Legal Issues Associated with the Development of Carbon Dioxide Sequestration Technology

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Summary

In the last few years there has been a surge in interest in the geologic sequestration of carbon dioxide (CO_2), a process often referred to as carbon capture and storage, or carbon capture and sequestration (CCS), as a way to mitigate man-made CO_2 emissions and thereby help address climate change concerns. The Energy Independence and Security Act of 2007 (P.L. 110-140) contains measures to promote research and development of CCS technology, to assess sequestration capacity, and to clarify the framework for issuance of CO_2 pipeline rights-of-way on public land. Other legislative proposals have also sought to encourage the development of CO_2 sequestration, capture, and transportation technology.

This report discusses the myriad legal issues associated with the development of CCS technology. These issues include, but are not limited to determinations of ownership and control of the underground pore space where the CO_2 would be "sequestered" under most of the contemplated technology; the question of which federal and state agencies would permit and regulate CO_2 pipelines transporting the gas to the sequestration site; and concerns over liability exposure that may hinder the development of CCS technology.

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Introduction

The last few years have seen a surge in interest in geologic carbon sequestration, also referred to commonly as carbon capture and sequestration or carbon capture and storage (CCS), as a way to reduce carbon dioxide (CO_2) emissions, and thereby help to address concerns about climate change. The Energy Independence and Security Act of 2007, P.L. 110-140, contains measures to promote research and development of CCS technology and assess sequestration capacity, including a measure to clarify the framework for issuance of CO_2 pipeline rights-of-way on public land.

The increased discussion of CCS technology has given rise to consideration of a number of potential legal issues related to the technology as it is currently envisioned. Among these issues are questions about legal control of the underground "pore space" used for CO_2 storage in most CCS models, questions about regulation of CO_2 pipelines, and liability concerns associated with CCS. This report discusses some of these legal hurdles that may need to be addressed if CCS technology is developed and employed.[1]

Background

In recent years, concerns over global climate change have been at the forefront of many policy discussions. Some have suggested that recent increases in the global temperature, as well as future anticipated increases, are the result, at least in part, of emissions of large quantities of CO_2 from man-made sources. While most proposals related to climate change have focused on limiting emissions, one of the more prominent ideas to address these climate change concerns is the capture and direct sequestration of CO_2 emissions. CCS is a process whereby CO_2 emissions would be "captured" at their source and then stored or "sequestered" either underground or elsewhere, rather than being released into the atmosphere.[2] In most models, this storage/sequestration would take place underground.[3]

CCS technology is still in the early stages of development. Therefore, there are a number of operational questions to be answered before we can fully understand all the legal issues that may arise. However, because the development of CCS technology could well depend in part upon the resolution of some of these legal issues, it is important to understand them as the discussion of implementation of CCS technology continues. Among the emerging legal issues associated with CCS technology are:

1. determinations of ownership and control of the underground pore space where the CO_2 would be "sequestered" under many of the CCS facility models proposed to date;

[1] This CRS Report was prepared with the assistance of James Nichols, an Information Research Specialist in the Knowledge Services Group of CRS.

[2] For a detailed discussion of CCS technology, *see* CRS Report RL33801, *Carbon Capture and Sequestration (CCS)*, by (name redacted).

[3] *Id.*

2. the question of which federal and state agencies would permit and regulate CO_2 pipelines transporting the gas from the point of emission to the sequestration site; and
3. concerns over liability exposure that may hinder development of CCS technology.

Discussion

Ownership and Control of Underground Pore Space

Background

Any entity wishing to operate an underground CCS facility must own or control the pore space in which the carbon dioxide would be sequestered or stored. However, since CCS technology has not yet been implemented and was not even considered until recently, most existing legal instruments related to property rights do not address ownership and control of pore space for purposes of sequestration or storage of carbon dioxide. Therefore, in order to determine who holds the relevant property rights, we must interpret the language found in such legal instruments and ascertain how it might apply to pore space to be used for CCS. In doing so, we can look to interpretations of courts that have reviewed similar or analogous property rights disputes.

Traditionally, property law issues are handled at the state level. Indeed, most of the analogous disputes regarding subsurface "pore space" to date have been handled under state law, and presumably would be handled under state law going forward. These disputes, and subsequent actions by some state legislatures, have produced what is referred to in this report as the "majority rule" that holders of mineral rights do not, merely by virtue of these rights, have ownership or control of subsurface pore space. However, to the extent that CCS projects might take place on lands owned or controlled by the United States, determinations of pore space ownership and control also become an issue for the federal government.

Because control of the pore space is vital to any CCS project, it is worthwhile to consider whether any private entity aside from the owner of surface rights might be able to claim ownership of, or control over, the relevant subsurface rights. The most obvious candidate would be the owner of "mineral rights" on/under the land in question, as mineral rights are, generally speaking, rights to something that is subsurface.

The Majority Rule: Pore Space Control Does Not Transfer with Mineral Rights

In order to determine the potential legal hurdles facing CCS projects related to control of subsurface pore space, we must look at both state and federal common law and existing statutes and regulations.

The majority of relevant case law suggests that a reviewing court would likely find that the pore space that would be used in CCS is not conveyed with mineral rights, but rather in most cases would remain with the holder of the surface rights. The majority of legal precedent suggests that the surface owner, not the holder of mineral rights, would have the relevant property interest in pore space for purposes of any CCS project. Indeed, most legal experts who have studied this

issue have reached a similar conclusion.[4] In the case of federal land on which the mineral rights are leased, this means that, although the holder of the mineral rights would have certain rights that must be considered in using the property, the federal government would have ownership of, and control over, the pore space that would be used for CCS. Experts have cited to a number of common law decisions in support of this conclusion.

An instructive precedent to consider from federal court jurisprudence is *Emeny v. United States.*[5] In *Emeny,* the United States Court of Claims[6] was tasked with deciding whether the United States had acquired the right to store helium gas within a pore space formation on a certain property when the terms of the government's lease with the owner of the pore space were limited to the sole purpose of mining and operating for oil and gas.

