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Property Interests and Liability of Geologic Carbon Dioxide Storage

A Special Report to the
MIT Carbon Sequestration Initiative

September 2005

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ABSTRACT

Carbon dioxide capture and storage involves the capture of carbon dioxide from a stationary source and injection into a suitable storage site. Increasing attention is being paid to the use of geologic formations as storage reservoirs for captured carbon dioxide. Property interests play a role in determining the cost of geologic storage through the acquisition of necessary geologic reservoir property rights and the value of storage through ownership of injected carbon dioxide. The determination of the ownership interest for the storage reservoir depends on whether carbon dioxide is being injected into a mineral formation, including depleted oil and gas reservoirs, unmineable coal seams, and oil reservoirs for enhanced oil recovery, in which case ownership determination is based on mineral law, or whether carbon dioxide is being into a deep saline formation, in which case the determination of property interests is influenced by water law. Acquisition of ownership rights over the formation may be done by voluntary methods, eminent domain, or adverse possession. Ownership over injected carbon dioxide will depend on whether a state subscribes to the ownership or non-ownership theory of injected gas. Liability concerning property rights may derive from several theories, including geophysical surface trespass, geophysical subsurface trespass, or liability from commingling of goods. Legislation on the state or federal level concerning property interests and eminent domain power may provide clarification over property interests and liability of geologic storage of carbon dioxide.

I. INTRODUCTION

In the face of increasing evidence of possible changes in the global climate as a result of anthropocentric causes[1] and the expectation that widespread use of fossil fuels will continue for the foreseeable future,[2] carbon dioxide capture and storage ("CCS") has stimulated interest as a potential method for managing greenhouse gas emissions.[3] CCS involves the capture of carbon dioxide from a stationary source and injection into a

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[1] CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS 10-11 (J.T. Houghton *et al.* eds., 2001).

[2] U.S. ENERGY INFORMATION ADMINISTRATION, ANNUAL ENERGY OUTLOOK 5 (February 2005).

[3] *See, e.g.*, U.S. DEPARTMENT OF ENERGY, OFFICE OF FOSSIL ENERGY, CARBON SEQUESTRATION TECHNOLOGY ROADMAP AND PROGRAM PLAN 9 (2004).

suitable storage site.[4] Increasing attention is being paid to the use of geologic formations as storage reservoirs for captured carbon dioxide. Potential geologic reservoirs include oil and gas fields, coal seams, and deep saline formations.[5]

The consideration of property interests and associated liability is fundamental to CCS operations. Property interests play a role in determining the cost of geologic storage through the acquisition of necessary geologic reservoir property rights and the value of storage through ownership of injected carbon dioxide. The determination of property interests will also have implications for long-term liability of any carbon dioxide emitted to the atmosphere in the future.[6]

This essay concentrates on property interests and liability of geologic carbon dioxide storage. Part II addresses the issue of property rights governing the geologic storage reservoir, including a characterization of relevant property interests and methods of acquiring the interests by voluntary and involuntary means. Part III examines the property interests of injected carbon dioxide, using the property frameworks of enhanced oil recovery and natural gas storage. With the property interests to the geologic reservoir and injected carbon dioxide defined, Part IV addresses potential sources of liability from geophysical trespass and the confusion of carbon dioxide with other minerals in the geologic reservoir. Finally, Part V considers the potential for federal and state legislation to clarify property interests and related liability.

There are several caveats to the property rights analysis in this essay. First, this essay does not consider the property rights governing permits for stored carbon dioxide. Economic studies often consider the role of CCS in a carbon-constrained world using scenarios such as emission trading schemes.[7] Emission trading allocates property rights in the form of emission allowances, with parties liable for noncompliance.[8] Property interests for carbon permits are a function of the climate policy regime, and must take into account issues such as permit allocation, regulatory evolution, transaction costs, and capital stock turnover.[9] This analysis is outside the scope of this essay. Regardless, it is within the authority of a legislature to create whatever rule governing property interests it deems fit, irrespective of the creation of a market for emission permits. Second, this essay does not consider the issue of taxation. If a geologic formation or injected carbon dioxide becomes one's property, there will be property tax implications associated with that ownership. Third, the examination of property rights in this essay is specific to the

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[4] *See, e.g.*, Howard Herzog & Dan Golomb, *Carbon Capture and Storage from Fossil Fuel Use, in* ENCYCLOPEDIA OF ENERGY 277, 280 (C.J. Cleveland *et al.* ed., 2004), *available at* http://sequestration.mit.edu/pdf/enclyclopedia_of_energy_article.pdf.

