizes this issue and contains a note stating:

The approach taken in these provisions avoids allowing unit operators to take pore space for their use and then compensate the pore space owner. Such a regulatory scheme likely would raise concerns about unconstitutional takings. Instead, these provisions track the constitutionally valid approach taken in the oil and gas unitization/forced pooling statutes.<sup>69</sup>

The "constitutionally valid" approach taken in oil and gas unitization brings together the leases and wells overlying a producing formation so that the producing formation or large portions thereof are contained within and administered as one

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<sup>65</sup> *Id.* §§ 34-1-152(e), 30-5-501.

<sup>66</sup> *Id.* § 35-11-313(f)(ii).

<sup>67</sup> Joint Judiciary Interim Committee Draft Bills, Sequestration site unitization, Bill Draft 09LSO-0153.W4, <http://legisweb.state.wy.us/2008/interim/Jud/bills.HTM>.

<sup>68</sup> *Id.*

<sup>69</sup> *Id.*

unit.<sup>70</sup> The goals of oil and gas unitization are “conserving resources by preventing waste and protecting landowners’ correlative rights.”<sup>71</sup> Such an arrangement allows multiple lessees to share in the risks and costs of oil and gas production and to share in the benefits of production. Interest owners in an oil and gas unit receive compensation for, or take-in-kind, the minerals produced from the unit in proportion to their interest in the unit.<sup>72</sup> An interest in oil and gas is an inchoate interest in the right to produce the mineral, and this right becomes a personal property interest in the mineral only upon the mineral’s production and severance.<sup>73</sup>

In contrast to oil and gas unitization, pore space unitization would pool real property interests in the subsurface pore space for the purpose of permanently placing CO<sub>2</sub> on the property, which is a process that may be more akin to the exercise of eminent domain than unitization. In addition, since nothing is produced in GCS, the source of compensation for the use of the pore space is uncertain. As currently written, the draft pore space unitization legislation suggests compensating the pore space owner with its proportionate share of any economic benefits generated by the CO<sub>2</sub> injector.<sup>74</sup> However, without further development of carbon markets and monetization of carbon credits or increased demand for CO<sub>2</sub> as a commodity, revenue generation via sequestration remains uncertain.

Though legislation is needed that allows for the amalgamation of pore space on a scale sufficient for GCS, application of the oil and gas unitization model to pore space unitization remains untested. The current draft of the unitization bill may raise constitutional issues by allowing a GCS developer to “force pool” an unwilling pore space owner instead of requiring the GCS developer to pursue condemnation of the pore space owner’s property.<sup>75</sup> Though recent legislative

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<sup>70</sup> WILLIAMS & MEYERS, *supra* note 16, at 1109–1110 (2007); see *Trout v. Wyo. Oil Gas Conservation Comm’n*, 721 P.2d 1047, 1051 (Wyo. 1986).

<sup>71</sup> WILLIAMS & MEYERS, *supra* note 16 at, 1110 (2007); see *Trout*, 721 P.2d at 1051. The sequestration site unitization legislation sponsored by the joint judiciary committee redefines the oil and gas concepts of “waste” and “correlative rights” in terms of GCS. Joint Judiciary Interim Committee Draft Bills, Sequestration site unitization, Bill Draft 09LSO-0153.W4, <http://legisweb.state.wy.us/2008/interim/Jud/bills.HTM>. The implications of these new, GCS-specific definitions of “waste” and “correlative rights” warrant analysis beyond the scope of this article.

<sup>72</sup> *Anschutz Corp. v. Wyo. Oil & Gas Conservation Comm’n*, 923 P.2d 751, 757 (1996) (“When [in forced pooling] it is not practicable to determine reserves under each tract, it is reasonable to use surface acreage formula allocating production.”).

<sup>73</sup> See *State v. Pennzoil Co.*, 752 P.2d 975, 980 (Wyo. 1988); *Denver Joint Stock Land Bank v. Dixon*, 122 P.2d 842, 849 (Wyo. 1942); *Boatman v. Andre*, 12 P.2d 370, 374 (Wyo. 1932).

<sup>74</sup> Joint Judiciary Interim Committee Draft Bills, Sequestration site unitization, Bill Draft 09LSO-0153.W4, at 3, <http://legisweb.state.wy.us/2008/interim/Jud/bills.HTM>.