The plaintiffs in *Emeny* owned a tract of land in Texas which contained significant deposits of helium gas. The plaintiffs granted to a private gas company "oil and gas leases covering a total of approximately 217,000 acres of land, including the area which contains the Bush Dome."[7] The United States eventually obtained these oil and gas leases from the private oil company, along with the remaining mineral rights that had been reserved by the plaintiffs, and compensated the respective parties accordingly.[8] However, in the lease with the United States, the plaintiffs expressly reserved for themselves the surface of the leased lands, "including any such structure that might be suitable for the underground storage of 'foreign' or 'extraneous' gas produced elsewhere."[9]

Pursuant to the lease agreement, the United States commenced operations to extract the helium contained within the Bush Dome, and continued to do so for approximately three decades until the Bush Dome was empty. After the Bush Dome was emptied, the United States sought to store helium gas produced elsewhere inside of the now empty pore space.[10] The plaintiffs argued that they were entitled to just compensation for the government's use of the Bush Dome as a helium storage facility because pursuant to the language of the lease agreement, the government only had a right to extract the gas contained within the pore space and no right to use the pore space for storage of helium gas produced elsewhere.

After a consideration of Texas common law, the court in *Emeny* agreed with the plaintiffs that the government's property interest did not include the right to use the pore space for gas storage, and

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[4] See, *e.g.*, Owen L. Anderson, *Geologic CO_2 Sequestration: Who Owns the Pore Space*? 9 Wyoming L. Rev. 97 (2009); Ian J. Duncan, Scott Anderson and Jean-Philippe Nicot, *Pore Space Ownership Issues for CO2 Sequestration in the U.S.*, GHGT-9 Energy Procedia, *Elsevier* V.1 4427-4430 (2009); Philip M. Marston and Patricia A. Moore, *From EOR to CCS: The Evolving Legal and Regulatory Framework for Carbon Capture and Storage*, 29 Energy L.J. 421, 475 (2008).

[5] 412 F.2d 1319 (Ct. Cl. 1969) (*Emeny*).

[6] The U.S. Court of Claims was the original court in which most money claims against the United States were tried. The U.S. Court of Claims was abolished in 1982. The court's trial-level jurisdiction was transferred to a newly created U.S. Claims Court, later renamed the U.S. Court of Federal Claims, and its appellate jurisdiction to a newly created U.S. Court of Appeals for the Federal Circuit.

[7] *Emeny* at 1321. According to the court's opinion, the Bush Dome "is a closed geological structure, or underground dome, in which gaseous substances can be stored ... The potential storage capacity of the Bush Dome is in excess of 52 billion standard cubic feet of gas." *Id.* at 1321.

[8] *Id.* at 1321-1322.

[9] *Id.* at 1323.

[10] *Id.* at 1322.

ordered the United States to pay the plaintiffs just compensation for its use of the Bush Dome as a helium storage facility. According to the court, "[t]here is no reasonable basis on which the rights granted to the [United States] in the ... oil and gas leases could be construed as including the right to bring to the premises and store there gas produced elsewhere."[11]

The West Virginia courts reached a similar conclusion in *Tate v. United Fuel Gas Company*.[12] In *Tate*, the highest court in West Virginia addressed the question of pore space ownership once the minerals contained therein had been extracted. The owner of the land deeded the land to another man, but expressly reserved to himself the "oil, gas ... and all minerals ... underlying the surface of the land."[13] The new owner then deeded the surface estate to Virgil Tate, subject to the same exceptions in the original deed, including the reservation of the mineral estate for the original owner. After extracting all of the oil from the pore space, the original owner eventually leased his remaining mineral rights to the defendant, United Fuel Gas Company. United Fuel Gas Company then used this mineral rights property interest to store gas produced elsewhere in the empty pore space.

Plaintiff Tate, the owner of the land subject to the underground property interest leased to United Fuel Gas Company, asserted that the lease between the original owner and United Fuel Gas Company which gave United Fuel the "remaining" mineral rights was invalid, since the original owner/holder of the mineral rights only had a right to extract the contents of the subsurface estate, not the right to use the pore space for other purposes. The Supreme Court of West Virginia agreed with Tate and held that the express reservation of mineral rights only granted to the original owner/mineral rights holder (and his lessee, United Fuel Gas Company) a right to exploit the gas and minerals contained within the pore space, not a right to use the pore space itself for the storage of gas produced elsewhere.[14]

According to *Tate*, the owner of the mineral rights likely would not have the right to the use or lease the pore space for carbon dioxide capture and sequestration, unless the owner of the surface estate expressly allows the owner of mineral rights to use the pore space. This conforms with what is referred to here as the "majority rule" (and others have called the "American rule") that pore space is not conveyed with a standard conveyance of mineral rights.[15]

Another case that reached a similar conclusion is *United States. v. 43.42 Acres of Land*.[16] In this case, a federal district court had to determine whether the surface owners, mineral owners, or both should receive compensation from the government for land acquired for the construction of an underground crude oil storage tank.[17] One defendant owned the land under which a crude oil

[11] *Id.* at 1323.

[12] 71 S.E.2d 65 (W. Va. 1952) (*Tate*).

[13] The pertinent language of the deed stated that "[t]he oil, gas and all minerals ... underlying the surface of the land hereby conveyed are expressly excepted and reserved from the operation of this deed ... it being under-stood [sic] that the term 'mineral' as used herein does not include clay, sand, stone, or surface minerals except such as may be necessary for the operation for the oil and gas and other minerals." *Id.* at 67-68.

[14] *Id.* at 72.

[15] Some legal writings have referred to this rule as the "American rule." This terminology is used in contrast with the "English rule" that the mineral rights owner retains the right to the subsurface space even after the minerals have been extracted.

[16] 520 F. Supp. 1042 (W.D. La. 1981) (*Acres*).