[5] Franklin Orr, *Distinguished Author Series: Storage of Carbon Dioxide in Geologic Formations*, J. PETROLEUM TECH., Sept. 2004, at 90.

[6] Mark de Figueiredo et al., *Framing the Long-Term Liability Issue for Geologic Carbon Storage in the United States*, MITIGATION & ADAPTATION STRATEGIES FOR GLOBAL CHANGE (forthcoming 2005).

[7] *See e.g.*, Jim McFarland et al., *Economic Modeling of Carbon Capture and Sequestration Technologies, in* PROCEEDINGS OF FIRST NATIONAL CONFERENCE ON CARBON SEQUESTRATION (2001), *available at* http://www.netl.doe.gov/publications/proceedings/01/carbon_seq/2c3.pdf.

[8] David G. Victor, *Enforcing International Law: Implications for an Effective Global Warming Regime*, 10 DUKE ENVIRONMENTAL LAW AND POLICY FORUM 147, 174 (1999).

[9] *Id.* at 175-179.

United States. In many countries where CCS has been proposed, such as Norway,[10] England,[11] and Australia,[12] the crown has retained its property interests to the subsurface.[13] In the United States, the issue of property rights is largely one of state law. Because some states follow English traditions with respect to property law, however, this analysis may be applicable to other common law countries as well.

II. OWNERSHIP OF GEOLOGIC STORAGE RESERVOIR

This section reviews the property interests associated with potential geologic storage reservoirs and reviews methods of acquiring ownership rights. The determination of the ownership interest for the storage reservoir depends on the type of geologic formation into which the carbon dioxide is being injected. When carbon dioxide is injected into a mineral formation, including depleted oil and gas reservoirs, unmineable coal seams, and oil reservoirs for enhanced oil recovery, property interests are influenced by mineral law. When carbon dioxide is injected into a deep saline formation, property interests are influenced by water law. In addition, ownership rules will vary on a state-by-state basis. Once the ownership interests have been determined, acquisition can take place using various potential methods, including voluntary methods, eminent domain, or adverse possession.

A. Ownership of Mineral Formation

1. Mineral and Surface Interests

There are two property interests of significance in determining ownership of the geologic storage reservoir that has contained oil, gas, or coal. The first is the mineral interest, which comprises the right to explore and remove minerals from the land.[14] The mineral interest may be associated with a royalty interest, which is the right to receive a share of the exploited mineral proceeds.[15] Most states regard a mineral interest as including not only stationary minerals such as coal, but also fugacious minerals, such as oil and gas, unless intent to the contrary is expressed.[16] The second property interest of significance is the surface interest, which consists of all other ownership in the land.[17]

In the simplest case, the mineral interest and surface interest of a property are held by a single owner in what is known as a "fee simple". A fee simple is the broadest property

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[10] Norway State Secretary Øyvind Håbrekke, Address at the OSPAR Workshop on the Environmental Impact of Placement of Carbon Dioxide in Geological Structures in the Maritime Area (Oct. 26, 2004).
[11] U.K. DEPARTMENT OF TRADE AND INDUSTRY, OUR ENERGY FUTURE – CREATING A LOW CARBON ECONOMY 90 (2003).
[12] AUSTRALIAN GOVERNMENT, SECURING AUSTRALIA'S ENERGY FUTURE 143 (2004).
[13] Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 VA. L. REV. 965, 1028 (2004).
[14] BLACK'S LAW DICTIONARY (8th ed. 2004).
[15] BLACK'S LAW DICTIONARY (8th ed. 2004).
[16] BLACK'S LAW DICTIONARY (8th ed. 2004).
[17] This follows the common law doctrine *cujus est solum, ejus est usque ad coelum et ad inferos* ("to whomever the soil belongs, he also to the sky and to the depths").

interest allowed by law and is unlimited in duration.[18] If the mineral and surface interests are held together in fee simple, one need only acquire the interest to the reservoir from the fee owner. If the fee owner grants an exclusive right to drill into the formation, there will be no danger of liability for trespass (see discussion on liability, *infra*).[19] If there are numerous fee owners, transaction costs may increase and difficulties could arise if one of the fee owners refused to give consent for storage.[20]