<sup>75</sup> Constitutional requirements for taking private property include Wyo. Const. art. 1, § 32 (“Private property shall not be taken for private use unless by consent of the owner, except for private ways of necessity, and for reservoirs, drains, flumes or ditches on or across the lands of

battles have dulled the legislature's appetite for amending the state's eminent domain provisions, such amendment may be necessary to allow private property to be taken for GCS projects and may prove a more certain path to encouraging the development of GCS projects in Wyoming.

## 2. *Multiple Use Conflicts*<sup>76</sup>

Wyoming's legislature has attempted to head off conflicts between multiple interest owners in and around proposed GCS reservoirs by asserting that the GCS legislation does not alter the dominance of the mineral estate.<sup>77</sup> Nevertheless, this declaration does not address the full range of scenarios that may arise between multiple interest owners, and any GCS siting decision may create the potential for conflict between surface and mineral interest owners and owners of sequestration rights. For example, Wyoming's GCS legislation restricts the pore space owner's right to use the surface estate to what is stated expressly in the instrument of conveyance or set out in a properly recorded instrument.<sup>78</sup> Given these restrictions, conflicts may arise where a party seeking to sequester CO<sub>2</sub> has acquired rights to the necessary pore space but not the rights to enter upon or use the surface. And despite the legislature's declaration that the mineral estate remains the dominant estate, conflicts may arise where a mineral interest is conveyed subsequent to the conveyance of a conflicting sequestration interest. The joint judiciary committee has recognized the need to further address these and other multiple use conflicts and has voted to introduce two bills during the 2009 legislative session further clarifying interest owners' respective rights and the dominance of the mineral estate.<sup>79</sup>

## 3. *Geologic Isolation*

Wyoming and the IOGCC recognize the importance of siting GCS projects in appropriate geologic formations. These formations need to be large enough to store the requisite volumes of CO<sub>2</sub> and geologically isolated so as to protect the rights of surrounding interest holders. The IOGCC proposes that GCS projects be required to obtain a permit before commencing injection and that

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others for agricultural, mining, milling, domestic or sanitary purposes, nor in any case without due compensation.") and Wyo. Const. art. 1, § 33 ("Private property shall not be taken or damaged for public or private use without just compensation.").

<sup>76</sup> E-mail from Owen L. Anderson, Eugene Kuntz Chair in Oil, Gas & Natural Resources, University of Oklahoma College of Law, to Delissa Hayano, Attorney, Holland & Hart LLP (Oct. 30, 2008) (on file with author) (discussing multiple use conflicts that may need to be addressed by regulation despite the statute's assertion of the dominance of the mineral estate).

<sup>77</sup> WYO. STAT. ANN. §§ 34-1-152(e), 30-5-501 (2008).

<sup>78</sup> *Id.* § 34-1-152(f).

<sup>79</sup> Joint Judiciary Interim Committee Draft Bills, Bill Draft 09LSO-0154.W1, 09LSO-0310.W1, & 09LSO-0311.W1, <http://legisweb.state.wy.us/2008/interim/Jud/bills.HTM>.

said permit be granted only where the state regulatory agency has determined: (1) the reservoir proposed for injection is “suitable and feasible for the injection and storage of” CO<sub>2</sub>; (2) use of the proposed storage facility “will not contaminate other formations containing fresh water or oil, gas, coal, or other commercial mineral deposits;” and (3) “the proposed storage will not unduly endanger human health and the environment and is in the public interest.”<sup>80</sup> Though Wyoming’s current GCS legislation lacks the clear directives of the IOGCC model, it does require the Water Quality Division of the DEQ to propose rules and regulations addressing the geologic fitness of reservoirs proposed for CO<sub>2</sub> sequestration.<sup>81</sup>

Geologic isolation is critical to the protection of interests in formations surrounding the CO<sub>2</sub> sequestration reservoir. Wyoming’s GCS legislation makes clear that the mineral interest remains the dominant interest even after the enactment of the state’s GCS statutes.<sup>82</sup> Though the dominance of the mineral estate is made clear and the mineral interest owner may drill through a CO<sub>2</sub> sequestration reservoir to access mineral rights below the reservoir, the question of liability for wells completed into or through the sequestration formation and abandoned prior to the acquisition of the formation for CO<sub>2</sub> sequestration remains unanswered. If well bores are abandoned in accordance with WOGCC rules and regulations for plugging and abandonment, will these requirements be adequate to prevent failure of the plug when the previously depleted reservoir is injected with CO<sub>2</sub> and brought to pressures exceeding those present in the reservoir when the wells were plugged and abandoned? If those old well plugs begin to fail at the new CO<sub>2</sub> reservoir pressures and communication occurs between the sequestration formation and surrounding formations or the surface, who will be liable? These are real and important questions as many of Wyoming’s depleted oil and natural gas reservoirs currently eyed as likely candidates for CO<sub>2</sub> sequestration are pin cushions riddled with hundreds, if not thousands, of old drill holes and well bores. Though Wyoming’s legislation requires that permit applications identify “all other drill holes and operating wells that exist within or adjacent to the proposed sequestration site,” it stops short of requiring that the applicant verify the integrity of abandoned well bores and drill holes at the proposed reservoir pressures. It is not clear how the DEQ’s Water Quality Division will evaluate the well bore and drill hole information, whether the division has the personnel to do so, and how Wyoming’s courts will assign liability for any plugged and abandoned drill or well holes that fail as the result of a previously depleted reservoir being brought to the pressures associated with CO<sub>2</sub> injection.