[17] In his opinion, Judge Veron writes, "Simply stated, the issue to be decided by this court is: who is entitled to be compensated for the value of the hole in the ground to be created by construction of the underground storage cavern[:] (continued...)

storage tank was to be constructed. The other defendant owned the rights to the minerals that needed to be extracted to construct the underground storage tank. The United States intended to construct this storage tank by extracting the salt contained inside of the subterranean geological structure and then using the evacuated underground formation as a storage area.[18] Both defendants claimed an exclusive right to be compensated by the United States for its taking of the property pursuant to the Energy Policy and Conservation Act.[19]

Since *Acres* was a case of first impression under Louisiana law, the court considered common law authority from other jurisdictions to inform its opinion, and concluded that "... the general rule in common law ... provides that, after the removal of minerals, the opening left by the mining operations belongs to the land owner by operation of law."[20] Since the minerals had not yet been removed from the pore space by the United States and since the resulting pore space needed to be used by the United States for crude oil storage, the court ordered the United States to compensate both the landowner and the mineral rights owner.[21]

Although the question of compensation was the primary focus of the court in *Acres*, the determination that both the surface and mineral estate owners should be compensated by the government was based on the rationale that the mineral estate owner has an interest in the minerals contained within a pore space, while the surface estate owner retains an interest in the pore space itself.[22]

The Minority Rule: Pore Space Control Is Conveyed with Mineral Rights

While most authors and scholars have concluded that the case law clearly favors a rule attaching pore space ownership and control to the surface estate or remaining estate over the holder of mineral rights, some have noted that the precedent is far from unanimous.[23] Two cases commonly cited in support of the argument that a mineral rights conveyance also conveys ownership and

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the land owners or the mineral owners?" *Id.* at 1043.

[18] The process by which crude oil reservoirs are created was described in *Acres*:

> To utilize the subsurface for the extraction of brine and the creation of storage facilities[,] a well is drilled so as to penetrate the salt formation. Water is forced into the formation through the well, the salt is withdrawn as brine, and a cavity is left in the salt mass because of gradual dissolving of the salt and a resulting erosion by the leaching process. The jug shaped cavity, or 'jug[,]' formed by this leaching is used for the storage of hydrocarbons. A jug is 100 feet or more in depth, with capacity for storing over a million barrels of one of the various hydrocarbons. A thick barrier of salt must be retained around each jug to form a satisfactory wall for the containment of the stored product.

Acres at 1043.

[19] 42 U.S.C. § 6249(a)-(f).

[20] *Acres* at 1045.

[21] "[Owners of a mineral servitude] have no right to claim compensation for the value of the cavern to be created by removal of the salt. They should be compensated only for the value of the right to explore for and reduce to possession the minerals on the land in question. [The] land owners ... own all remaining rights in the land, and they are entitled to be compensated for the underground storage value of the land." *Id*. at 1046.

[22] *Id*. at 1045.

[23] *See, e.g.*, Elizabeth J. Wilson and Mark A. Figueiredo, *Geologic Carbon Dioxide Sequestration: An Analysis of Subsurface Property Law*, 36 Environmental L. Rev. 1014 (2006).

control of pore space are *Mapco v Carter*[24] and *Central Kentucky Natural Gas Co. v. Smallwood*.[25]

In *Mapco*, multiple parties had interests in the surface and mineral rights of a parcel of land in Texas. As a result of a previous court-ordered partition, the surface and mineral rights were divided among the various co-owners. Despite the fact that the co-owner Mapco only possessed a minority interest in the mineral rights in addition to the surface rights, Mapco decided to extract and sell the salt contained beneath its portion of the partitioned land without the consent of the other co-owners.[26] When the salt was completely extracted, Mapco "plugged" the empty cavern with concrete and abandoned it, thereby rendering it unusable as storage space for gas or petroleum products.[27]

Ultimately, the Court of Appeals of Texas ordered Mapco to compensate the co-owners of the mineral rights because, as mineral rights co-owners, they were also entitled to an amount of the proceeds from Mapco's sale of the salt equal to their respective interests in the partitioned land.[28] The court held that under Texas law, "this interest in minerals is an interest in real property. Thus, the fee mineral owners retained a property ownership, right and interest after the underground storage facility ... had been created."[29]

This result suggests that mineral rights are not merely a right to extract the minerals in question and an ownership right in said minerals, but also grant an ownership right in the subsurface formation left behind. However, this fact pattern may be distinguished from any hypothetical claim that mineral rights include an interest in subsurface pore space. In *Mapco*, the subsurface storage area was created by the excavation of the mineral. In contrast, pore space contemplated for use in CCS technology is naturally occurring, not created by the mineral extraction. Furthermore, the storage area in *Mapco* was actually composed of the mineral in question (salt). Again, this would presumably not be the case with respect to pore space used for CCS.

In *Central Kentucky Natural Gas v. Smallwood*,[30] the property owner executed an "oil and gas production and storage lease" conferring the right to drill for oil and gas and to store gas of any kind regardless of source in the subsurface.[31] The lessee did not produce any gas, but gas that was removed from wells on adjacent lands in the area was stored under the surface and rentals were paid. The lessee paid the lessor only half of the rental fees, under the assumption that the rentals should be paid to the holder of the mineral rights, not the surface rights (the lessor had retained a 50% interest in the minerals).[32] The lessor claimed that the rent should be paid solely to him, as the owner of the surface estate and thus the subsurface formations in which the gas was stored.[33] The court ruled in favor of the lessee, finding that the stored gas was equivalent to "native" gas

[24] 808 S.W.2d 262 (Tex. 1991) (*Mapco*).

[25] 252 S.W.2d 866 (Ky. 1952) (*Smallwood*).

[26] *Mapco* at 267.

[27] *Id.* at 268-269.

[28] *Id.* at 278-279.

[29] *Id.* at 274-275.

[30] 252 S.W.2d 866 (Ken. 1952) (*Smallwood*).

[31] *Id.*

[32] *Id.* at 867.

[33] *Id.*

and that therefore revenue therefrom was attributable to the owner of that gas (i.e., the holder of the mineral rights.)[34]

However, the court's decision was based solely on the classification of the stored gas as equivalent to the native gas. In fact, the court clarified that "[i]n reaching the conclusion that we reach, it is not necessary to determine whether the cavern or strata from which a mineral has been removed becomes the property of the mineral or surface owner."[35] Indeed, the court references the "English rule" that subsurface spaces are owned by the mineral rights holder and then notes that "[t]he general rule in the United States seems to be otherwise."[36] Thus, *Smallwood* does little to establish precedent contrary to the "majority" (or "American") rule.