It would be unlikely that an entity seeking to use a geologic formation for carbon dioxide storage would acquire the property rights as a fee simple because the land area overlying the storage formation could be quite large, and only a limited portion of this surface would be necessary for storage operations.[21] It is more likely for a storage owner to obtain a lease or a storage deed.[22] In a lease, the owner of the land (lessor) receives a series of payments from the tenant (lessee), in exchange for development rights to the land for a period of time. In a storage deed, the fee owner conveys the property interest to the geologic formation, and all surface rights which may be necessary for storage operations.[23]

2. American and English Rules for Ownership of Geologic Formation

The mineral interest may be severed from the surface interest, meaning that the mineral and surface interests are held by different owners.[24] Severance may have occurred through a mineral deed, a mineral deed and subsequent oil and gas lease, or by an oil and gas lease alone.[25] If the mineral and surface interests are severed, states are not in agreement as to whether the geologic formation is owned by the mineral owner or by the surface owner.

The English rule, which is the minority rule in the United States, but is law in Canada and England, holds that the owner of the mineral interest has ownership over the geologic formation, even after all the minerals have been removed.[26] This is because the mineral owner has the exclusive right of possession of the whole space, and is entitled to the entire and exclusive use of that space for all purposes.[27] The English Rule assumes that the mineral owner does not take title to oil or gas until the owner reduces it to possession. The Kentucky case of *Central Kentucky Natural Gas Co. v. Smallwood* was one of the

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[18] BLACK'S LAW DICTIONARY (8th ed. 2004).
[19] Wade H. Creekmore, Jr. & William B. Harvey, Comment, *Subsurface Storage of Gas*, 39 MISS L. J. 81, 91 (1967).
[20] *Id.*
[21] Alan Stamm, *Legal Problems in the Underground Storage of Natural Gas*, 36 TEX. L. REV. 161, 164 (1957).
[22] *Id.*
[23] *Id.* at 165.
[24] Roger Scott, *Underground Storage of Natural Gas: A Study of Legal Problems*, 19 OKLA. L. REV. 47, 57 (1966).
[25] Wade H. Creekmore, Jr. & William B. Harvey, Comment, *Subsurface Storage of Gas*, 39 MISS L. J. 81, 91 (1967).
[26] Jack Lyndon, *The Legal Aspects of Underground Storage of Natural Gas – Should Legislation Be Considered Before the Problem Arises?* 1 ALBERTA L. REV. 543, 545 (1961).
[27] *Central Kentucky Natural Gas Co. v. Smallwood*, 252 S.W.2d 866, 868 (Ky. 1952).

first applications of the rule in the United States,[28] however, the Kentucky judiciary limited the *Smallwood* holding in 1987 for cases where storage reservoirs were capable of being defined with certainty and reservoir integrity was capable of being maintained.[29] Note that even where the mineral interest owner has ownership over the subsurface formation, CCS operations may still require property interests over the land surface for drilling injection wells, pipelines to carry carbon dioxide to the formation, and necessary equipment such as compressor stations or monitoring devices.[30]

In the majority of states, the owner of the surface interest owns the geologic formation. This is known as the American Rule. The West Virginia case of *Tate v. United Fuel Gas Co.* is exemplary of the rule.[31] The fee simple owner conveyed the surface interest of the land to the plaintiff Tate's predecessor in title, but excepted from the deed was the right to produce and remove the "oil, gas and brine and all minerals, except coal underlying the surface of the land". The deed included a clause that the term "mineral" did 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 reserved and excepted herein". Tate acquired the surface interest to the land, including the same exceptions set forth in the original deed. The mineral interest owners executed an oil and gas lease with United Fuel Gas, as well as a gas storage agreement granting United Fuel Gas the right to inject and store gas in the formation. Although no gas was produced from the formation, United Fuel Gas used the formation to store gas that had been produced elsewhere. Tate claimed that he was the rightful owner of all the clay, sand and stone within and underlying the land. The court concluded that because "mineral" was limited so as not to include "clay, sand, stone or surface minerals", the surface interest owner Tate retained ownership of the geologic formation. The court found that the restriction in the deed was limited to the production of minerals, and was not intended for the storage of gas produced elsewhere.