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<sup>80</sup> *IOGCC Guide*, *supra* note 16, at 33.

<sup>81</sup> WYO. STAT. ANN. § 35-11-313(f)(ii).

<sup>82</sup> *Id.* §§ 30-5-501, 34-1-152(e).

#### D. Operation

The sections above have addressed capture, transportation, and siting issues, which are necessary prerequisites for getting a GCS project in place. A cradle to grave statutory and regulatory scope for GCS also needs to address the operation of a GCS project once it is in place and the closure of a GCS project once CO<sub>2</sub> injection is complete. This section will address GCS operational issues and the following section will address closure issues.

Operation issues associated with GCS include the mechanics of injection, such as the placement and drilling of injection and monitoring wells, as well as measurement, monitoring, and verification (“MMV”) procedures. The IOGCC’s proposed injection well requirements include practices designed to protect underground sources of drinking water and include well drilling, casing, sealing, and plugging requirements intended to prevent communication between formations used for CO<sub>2</sub> storage and surrounding formations and to prevent escape of CO<sub>2</sub> at the surface.<sup>83</sup> The IOGCC also includes special requirements intended to address the corrosive nature of CO<sub>2</sub>. As part of the requirements for obtaining an operating permit, the IOGCC Task Force recommends the operator submit a CO<sub>2</sub> injection plan “that includes a description of mechanisms of geologic confinement” and specifically addresses how the mechanisms of confinement will “prevent migration of CO<sub>2</sub> beyond the proposed storage reservoir.”<sup>84</sup>

Prevention and early detection of the migration of CO<sub>2</sub> are further addressed by the IOGCC’s suggested MMV requirements. The MMV requirements focus on subsurface monitoring via observation wells completed within the CO<sub>2</sub> storage reservoir and in underlying formations and overlying formations. The IOGCC Task Force has determined that subsurface monitoring “would be the best mechanism to protect public health and safety and the environment and offer sufficient time to address the cause of . . . leakage.”<sup>85</sup> Under the IOGCC plan, GCS operators would have to submit and obtain approval of detailed monitoring plans prior to project approval.<sup>86</sup>

As stated above, Wyoming’s GCS program falls under the umbrella of the UIC program of the EPA’s SDWA and § 404 of the Clean Water Act.<sup>87</sup> Like the IOGCC Model, Wyoming’s legislation requires that permit applications contain

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<sup>83</sup> *IOGCC Guide*, *supra* note 16, at 39–46.

<sup>84</sup> *Id.* at 26.

<sup>85</sup> *Id.*

<sup>86</sup> *Id.*

<sup>87</sup> 42 U.S.C. § 300(h) (2006); 33 U.S.C. § 404 (2006). The IOGCC also notes the applicability of the SDWA’s UIC program and the CWA § 404. *IOGCC Guide*, *supra* note 16, at 12, 35, 38.

“[p]lans and procedures for environmental surveillance and excursion detection, prevention and control programs.”<sup>88</sup> But many of the specific provisions addressed by the IOGCC have been left by Wyoming’s legislature to the Water Quality Division’s proposed rules and regulations. Until the DEQ has proposed its rules for permit requirements, comment on Wyoming’s operational and MMV provisions would be speculation. It should be noted, though, that the IOGCC’s suggested operational and MMV provisions provide a solid foundation from which the legislature and the DEQ can draw as they work to develop Wyoming’s GCS operation requirements.