It is worth pausing briefly to consider why this "majority rule" or "American rule" has been so widely adopted. There is a general principle in property law that any property right not expressly conveyed is retained by the owner or grantor.[37] Accordingly, courts have tended to interpret limited property grants (like mineral rights) from a fee simple owner narrowly, with the fee simple owner retaining all property rights not explicitly granted in the document. Thus, a grant of mineral rights would grant only what is explicitly granted within the "four corners" of the document. In the case of federal mineral rights leases, the conveying language usually is something similar to this: "This lease is issued granting the exclusive right to drill for, mine, extract, remove and dispose of all the oil and gas (except helium) in the lands described ... together with the right to build and maintain necessary improvements thereupon."[38]

Courts would thus likely be inclined to find that anything not explicitly mentioned, for example, subsurface pore space or similar formations, would not be transferred, but would remain with the grantor, as the cases described above illustrate.

Statutory Approaches

In the cases described above, the courts struggled to resolve issues of ownership and control of underground areas in the absence of legislative guidance. However, in recognition of the potential legal issues related to subsurface pore space ownership that may arise under the common law if CCS technology is developed and implemented, the legislatures of Wyoming and North Dakota and have enacted statutes to clarify issues of ownership and control over pore space, as well as the rights and obligations between surface and mineral owners.[39] The Wyoming and North Dakota statutes are examples of another approach to resolving issues related to pore space ownership.[40]

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[34] *Id.* at 867-868.

[35] *Id.* at 868.

[36] *Id.*

[37] *See, e.g.*, Davis v. Peavy-Moore Lumber Co., 144 S.W.2d 878, 880 (Tex. 1940).

[38] U.S. Department of the Interior, Bureau of Land Management, Form 3100-11 (October 2008): Offer to Lease and Lease for Oil and Gas. CRS has also reviewed several other lease forms dating back to 1984, and all of them contain substantially similar language.

[39] Wyo. Stat. §§ 34 -1-152 and 34-1-153 (2009); N.D. Cent. Code § 47-31-02 *et seq* (2009). A note following Wyo. Stat. § 34-1-152 provides: "It is the intent of the legislature to clarify the ownership of pore space underlying the surface of the lands and waters of this state." Similarly, N.D. Cent. Code § 47-31-01 provides: "Undivided estates in land and clarity in land titles reduce litigation, enhance comprehensive management, and promote security and stability useful for economic development, environmental protection, and government operations."

Montana has also enacted legislation that addresses the issue of pore space control. However, the Montana statute does (continued...)

The Wyoming Statute

Wyoming's pore space statute defines the term "pore space" as "subsurface space which can be used as storage space for carbon dioxide or other substances."[41] Wyoming's statute makes it expressly clear that the owner(s) of the surface rights are entitled to "ownership of all pore space in all strata below the surface."[42] Additionally, under the Wyoming statute, a conveyance of surface rights automatically conveys ownership of any pore space below the surface.[43] Finally, the Wyoming statute clarifies the status of mineral rights with respect to the pore space by providing that "[n]o agreement conveying mineral or other interests underlying the surface shall act to convey ownership of any pore space in the stratum unless the agreement explicitly conveys that ownership interest."[44]

Wyoming has also created a statutory framework to provide for the "unitization" of a single pore space that is located beneath multiple tracts of real property.[45] Specifically, under Wyoming state law, no CCS activities within a particular pore space shall commence "until the plan of unitization has been signed or in writing ratified or approved by those persons who own at least eighty percent (80%) of the pore space storage capacity."[46]

With respect to the issue of potential liability resulting from CO_2 sequestration within pore spaces, Wyoming's pore space statute provides:

> All carbon dioxide, and other substances incidental to the injection of carbon dioxide injected into any [pore space] for the purpose of [CO_2 sequestration] shall be presumed to be owned by the injector of such material, and all rights, benefits, burdens, and liabilities of such ownership shall belong to the injector.[47]

(...continued)

not make a conclusive determination regarding pore space control; rather, it establishes a default position in the event the courts cannot establish ownership based on interpretation of previously existing statutory or common law. The Montana statute provides that "[i]f the ownership of the geologic storage reservoir cannot be determined from the deeds and or severance documents related to the property by reviewing statutory or common law, it is presumed that the surface owner owns the geologic storage reservoir." Mont. Code Ann. § 82-11-180(3).

[40] Several states have enacted legislation that could regulate other aspects of CCS. Those statutes are not discussed in this Report because they do not expressly address pore space ownership and control.

[41] Wyo. Stat. § 34-1-152(d).

[42] *Id.* at § 34-1-152(a).

[43] *Id.* at § 34-1-152(b).

[44] Wyo. Stat. § 34-1-152(b). In its entirety, § 34-1-152(b) provides:

> A conveyance of the surface ownership of real property shall be a conveyance of the pore space in all strata below the surface of such real property unless the ownership interest in such pore space previously has been severed from the surface ownership or is explicitly excluded in the conveyance. The ownership of any pore space in strata may be conveyed in the manner provided by law for the transfer of mineral interests in real property. No agreement conveying mineral or other interests underlying the surface shall act to convey ownership of any pore space in the stratum unless the agreement explicitly conveys that ownership interest.

[45] See generally *id.* at §§ 35-11-314, 35-11-315, 35-11-316, and 35-11-317.

[46] *Id.* at § 35-11-316(c).

[47] Wyo. Stat. § 34-1-153(a) (2009).