Although the subsurface geologic formation is owned by the surface interest owner under the American Rule, the mineral interest owner still has a property interest in exploring and removing minerals from the land. As shown in Figure 1, the property interests that need to be acquired are a function of: (1) whether the reservoir is depleted of minerals; and (2) whether the mineral interest has been severed from the surface interest. If the mineral interest has not been severed, meaning that the surface interest and mineral interest are owned as one, the interest of this owner (shown in Figure 1 as "Surface Owner") must be acquired; this is irrespective of whether the reservoir has been depleted of minerals. If the mineral interest has been severed, whether the mineral interest must be acquired depends on whether the reservoir is depleted of minerals. If the reservoir is depleted of minerals, the mineral interest owner no longer has the right of use of the formation space, and the surface interest need only be acquired. If the reservoir still contains minerals, both the surface interest and the mineral interest must be acquired.

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[28] *Id.*
[29] *Texas American Energy Corp. v. Citizens Fidelity Bank & Trust Co.*, 736 S.W.2d 25, 28 (Ky. 1987).
[30] Wade H. Creekmore, Jr. & William B. Harvey, Comment, *Subsurface Storage of Gas*, 39 MISS L. J. 81, 91 (1967).
[31] 71 S.E.2d 65 (1952).

	Unsevered Mineral Interest	**Severed Mineral Interest**
Non-Depleted Reservoir	Surface Owner	Surface Owner Mineral Owner
Depleted Reservoir	Surface Owner	Surface Owner

Figure 1: Relevant Property Interests for Acquisition of Geologic Reservoir

Also of note is that the geologic formation will never be fully depleted of minerals.[32] In the future, new methods of mineral extraction could potentially be developed to exploit the presently unrecoverable minerals.[33] Therefore, there will likely be a transaction cost associated with purchasing the rights of the mineral interest owner who claims that the reservoir is not depleted.

B. Ownership of Saline Formation

In general, water property law differentiates between "surface water" and "groundwater". Surface water is water lying on the surface of the Earth but not forming part of a watercourse or lake, while groundwater is water found in layers of permeable rock or soil.[34] Groundwater is typically classified as either an "underground stream" or "percolating water". An underground stream, defined as water with a defined channel,[35] is treated by the law as surface water.[36] Percolating water, defined as water that seeps through the soil without a defined channel,[37] operates under a separate legal regime.[38] Groundwater which is not contained in an underground stream, is assumed to be percolating water by default.[39] The distinction between an underground stream and percolating water as the only sources of groundwater has been criticized by hydrologists

[32] Orpha A. Merrill, Note and Comments, *Oil and Gas: Substratum Storage Problems*, 7 OKLA. L. REV. 225, 227 (1954).
[33] *Id.*
[34] BLACK'S LAW DICTIONARY (8th ed. 2004).
[35] *Id.*
[36] Eric Behrens & Matthew G. Dore, *Rights of Landowners to Percolating Groundwater in Texas*, 32 S. TEX. L. REV. 185, 199 (1991).
[37] BLACK'S LAW DICTIONARY (8th ed. 2004).
[38] Behrens & Dore, *supra* note 36, at 187.
[39] J. P. Massie, Annotation, *Subterranean and Percolating Waters*, 55 A.L.R. 1385 (2004).

as lacking a scientific basis.[40] Water contained in a saline formation suitable for geologic carbon dioxide storage would be defined as percolating water. Note that the law does not differentiate between freshwater and saline aquifers with respect to ownership. In addition, there is an inherent uncertainty concerning the determination of property rights for a saline formation with respect to carbon dioxide storage because of the lack of case law on point.[41] Instead, the law has focused on property rights over the taking and use of groundwater for consumption.

The determination of property rights over a saline formation is comparable to the mineral formation case. In the majority of states, the owner of the surface interest has the right to make any use of the subsurface space, including the saline formation.[42] Just as in the case of a mineral formation, where ownership of non-depleted minerals must be accounted for, any storage operation needs to take into account ownership of the water contained in the saline formation. Unlike the mineral rights case, however, there are a number of property regimes that states use to determine property rights over the water. In general, states follow one of five major doctrines: absolute dominion, reasonable use, prior appropriation, correlative rights, or the Restatement rule (see Table 2).

1. Absolute Dominion Rule

Under the absolute dominion rule (also known as the "absolute ownership" rule), the surface owner has "absolute dominion" over everything above, on, or below the land.[43] Any water contained in an aquifer lying beneath the land is the property of the surface owner.[44] The surface owner would have the right to use the water for any purpose, with no liability for damage to an adjoining owner.[45] The absolute dominion rule holds that groundwater is the absolute property of the surface owner, as with the rocks and soil that compose the land.[46] Therefore, for any state operating under the absolute dominion rule, acquisition of the surface right to the land would be a sufficient property right over water contained in an aquifer beneath the land.