### *E. Closure*

The final category that needs to be addressed within the scope of GCS legislation is closure. Closure requires the determination of long-term liability and adequate bonding amounts and timeframes.<sup>89</sup> The IOGCC proposes a two-phase closure process divided into a Closure Period and a Post-Closure Period. The Closure Period begins after injection activities cease and injection wells have been plugged and continues for a set number of years (ten years is the time frame suggested by the IOGCC). During the ten-year Closure Period, the GCS operator maintains liability for the GCS project and is responsible for continued monitoring of the reservoir. Under the IOGCC plan, individual well bonds would be released as the injection wells are plugged, but the operational bond would remain in place until the commencement of the Post-Closure Period. Once the Post-Closure Period begins, the operational bond is released and the liability for ensuring that the GCS project remains a secure storage site transfers to the state. Funding for the state’s monitoring and remediation activities would be provided by a trust fund created specifically for this purpose and funded by an injection fee imposed on GCS operators on a per ton basis.

The IOGCC recommends operational and per well performance bond requirements sufficient to cover all surface facilities as well as plugging and abandonment, injection well remediation, and subsurface observation well remediation. The IOGCC suggests applicable bond amounts should be calculated by using a standard methodology such as that used to calculate bond amounts for other regulated activities (e.g., the bond calculation methodology for coal mining under the Surface Mining Conservation and Reclamation Act).<sup>90</sup>

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<sup>88</sup> WYO. STAT. ANN. § 35-11-313(f)(ii)(E) (2008).

<sup>89</sup> See James A. Holtkamp, *Models Studied for Long-Term Liability Risks in CCS*, NATURAL GAS & ELECTRICITY, May 2008, at 12, for a discussion of liability risks associated with long-term sequestration of CO<sub>2</sub>.

<sup>90</sup> *IOGCC Guide*, *supra* note 16, at 26, 35, 41.

Wyoming appears to have rejected the IOGCC's approach to long-term liability. In Wyoming, the bond shall remain in place during the operational and post-closure care period. The working group created by Wyoming Statute § 35-11-313(g) is required to propose by September 30, 2009, adequate bonding amounts and the duration of the post-closure care period. Draft legislation of the joint judiciary interim committee titled "Responsibilities of sequestration injectors and pore space owners" appears to reject the IOGCC's idea that the state assume liability for the sequestration sites after a ten-year, post-closure period. The draft bill states that "[a]ll material injected into any geologic sequestration site . . . shall be presumed to be owned by the injector . . . and all rights, benefits, burdens and liabilities of ownership shall belong to the injector."<sup>91</sup> Whether the working groups' proposed post-care period would temper this assertion of injector liability is not clear, but at this point it does not appear likely that Wyoming will assume liability for sequestration sites.

## V. CONCLUSION

Wyoming's GCS statutes lack the cradle to grave scope necessary to support commercial-scale GCS development. Admittedly, House Bills 89 and 90 are Wyoming's first foray into GCS and the legislature has evidenced an intent to address several additional and necessary issues, but in its current state, Wyoming's GCS legislation does not adequately address capture, transportation, siting, operation, or closure issues. Given the socio-political and environmental pressure to limit CO<sub>2</sub> emissions from coal-fired power plants, Wyoming's state-based approach may not bring to the table sufficient sequestration capacity to assuage the current concerns about the contribution of anthropogenic CO<sub>2</sub> emissions to global warming. Though the IOGCC also advocates a state-based approach to GCS, consideration of the other aspects of the IOGCC's models would serve the State well as it continues to develop the State's GCS program.

Wyoming's pioneering GCS legislation, while a step toward encouraging development of pilot-scale research projects, needs to move forward carefully and thoughtfully. The future of one of Wyoming's economic pillars depends on the future viability of coal-fired power plants. Thus, Wyoming should not rush to implement a statutory and regulatory framework that does not recognize the complexity and scale of the socio-political and environmental factors present in the discourse that will determine the future viability of coal as a source of power generation.

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<sup>91</sup> Joint Judiciary Interim Committee Draft Bills, Responsibilities of sequestration injectors and pore space owners, Bill Draft 09LSO-0154.W1, at 2, <http://legisweb.state.wy.us/2008/interim/Jud/bills.HTM>.