Additionally, the Wyoming statute shields pore space owners from liability for "the effects of injecting carbon dioxide for geologic sequestration purposes" if the pore space owners consent to the use of pore space for CO_2 sequestration.[48]

The North Dakota Statute

North Dakota's pore space statute defines "pore space" as "a cavity or void, whether natural or artificially created, in a subsurface sedimentary stratum."[49] Similar to Wyoming's pore space statute, North Dakota's statute provides that "[t]itle to pore space in all strata underlying the surface of lands and waters is vested in the owner of the overlying surface estate."[50] Additionally, under the North Dakota statute, a conveyance of surface rights automatically conveys ownership of any pore space below the surface.[51] The primary difference between the Wyoming and North Dakota statutes with respect to ownership of the pore space is that under the North Dakota statute, the pore space cannot be severed from the surface estate.[52]

Similar to Wyoming's statutory approach to CCS, North Dakota requires the "consent of persons who own at least sixty percent [60%] of … the pore space" as a precondition for CO_2 sequestration.[53]

The Primacy of Mineral Rights

Although the majority rule suggests that the owner of the surface rights for a given property controls the pore space, it is important to bear in mind that in many instances, the mineral rights owner could have priority, or "primacy," over uses of the land (including the ability of the surface rights owner to make use of the pore space) that would interfere with the mineral rights holder's ability to remove minerals. The lease terms may provide for the relative priority of the various rights, but in the absence of language addressing this, the default rule seems to be that "[t]he mineral owner is privileged to drill and take the oil and gas, *and has rights that others shall not take them by operations on the land*."[54] Several states have clarified by statute the primacy of mineral rights over those seeking to use pore space for CCS.[55]

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[48] *Id.* at § 34-1-153(b). In its entirety, § 34-1-153(b) provides:

> No owner of pore space, other person holding any right to control pore space or other surface or subsurface interest holder, shall be liable for the effects of injecting carbon dioxide for geologic sequestration purposes, or for the effects of injecting other substances for the purpose of geologic sequestration which substances are injected incidental to the injection of carbon dioxide, solely by virtue of their interest or by their having given consent to the injection.

[49] N.D. Cent. Code § 47-31-02.

[50] *Id.* at § 47-31-03.

[51] *Id.* at § 47-31-04.

[52] N.D. Cent. Code § 47-31-05. In its entirety, § 47-31-05 provides: "Title to pore space may not be severed from title to the surface of the real property overlying the pore space. An instrument or arrangement that seeks to sever title to pore space from the title to the surface is void as to the severance of the pore space from the surface interest."

[53] N.D. Cent. Code § 38-22-08.

[54] Summers Oil and Gas Law, Vol IA, § 7.8, p. 38 (2004) (emphasis added).

[55] *See, e.g.*, Mont. Code Ann. § 82-11-180 (2)(a); N.D. Cent. Code § 32-11-13(2); Wyo. Stat. Ann. § 34-1-152(e).

Interstate CO_2 Pipeline Jurisdiction

Another issue relates to the authority to regulate the movement of CO_2 from the point of production/emission to the CCS facility. One possibility is that the transportation will be entirely local in nature, with CCS facilities located in the same state as the source of the CO_2 that is to be sequestered. In that case, the federal government can choose to step in via new legislation, but the default jurisdiction would likely remain with the state governments, similar to their current exercise of jurisdiction over intrastate natural gas pipelines.

However, if an interstate pipeline system for CCS is to be developed, questions arise as to who will regulate pipeline siting and the rates to be charged for transporting CO_2 from the point of emission to the sequestration location. Based on their current regulatory roles, two of the more likely candidates to have jurisdiction over interstate pipelines transporting CO_2 for purposes of CCS are the Federal Energy Regulatory Commission (FERC) and the Surface Transportation Board (STB).

The Natural Gas Act of 1938 (NGA) vests in FERC the authority to issue "certificates of public convenience and necessity" for the construction and operation of interstate natural gas pipeline facilities.[56] FERC is also charged with extensive regulatory authority over the siting of natural gas import and export facilities, as well as rates for transportation of natural gas and other elements of transportation service. FERC also has jurisdiction over regulation of oil pipelines pursuant to the Interstate Commerce Act (ICA).[57] The ICA, as amended by the Hepburn Act of 1905, provided that the Interstate Commerce Commission (ICC) was to have jurisdiction over rates and certain other activities related to interstate oil pipelines, as these pipelines were considered to be "common carriers."[58] This jurisdiction was transferred to FERC in the Department of Energy Organization Act of 1977.[59] FERC's jurisdiction over oil pipelines is not as extensive as its jurisdiction over natural gas pipelines. FERC is not involved in the oil pipeline siting process. However, as with natural gas, FERC does regulate transportation rates and capacity allocation for oil pipelines.[60]

Jurisdiction over rates for the transportation via pipeline of commodities other than oil and natural gas resides with the STB. The STB is an independent regulatory agency (administratively affiliated with the Department of Transportation) charged by Congress with the primary mission of resolving railroad disputes pursuant to the ICA. It is the successor agency to the ICC. Pipelines, like railroads, are "common carriers" and thus are used by more than one company for the transportation of goods. Therefore, the ICA also assigned the ICC (and thus the STB) oversight authority over pipelines transporting a commodity other than "water, gas or oil."[61] However, unlike FERC, the STB does not require pipeline companies to file tariffs and justify their rates. Instead, the STB acts as a forum to resolve disputes related to pipelines within its jurisdiction. Parties who wish to challenge a rate or another aspect of a pipeline's common carrier service may petition the STB for a hearing; there is no ongoing regulatory oversight.

[56] 15 U.S.C. § 717f(c).

[57] 49 App. U.S.C. § 1.

[58] *Id.* at §§ 1(1), 1(4), and 1(7).

[59] P.L. 95-224.

[60] Section 1801 of the Energy Policy Act of 1992 directed FERC to "promulgate regulations establishing a simplified and generally applicable ratemaking methodology" for oil pipeline transportation.

[61] 49 U.S.C. § 1-501(a)(1)(c).

Thus, there are two federal regulatory agencies that, generally speaking, have jurisdiction over interstate pipeline rate and capacity allocation matters. However, as explained below, both of these agencies appear to have explicitly rejected jurisdiction over CO_2 siting and rates, and there is no legislative or judicial history indicating that their rejections were improper. These decisions, the reasoning behind them, and the status of federal jurisdiction over CO_2 pipelines are covered in the next section.

Prior CO_2 Pipeline Regulation: Cortez Pipeline

Carbon dioxide is sometimes used for a process referred to as enhanced oil recovery (EOR). In EOR, a gas is injected into a well under high pressure in order to aid in extraction of the oil. In some cases companies have used pipelines to transport CO_2 over state lines (i.e., in interstate commerce) for EOR purposes. One such pipeline is the Cortez Pipeline, which runs through Colorado, New Mexico, and Texas. The Cortez Pipeline was the subject of an instructive regulatory dispute over CO_2 pipeline jurisdiction.