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[40] Behrens & Dore, *supra* note 36, at 187.
[41] Tara L. Taguchi, *Whose Space Is It Anyway? Protecting the Public Interest in Allocating Storage Space in California's Groundwater Basins*, 32 SW. U. L. REV. 117, 119 (2003).
[42] WILLIAM R. WALKER & WILLIAM E. COX, DEEP WELL INJECTION OF INDUS. WASTES: GOV'T CONTROLS AND LEGAL CONSTRAINTS 131 (1976).
[43] Alison Mylander Gregory, *Groundwater and its Future: Competing Interests and Burgeoning Markets*, 11 STAN. ENVTL. L.J. 229, 240 (1992). *See also*, 78 AM. JUR. 2D *Waters* § 214 (2004).
[44] Alison Mylander Gregory, *Groundwater and its Future: Competing Interests and Burgeoning Markets*, 11 STAN. ENVTL. L.J. 229, 240 (1992).
[45] *Bristor v. Cheatham*, 255 P.2d 173, 178 (Ariz. 1953).
[46] *Maddocks v. Giles*, 728 A.2d 150 (Me. 1999). *See also*, 78 AM. JUR. 2D *Waters* § 214 (2004).

Table 1: Groundwater Property Rights Doctrines (Water Systems Council, 2003) [47]

DOCTRINE	STATES
Absolute Dominion Rule	Connecticut, Indiana, Louisiana, Maine, Massachusetts, Mississippi, Rhode Island, Texas
Reasonable Use Rule	Alabama, Arizona, Florida, Georgia, Illinois, Kentucky, Maryland, New Hampshire, New York, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia
Correlative Rights Rule	California, Hawaii, Iowa, Minnesota, New Jersey, Vermont
Restatement Rule	Michigan, Ohio, Wisconsin
Prior Appropriation Rule	Alaska, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington
Combination of multiple rules	Arkansas, Delaware, Missouri, Nebraska, Wyoming

2. Reasonable Use Rule

Under the reasonable use rule, there is no restriction on the taking of groundwater, however, any use must be in a reasonable and beneficial manner.[48] A use not connected to beneficial enjoyment of the land from which it is obtained would be an unlawful purpose with respect to percolating waters. The reasonable use rule is pertinent where large quantities of water are extracted for use at a distance from the land where the water was extracted, and generally applies only when there is no connection with the use, enjoyment, or improvement of the land from which it is extracted.[49]

3. Correlative Rights Rule

The correlative rights rule is an extension of the reasonable use rule. Surface owners hold proportionate proprietary shares in the aquifer, with the largest landowner having the largest share of the aquifer since the owner has the largest share of the land above it.[50] During times of water scarcity, landowners are restricted to a fair and just proportion of the supply, which is determined by the proportionate share.[51] The courts may weigh and balance the rights of competing uses to determine those that are proper.[52] In California, the correlative rights rule has been extended by the doctrine of mutual prescription,

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[47] WATER SYSTEMS COUNCIL, WHO OWNS THE WATER? 1-2 (2003)
[48] *Bristor*, 255 P.2d at 178.
[49] 78 AM. JUR. 2D *Waters* § 215 (2004).
[50] Earl Finbar Murphy, *The Recurring State Judicial Task of Choosing Rules for Groundwater Law: How Occult Still?* 66 NEB. L. REV. 120, 134 (1987).
[51] Gregory, *supra* note 45, at 241.
[52] *Id.*

allocating water by comparing reasonableness of use based on such factors as custom, social utility, safe yield, and need.[53]

4. Restatement Rule

The Restatement rule, from Section 858 of the Restatement (Second) of Torts, is also an extension of the reasonable use rule. While the reasonable use rule requires water to be used on the land overlying the aquifer, the Restatement rule allows for water to be applied outside of the overlying land.[54] Although the rule is a limitation of liability, its effect is as a rule governing property rights allocation.[55] The Restatement rule is stated as follows:

> A possessor of land who, in using the subterranean water therein, intentionally causes substantial harm to a possessor of other land through invasion of the other's interest in the use of subterranean water in his land, is liable to the other if, but only if, the harmful use of water is unreasonable in respect to the other possessor.