## APPENDIX A

## CARBON SEQUESTRATION LEGISLATION BY STATE

*Arizona*

- Proposed legislation would require the adoption of rules requiring GHG emissions reporting, setting a GHG emissions limit to be achieved by 2021, and identifying emissions reduction measures including carbon sequestration.<sup>92</sup>

*California*

- Proposed tax incentives for “Clean energy technology” include reduced emissions via geologic sequestration.<sup>93</sup>
- By 2009, the State Board of Health and Safety shall identify opportunities for emission reduction measures from all verifiable and enforceable voluntary actions, including, but not limited to, carbon sequestration projects and best management practices.<sup>94</sup>

*Colorado*

- Grant of \$50,000 to Colorado State University to research the potential of terrestrial carbon sequestration, and a grant of \$50,000 to Colorado School of Mines to research the potential of geological carbon sequestration.<sup>95</sup>
- The Colorado Public Utilities Commission is to consider proposals by Colorado electric utilities to build one or more demonstration power plants using IGCC electric generation technology and demonstrate the capture and sequestration of a portion of its CO<sub>2</sub> emissions.<sup>96</sup>
- The Colorado Clean Energy Development Authority Act, Colorado Revised Statute §§ 40-9.7-101 to 40-9.7-123, created the Colorado Clean Energy Development Authority (“CCEDA”), which is charged with recommending whether clean coal technologies that have the potential for substantial sequestration of carbon emissions should be considered clean energy projects that the CCEDA may finance, refinance, or otherwise support, and, if so, the nature and extent of any restrictions, including, but not limited to, specific

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<sup>92</sup> H.B. 2542, 48th Leg., 2d Reg. Sess. (Az. 2008).

<sup>93</sup> S.B. 1484, 2007–2008 Sess. (Cal. 2008).

<sup>94</sup> CAL. HEALTH & SAFETY CODE §§ 38560–38565 (2006).

<sup>95</sup> COLO. REV. STAT. § 25-1-1303 (2006).

<sup>96</sup> *Id.* § 40-2-123.



CO<sub>2</sub> emissions sequestration requirements that such projects should satisfy as a prerequisite to authority financing, refinancing, or other support.<sup>97</sup>

### *Idaho*

- Idaho has established a Carbon Sequestration Assessment Fund.<sup>98</sup>
- The Idaho Carbon Sequestration Advisory Committee may: (1) encourage production of educational and advisory materials regarding carbon sequestration; (2) identify and recommend areas of research needed to better understand and quantify the processes of carbon sequestration on agricultural lands; and (3) review carbon sequestration programs of other states.<sup>99</sup>

### *Montana*

- The “Clean and Green” Energy bill was approved to provide tax incentives for equipment that sequesters carbon.<sup>100</sup>
- Montana has created the Big Sky Sequestration Partnership, led by Montana State University, which combines state-funded study of storage areas, storage standards, and similar issues, as part of one of DOE’s seven approved regional partnerships. In 2007-2008, Montana’s Environmental Quality Council studied the issue of carbon sequestration.<sup>101</sup>
- The Governor’s Climate Change Advisory Committee completed inventory of GHG sources (primarily CO<sub>2</sub>) in Montana. In November 2007, the Committee submitted a general report with fifty-four policy recommendations that are designed to help reduce Montana’s emissions of GHGs to 1990 levels by the year 2020.<sup>102</sup>
- Montana Public Service Commission may not approve a utility company’s acquisition of an equity interest in a coal-fired power plant constructed after January 1, 2007, unless the facility captures and sequesters a minimum of 50% of the CO<sub>2</sub> produced, either on- or off-site.<sup>103</sup>

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<sup>97</sup> *Id.* § 40-9.7-106.

<sup>98</sup> IDAHO CODE ANN. § 22-5206 (2003).

<sup>99</sup> *Id.* § 22-5203.

<sup>100</sup> MONT. CODE ANN. §§ 15-6-158, 15-24-3111 (2007).

<sup>101</sup> Sonja Nowakowski, *Carbon Sequestration Study: An analysis of geological and terrestrial carbon sequestration regulatory and policy issues*, Oct. 2008, [http://leg.mt.gov/content/Publications/committees/interim/2007\\_2008/2008carbonsequestration.pdf](http://leg.mt.gov/content/Publications/committees/interim/2007_2008/2008carbonsequestration.pdf).

<sup>102</sup> *Id.*

<sup>103</sup> MONT. CODE ANN. § 69-8-421.

- Bills drafted, but not yet introduced, include an interim study of geologic carbon sequestration and protection and compensation for surface owners of land overlying pore space that may be used for storage of CO<sub>2</sub>.<sup>104</sup>

### *Nevada*

- None.