FERC Decision

In December 1978, the Cortez Pipeline Company (Cortez) sought a declaratory order from FERC that the construction and operation of a proposed interstate pipeline transporting a gas composed of 98% CO_2 and 2% methane would not be within the Commission's jurisdiction. Cortez argued that the gas in question was not "natural gas" as the term is defined in Section 2(5) of the NGA,[62] so a proposed pipeline to transport this gas was not under FERC's NGA jurisdiction. FERC agreed with Cortez and issued a declaratory order disclaiming jurisdiction over the proposed pipeline.[63] In its decision, FERC explored the inherent ambiguity in the term "natural gas," explaining that it has two very different definitions. FERC recognized that in the terminology of chemistry, "natural gas" refers to any substance that is gaseous in its natural state, including carbon dioxide.[64] However, according to FERC, the more common usage of the term "natural gas" refers to a gaseous mixture of hydrocarbons.[65] FERC held that it was this more common meaning of "natural gas" that applied to the term as it was used in the NGA. FERC pointed to the goals and purposes of the NGA, which are primarily to regulate a specific "natural gas" industry.[66] Thus, the term "natural gas" as used in the statute referred to a gaseous mixture of hydrocarbons.[67] As a result, FERC held that the proposed Cortez Pipeline was not within the NGA jurisdiction of the Commission.[68]

ICC Decision

In 1980, after FERC issued its CO_2 ruling, the owners of the proposed Cortez Pipeline petitioned the ICC for a similar declaratory order that the pipeline would not be subject to the ICC's

[62] 15 U.S.C. § 717(a)(5).

[63] *Cortez Pipeline Company*, 7 FERC ¶ 61,024 (1979).

[64] *Id.* at 61,041.

[65] *Id.*

[66] *Id.*

[67] *Id.*

[68] *Id.* at 61,042.

jurisdiction either. As the ICC recognized at the outset of its decision, there was no controversy concerning whether ICC approval was necessary for construction or expansion of pipeline facilities—the statute and previous case law plainly state that the ICC has no pipeline siting jurisdiction whatsoever.[69] Furthermore, the ICC noted that the U.S. Department of Transportation would exercise jurisdiction over the pipeline's compliance with applicable safety standards.[70] Instead, the decision emphasized the ICC's regulation of other aspects of pipeline service (i.e., rates), and whether the statutory exception from ICC regulation for pipelines that transport "water, gas or oil" covers CO_2 pipelines. [71]

Relying on the legislative history of previous versions of the statutory language in the ICA (which excluded "natural or artificial gas") as well as the plain language of the statute, the ICC concluded that Congress intended to exclude all types of gas, including CO_2, from ICC regulation. The ICC recognized that its initial ruling in this matter, in concert with FERC's order disavowing jurisdiction over the proposed Cortez Pipeline, created a regulatory gap of sorts. The ICC noted that generally, "[t]he opinion of a sister agency should be given weight, if possible, so that related statutes can be coordinated."[72] However, the ICC found that "in this case the FERC decision is not helpful to us because it did not construe or interpret the terms natural and artificial gas [under the ICA]. Its decision was based on other grounds."[73] Although the ICC found in this initial decision that it likely did not have jurisdiction over CO_2 pipelines, it did conclude that "the issue is important enough to institute a proceeding and accept comments on the petition and our view on it."[74] After the comment period, the ICC confirmed its view that CO_2 pipelines were excluded from the ICC's jurisdiction.[75]

Potential Issues Related to ICC Disclaimer of Jurisdiction

Notwithstanding the ICC's 1980 disclaimer of jurisdiction over CO_2 pipelines in the Cortez Pipeline case, other evidence indirectly suggests the possibility that interstate CO_2 pipelines could still be considered subject to the jurisdiction of the STB. For example, an April 1998 report by the General Accounting Office (GAO)[76] stated that interstate CO_2 pipelines, as well as pipelines transporting other gases, are subject to the board's oversight authority. The report stated that GAO had identified five products carried by 21 pipelines subject to the STB's jurisdiction.[77] One of the five identified products was CO_2 (another was hydrogen—also a gas). In fact, the report lists 14 different pipelines transporting CO_2 for purposes of EOR, including the Cortez Pipeline, which

[69] *Cortez Pipeline Company—Petition for Declaratory Order—Commission Jurisdiction Over Transportation of Carbon Dioxide by Pipeline,* 45 Fed. Reg. 85177 (December 24, 1980).

[70] *Id.*

[71] 49 U.S.C. § 1-501(a)(1)(c).

[72] *Cortez Pipeline Co.*, 45 Fed. Reg. at 85178.

[73] *Id.* at 85178.

[74] *Id.*

[75] *Cortez Pipeline Company—Petition for Declaratory Order—Commission Jurisdiction Over Transportation of Carbon Dioxide by Pipeline,* 46 Fed. Reg. 18805 (March 26, 1981).

[76] Now known as the Government Accountability Office.

[77] GAO Report: SURFACE TRANSPORTATION: Issues Associated With Pipeline Regulation by the Surface Transportation Board, April 1998.

are said to be subject to the jurisdiction of the STB.[78] The GAO states that the STB reviewed its analysis and, presumably, did not object to this jurisdictional classification.[79]

It should also be noted that the Cortez Pipeline decision was issued by the ICC, not the STB. Although the STB is the successor to the now-defunct ICC and the statutory language regarding the STB's jurisdiction is virtually identical to the language at issue in the Cortez decision, they are not the same agency. The STB conceivably could determine that its jurisdiction is not governed by the ICC's decision in the Cortez Pipeline matter. Indeed, the Supreme Court has ruled that federal agencies are not precluded from changing their positions on the issue of regulatory jurisdiction. According to the Court, "an initial agency interpretation is not instantly carved in stone. On the contrary, the agency, to engage in informed rulemaking, must consider varying interpretations and the wisdom of its policy on a continuing basis."[80] Accordingly, regulation of CO_2 pipelines for CCS purposes by the STB (or by FERC, for that matter) under existing statutes remains a possibility.