Restatement (Second) Torts, Section 858. As the rule has been interpreted, liability is imposed for any withdrawal which causes unreasonable harm to neighboring landowners by lowering the water table or reducing the pressure of the aquifer.[56] Liability is also imposed for any withdrawal which exceeds a reasonable portion of the annual ground water storage for the aquifer.[57] The rule has not received widespread acceptance due to its lack of guidance and difficulties in application.[58]

5. Prior Appropriation Rule

Under the prior appropriation rule, temporal precedence establishes property right over the groundwater.[59] This is the so called "first in time, first in right" rule. During times of water shortage, whoever drills into the aquifer first in time has priority over the taking of water contained in the aquifer.[60] In some states, the courts have imposed reasonableness restrictions on the prior appropriation rule.[61] For example, Colorado prohibits pumping if it would result in a forty percent depletion of groundwater over a twenty-five year period, and Idaho has prohibited all groundwater mining.[62]

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[53] *City of Pasadena v. City of Alhambra*, 207 P.2d 17, 33 (Cal. 1949). *See also*, Gregory, *supra* note 45, at 242.
[54] Dylan O. Drummond, Comment, *Texas Groundwater Law in the Twenty-First Century: A Compendium of Historical Approaches, Current Problems, and Future Solutions Focusing on the High Plains Aquifer and the Panhandle*, 4 TEX. TECH. J. TEX. ADMIN. L. 173, 197 (2003).
[55] *Id.* at 200.
[56] *Id.*
[57] *Id.*
[58] Gregory, *supra* note 45, at 242.
[59] Drummond, *supra* note 54, at 201.
[60] Taguchi, *supra* note 41, at 125.
[61] Drummond, *supra* note 54, at 201.
[62] *Id.* at 202.

C. Methods of Acquiring Ownership Rights

There are three methods of acquiring ownership rights: voluntary methods, eminent domain, and adverse possession. Ownership acquired by voluntary methods involves negotiations with the interest owner to acquire storage rights to the reservoir under a lease or a deed. A second method of acquiring ownership, using the power of eminent domain, typically follows the unsuccessful use of voluntary methods, and must be specified by law. Ownership acquired by adverse possession requires the actual, open and notorious, hostile, exclusive, and continuous possession of the property.

1. Acquisition by Voluntary Methods

The choice of acquiring ownership by lease or deed depends on the desire of the person controlling the needed property interest.[63] A deed conveys all rights, title and interest in a formation, together with any necessary surface land.[64] Payment would be made in the form of a lump sum and costs would be capitalized. A lease provides the right to conduct operations in the geologic formation for a defeasible term, along with the right to use surface land which is reasonable and necessary to the exercise of the storage rights.[65] Payments would be made on a periodic basis, with the costs accounted for as an expense.

2. Acquisition by Power of Eminent Domain

A second method of acquiring ownership rights over the reservoir is through the power of eminent domain, or condemnation. Eminent domain power must be provided for by federal or state legislation.[66] In addressing the use of eminent domain power for natural gas storage, the court in *Strain v. Cities Service Gas Co.* held that a general condemnation statute was insufficient for exercising eminent domain power for the purposes of acquiring a natural gas storage reservoir; eminent domain statutes are not to be "enlarged by implication".[67] The power of eminent domain can only be exercised after the passage of legislation which is specific to the occasions, modes, conditions, and agencies for exercising the power.[68] The *Strain* court held that:

> The use of the earth as a storage place for gas is an idea so novel, we cannot believe the legislature had such matter in contemplation when the power of eminent domain was given to pipe line companies. If the rights contended for by appellant are to be given to gas pipe line companies, it is a matter for the consideration of the legislature. The stretch the statute to cover the case here presented would be a little short of judicial legislation.

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[63] Scott, *supra* note 24, at 64.
[64] *Id.*
[65] *Id.*
[66] *Strain v. Cities Service Gas Co.*, 83 P.2d 124, 126 (Kan. 1938).
[67] *Id.* at 127.
[68] *Id.* at 126.