### *New Mexico*

- Tax credits approved for certain coal-fired power plants that employ carbon capture and sequestration.<sup>105</sup>
- The New Mexico Public Utilities Commission shall consider appropriate performance-based financial or other incentives to encourage public utilities to develop and construct clean energy projects.<sup>106</sup>
- Refineries, certain electrical generating units, and cement manufacturing facilities are required to inventory and report CO<sub>2</sub>, and all GHS emissions are subject to voluntary reporting.<sup>107</sup>
- A Climate Action Team was formed pursuant to Executive Order (“EO”) 2006-69. The team members include representatives from nine agencies. The team advises the governor on agency compliance with mandates of the EO. New Mexico Energy, Minerals, and Natural Resources Department (“EMNRD”) fulfilled its EO mandate by working with a stakeholder group to explore and identify statutory and regulatory requirements needed to sequester CO<sub>2</sub>. The EMNRD report was issued to the team and the Governor on December 1, 2007.<sup>108</sup>

### *Oregon*

- Oregon Global Warming Commission will evaluate methods for carbon sequestration.<sup>109</sup>

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<sup>104</sup> See Energy and Telecommunications Interim Committee Draft Bills, Bill Draft LC4003, [http://leg.mt.gov/content/committees/interim/2007\\_2008/energy\\_telecom/assigned\\_studies/co2page/lc4003.pdf](http://leg.mt.gov/content/committees/interim/2007_2008/energy_telecom/assigned_studies/co2page/lc4003.pdf); Energy and Telecommunications Interim Committee Draft Bills, Bill Draft LC4002, [http://leg.mt.gov/content/committees/interim/2007\\_2008/energy\\_telecom/assigned\\_studies/co2page/lc4002.pdf](http://leg.mt.gov/content/committees/interim/2007_2008/energy_telecom/assigned_studies/co2page/lc4002.pdf).

<sup>105</sup> N.M. STAT. ANN. § 7-9G-2 (2007).

<sup>106</sup> *Id.* § 62-6-28.

<sup>107</sup> N.M. CODE R. § 20.2.87.1–20.2.87.202 (2008).

<sup>108</sup> N.M. Exec. Order No. 2006-69 (Dec. 28, 2006).

<sup>109</sup> OR. REV. STAT. § 468A.250 (2007).

- Energy Facility Siting Council has adopted rules relating to CO<sub>2</sub> offset projects, including carbon sequestration projects.<sup>110</sup>

### *Utah*

- Relevant state agencies are required to submit rules concerning geologic sequestration to the legislature by January 1, 2011, with a progress report on July 1, 2009.<sup>111</sup>

### *Washington*

- A CO<sub>2</sub> mitigation program is established for electric generation facilities.<sup>112</sup>
- The governor shall develop policy recommendations for the reduction of GHG emissions and present to the legislature. These recommendations shall include carbon sequestration options.<sup>113</sup>
- Legislation identifies the requirements for Class V wells used to inject CO<sub>2</sub> for permanent geologic sequestration.<sup>114</sup>

### *Wyoming*

- Wyoming is the first state to pass geologic sequestration legislation. The sequestration program is administered by the Wyoming Department of Environmental Quality.<sup>115</sup>
- The 2008 Wyoming Legislature appropriated \$250,000 to fund the working group mandated by Wyoming Statute § 35-11-313 to develop bonding procedures for geologic sequestration projects.<sup>116</sup>
- On December 5, 2008, the joint judiciary interim committee voted to sponsor four GCS bills in the 2009 legislative session addressing unitization of pore space, injector liability for CO<sub>2</sub>, and dominance of the mineral estate.<sup>117</sup>

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<sup>110</sup> See OR. ADMIN. R. CH. 345 (2007).

<sup>111</sup> UTAH CODE ANN. § 54-17-701 (2008).

<sup>112</sup> WASH. REV. CODE § 80.70.010–80.70.070 (2008).

<sup>113</sup> S.B. 6001, 60th Leg., 2007 Reg. Sess., 2007 Wash. Sess. Laws 1.

<sup>114</sup> WASH. ADMIN. CODE § 173-218-115 (2008).

<sup>115</sup> WYO. STAT. ANN. § 34-1-152 (2008) (“Ownership of pore spaces underlying surfaces”); *id.* § 30-5-501 (“Oil & gas activities at geologic sequestration sites”); *id.* § 35-11-313 (“Carbon sequestration, permit requirements”).

<sup>116</sup> WYO. STAT. ANN. § 35-11-313.

<sup>117</sup> Joint Judiciary Interim Committee Draft Bills, Bill Draft 09LSO-0153.W4, 09LSO-0154.W1, 09LSO-0310.W1, & 09LSO-0311.W1, <http://legisweb.state.wy.us/2008/interim/Jud/bills.HTM>.