Implications of the Possible Regulatory "Gap"

If CCS technology develops to the point where interstate CO_2 pipelines become more common, and if FERC and the STB continue to disclaim jurisdiction over CO_2 pipelines, then the potential regulatory "gap" discussed above may receive attention. This gap does not necessarily demand resolution. As commentators have noted, state laws and contractual arrangements among interested parties established under the EOR model would also apply to CO_2 pipelines for CCS.[81] Interstate CO_2 pipelines would still be required to meet the safety requirements of the Department of Transportation. Also, although there would be no federal rate regulation, any anti-competitive behavior by the owners or operators of a CO_2 pipeline could probably be addressed by federal antitrust enforcement agencies, including the Federal Trade Commission and the antitrust division of the U.S. Department of Justice. Finally, any pipelines needing to cross federal lands would be required to obtain a right-of-way from the federal government, and so would be subject to any conditions such rights-of-way might impose.

Nevertheless, some analysts, drawing on the history of oil and natural gas pipeline development, anticipate a potential need for better defined federal regulatory authority over a potential expansive CO_2 pipeline network:[82]

> The growth of these sectors and the growing importance of transportation, abuses of market power, price discrimination and other issues, including conflicts between state and federal authorities led both to preemption by the federal government and administrative regulation.

[78] *Id.* at 27.

[79] STB, personal communication (December 2007). The STB Office of Governmental and Public Affairs informed CRS that the board recognizes the conflict between this GAO report and the ICC decision (as well as the wording of 49 C.F.R. § 15301 governing STB jurisdiction over pipelines other than those transporting "water, gas or oil"). However, the office declined to state an opinion as to the current extent of STB jurisdiction over CO_2 pipelines and suggested that the STB would likely not act to resolve this conflict unless a CO_2 pipeline dispute comes before it.

[80] *Chevron U.S.A. v. Nat. Res. Def. Council*, 467 U.S. 837, at 863-64 (1984).

[81] *See, e.g.*, Philip M. Marston, "Doing the Deal: Legal and Regulatory Aspects of the Evolving CCS Regime in the USA," Proceedings of the *2e Collogue International Captage et Stockage Géologique du CO2*, Paris, France (October 4-5, 2007), at 3. http://www.colloqueco2.com/presentations2007/ColloqueCO2-2007_Session4_1-MARSTON.pdf.

[82] M.A. de Figueiredo, H.J. Herzog, P.L. Joskow, K.A. Oye, and D.M. Reiner, *Regulating Carbon Dioxide Capture and Storage*, MIT Center for Energy and Environmental Policy Research, Working Paper 07-003 (April 2007), at 5.

> As the CO_2 transport and storage sector grows, similar issues of regulatory frameworks and the mix of federal and state jurisdiction are likely to have to be confronted, as has been the case for all network industries in the United States. The eventual economic regulatory development for CCS will need to consider the varying approaches taken for oil and natural gas, and the serious problems that their history experienced.

Thus, Congress may eventually be asked to consider whether the existing federal jurisdictional disclaimers and the current state-by-state regulatory structure for EOR pipelines comprise an appropriate regulatory scheme for a potential national CO_2 pipeline network in support of CCS. If Congress wishes to amend the existing regulatory structure, it could choose to amend existing statutes to provide for definitive CO_2 pipeline rate jurisdiction by the federal government. FERC and the STB are two candidates for administration of such oversight. Alternatively, Congress could establish another federal regulator of CO_2 pipelines, or enact legislation addressing specific aspects of the existing regulatory structure for EOR.

Liability Concerns Associated with CCS Technology

As with most developing technologies, implementation of CCS gives rise to a number of concerns related to both known and unknown risk of loss and liability. Generally, the liability risks associated with CCS fall into three categories: (1) groundwater contamination, either through displacement of saline groundwater into potable aquifers or through direct CO_2 contamination of the aquifers; (2) seismic events triggered by pressure changes; and (3) surface releases due to buoyant flow of CO_2 upward through pathways in undetected faults or abandoned wells.

There is a growing concern that the uncertainty regarding financial responsibility for liability associated with CCS could seriously hinder the development of CCS technology. In the words of the non-profit U.S. Carbon Sequestration Council:

> A commercial scale power plant equipped with current CCS technology can easily cost over $2 billion. Energy companies and financial institutions (including insurers) cannot risk capital of that magnitude without a clear understanding of regulatory requirements, legal risks and long-term liabilities, before they commit the capital. Today, that understanding does not exist.[83]

Because of this uncertainty and the concern that it will hinder the development of CCS technology, some have suggested that the government create a liability scheme that will provide certainty to developers and possibly buttress against catastrophic risk. The first such proposal has been issued by the EPA pursuant to its regulatory authority under the Safe Drinking Water Act.[84] Other liability schemes that provide greater protection from catastrophic risk, including the "Price-Anderson" model, have also been discussed.

[83] U.S. Carbon Sequestration Council, *Wanted: A Legal and Regulatory Framework for Carbon Capture and Storage (CCS)*, April 2009, http://www.uscsc.org/Files/Admin/Educational_Papers/CCS_Legal_Regulatory_Framework.pdf.

[84] See generally 42 U.S.C. §§ 300f through 300j-26.

EPA Final Rule Governing UIC

On December 10, 2010, EPA issued a final rule for the regulation of the underground injection of CO_2 for purposes of CCS.[85] EPA issued the rule pursuant to its authority to regulate underground injections under the Safe Drinking Water Act. The rule applies to owners and operators of wells that will be used for long-term CO_2 sequestration.[86] In addition to technical and operational requirements, the final rule establishes a 50-year post-injection site care period, commencing when injection activities cease and the wells are plugged.[87] During this care period, the owner/operator would be required to comply with the regulatory requirements set forth by EPA, which include submission of a site closure plan, continued monitoring of the facility along with monitoring the underground CO_2 plume and modeling of its potential spread. [88] After this period has ended, the site is to be closed in accordance with the requirements set forth in this final rule.[89]

The final rule also establishes regulations that require owners or operators to demonstrate and maintain financial responsibility for corrective action on any wells in the vicinity, as well as for plugging of the injection well, the post-injection site care period, and emergency and remedial responses to any incidents.[90] The financial responsibility requirements are set forth in new regulations found at 40 C.F.R. § 146.85. They provide:

- the owner/operator must demonstrate financial responsibility in an acceptable instrument;[91]
- the instrument of financial responsibility must be sufficient to cover the cost of: (i) corrective action; (ii) injection well plugging; (iii) post-injection site care; (iv) emergency and remedial response;[92]
- the instrument must be "sufficient to address endangerment of underground sources of drinking water";[93] and
- the instrument must include certain cancellation, renewal and continuation provisions.[94]

More details regarding the required content of the instrument of financial responsibility are set forth in the regulations concerning each of these necessary elements. The sufficiency of the instrument also must be approved by the EPA Administrator.[95]

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[85] *Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO^2) Geologic Sequestration (GS) Wells, Final Rule*, 75 Fed. Reg. 77230 (December 10, 2010).

[86] *Id.*

[87] *Id.* at 77266-77268. The 50-year time frame can be shortened or lengthened by EPA based on site-specific data.

[88] *Id.*

[89] *Id.* at 77268.

[90] *Id.*

[91] 40 C.F.R. § 146.85(a)(1).

[92] *Id.* at § 146.85(a)(2).

[93] *Id.* at § 146.85(a)(3).

[94] *Id.* at § 146.85(a)(4).

[95] *Id.* at § 146.85(a)(5).

These financial assurance requirements are immediately applicable to any CCS owners or operators. However, if Congress wishes to require further financial assurance or liability coverage in the event of harm beyond what might be addressed by the EPA's UIC Final Rule, it can consider a number of options. Some of these are addressed here.

The Price-Anderson Model

One possible model for addressing potential liability concerns associated with CCS, especially the possibility of catastrophic loss, is the Price-Anderson Act,[96] which addresses liability associated with nuclear energy facilities. Under the Price-Anderson Act, nuclear power licensees are required to initially assume all liability for damages associated with their operations that are awarded to the public, though they may bring contribution actions if they feel that others are to blame. In addition, licensees must waive most of their legal defenses following an "extraordinary nuclear occurrence."[97] The act further requires licensees that operate reactors with at least 100 megawatts of generation capacity to obtain the maximum liability coverage readily available on the insurance market (currently $375 million).[98] Damages that exceed that amount are covered by the "Price-Anderson Fund," which is funded with retrospective premiums assessed equally against all licensees of 100 megawatts or greater.[99] That is, if a nuclear incident with liability in excess of $375 million occurs, that excess liability is covered equally by all the licensees. These retrospective payments are capped in order to limit the potential financial burden following a major accident.[100] Cumulative liability per incident is capped at $12.6 billion as of the date of this report.[101] Repayment of liability beyond that amount would require congressional approval under certain procedures outlined in the act.[102]

The liability scheme established by the Price-Anderson Act helped to make the developing nuclear power industry commercially viable in the 1950s by creating a means by which parties could obtain liability coverage despite the unknown extent of the potential liability associated with the emerging technology. Without liability coverage, nuclear generation would have been a risky financial proposition and perhaps would not have been economically viable, given the substantial liability exposure of nuclear facilities.

Although it could be argued that the CCS industry might not face the same potential for catastrophic loss associated with nuclear power, the uncertainty of liability associated with CCS could limit the industry much as the nascent nuclear power industry could have been limited without a federally created liability program. As a result, some have proposed the adoption of a liability scheme for CCS projects that is similar to that found in the Price-Anderson Act. For example, in March of 2009, a panel of EPA's Financial Advisory Board announced that it would look to the Price-Anderson Act for guidance in establishing the liability scheme for geologic CO_2

[96] Primarily section 170 of the Atomic Energy Act of 1954, 42 U.S.C. § 2210. For further discussion of the Price-Anderson Act, see CRS Report RL33558, *Nuclear Energy Policy*, by (name redacted) at section entitled "Nuclear Accident Liability."

[97] 42 U.S.C. § 2210(n).

[98] *Id.*

[99] *Id.*

[100] *Id.*

[101] See announcement of American Nuclear Insurers (the group tasked by the Price-Anderson Act with setting the liability limits) effective January 1, 2010, at http://www.amnucins.com/Media%20Center.html.

[102] *Id.*

sequestration.[103] Speaking about the Price-Anderson Act, the chairman of the panel noted that "[b]y limiting liability in the event of an accident, while at the same time providing some level of public compensation for damages, the legislation served as an incentive and the nuclear power industry grew from one reactor in 1957, to 104 today."[104] The chairman clarified that while he was not suggesting the adoption of the Price-Anderson model without alteration for the CCS industry, the panel would use the act as a guide for addressing long-term financial responsibility issues; for example, the panel might look to the act's three tiers of liability: individual site responsibility; collective responsibility of all nuclear generators; and the responsibility of the U.S. government.[105]

Financial Assurance Requirements in Legislative Proposals from the 111th Congress

Not all proposals to address CCS liability concerns are variations on the Price-Anderson model. Legislators proposed other CCS liability models in the 111th Congress. While none were ultimately adopted, they may provide a framework for future legislative proposals. For example, S. 1013, the Department of Energy Carbon Capture and Sequestration Program Amendments Act of 2009, would have required CCS facility licensees to obtain liability protection in amounts "acceptable" to regulators, and would authorize the Secretary of Energy to agree to indemnify licensees who satisfy this requirement for amounts in excess of the liability protection obtained by the licensees.[106] The federal Secretary of Energy would also have been authorized to collect a fee from licensees to cover this indemnification.[107] The amount of the fee would be determined by taking into account the likelihood of an incident and other factors related to the hazards associated with the indemnified project.[108] This proposal had some elements in common with the Price-Anderson model—most notably, the requirement that licensees obtain financial protection to a certain level, and indemnification through a federal program above and beyond that protection. However, the proposal would not necessarily have required licensees to obtain the highest possible level of financial protection before triggering federal indemnification, and such federal indemnification would come from the Treasury rather than a separate fund composed of monies collected retroactively from licensees.

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[103] "EPA Finance Advisors Eye Price-Anderson Model for CCS Liability," *Inside the EPA*, March 20, 2009.
[104] *Id.*
[105] *Id.*
[106] S. 1013 at § 2.
[107] *Id.*
[108] *Id.*