Strain v. Cities Service Gas Co., 83 P.2d 124, 127 (Kan. 1938). In 1938, Congress passed the Natural Gas Act, with language authorizing the federal power to condemn property for natural gas storage.[69] In addition, several states have enacted eminent domain laws for acquiring underground storage rights.[70] As a general rule, state eminent domain laws contain a recitation that underground storage of natural gas promotes conservation, the public interest, and the general welfare of the state;[71] acquiring ownership through the federal Natural Gas Act requires that a "certificate of public convenience or necessity" be acquired from the Federal Energy Regulatory Commission upon a finding that the applicant's operations conform with the Natural Gas Act.[72] Although there is both federal and state legislation delegating eminent domain power, there is no need for federal legislation if states legislate in this area.[73]

The condemnor will generally acquire an easement in the subsurface stratum.[74] Thus, the condemnee may drill through the condemned stratum to extract oil or gas from a deeper formation.[75]

In general, the power of eminent domain may be exercised in four possible ways.[76] The most common way is through a condemnation proceeding, where a judge or arbiter determines the compensation to be paid to the property owner, the owner is paid, and title to the property transfers to the government.[77] A second way is through the federal Declaration of Takings Act,[78] where the government files a declaration of taking with the court, deposits an amount of money equal to the estimated value of the land, and takes immediate title and possession of the property; the deposited money is paid to the owner, and a condemnation proceeding is held to determine if the value of the property is higher than the estimate.[79] The third possibility, a legislative taking, occurs when the legislature passes a statute vesting title of a property in the government immediately upon enactment, with the compensation to the landowner to be determined at a subsequent proceeding.[80] The final option, and the least common, known as inverse condemnation, is for government to take physical possession of a property without any formal proceedings, with the owner having the right to sue the government for "inverse condemnation" for taking the property without just compensation and seeking damages for that taking.[81]

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[69] *Columbia Gas Transmission Corp. v. An Exclusive Gas Storage Easement*, 776 F.2d 125, 128 (1985).
[70] Scott, *supra* note 24, at 64.
[71] *Id.* at 67.
[72] Fred McGaha, *Underground Gas Storage: Opposing Rights and Interests*, 46 LA. L. REV. 871, 886 (1986).
[73] Scott, *supra* note 24, at 71.
[74] *Id.* at 66.
[75] *Id.*
[76] *See generally*, Steven D. McGrew, *Selected Issues in Federal Condemnations for Underground Natural Gas Storage Rights: Valuation Methods, Inverse Condemnation, and Trespass*, 51 CASE. W. RES. L. REV. 131, 148 (2000).
[77] *Id.*
[78] 40 U.S.C. § 3114 (2005).
[79] McGrew, *supra* note 76, at 148.
[80] *Id.*
[81] *Id.*

In general, the value that is paid by the government for the property rights appropriated is the fair market value of the rights appropriated due to the condemnation action.[82] The level of compensation will depend on whether full ownership of the property has been granted (in which case a "takings" analysis determines the value) or whether a servitude has been obtained (in which case a "damages" analysis determines value). In a takings analysis, the fair market value is the price at which a buyer, willing but not obligated to buy, would pay a seller, willing but not obligated to sell the property.[83] Determining the fair market value requires one to speculate the value of the mineral interest. Because mineral rights are seldom sold, but rather are normally leased, mineral interest owners often have difficulty in establishing their losses.[84] The value of compensation may derive from evidence of comparable sales, the existence of sufficient minerals allowing for their commercial recovery, and that exploitation of minerals is consistent with the highest and best use of the land.[85] In a damages analysis, where the property right remains with the owner subject to a servitude granted for the storage operations, the fair market value is determined by a before-and-after market value test, where compensation is the difference between the value of the property interest before the taking and the value of the property interest after the taking.[86] Evidence for determination of this compensation could include the fair market value of the servitude based upon a capitalization of retail income for the right to store the gas, depreciation in the fair market value of the condemned tract as a whole by reason of the taking of the storage easement, and the change in value of a mineral lease for the property (such as due to the increased cost in mining).[87]

3. Acquisition by Adverse Possession

Finally, property ownership may be lost due to "adverse possession". Adverse possession is the loss of ownership due to the adverse use and possession of the servient lands sufficient to give rise to a cause of action.[88] The adverse possessor must demonstrate "actual",[89] "open and notorious",[90] "hostile",[91] and "adverse use"[92] of the property during a continuous and uninterrupted statutory period. Generally, once adverse possession begins, it can be interrupted only by an actual or constructive ouster.[93] Actual ouster is the physical removal of the adverse possessor from the premises, while

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[82] Scott, *supra* note 24, at 71.
[83] Robert A. Dunkelman, *Consideration of Mineral rights in Eminent Domain Proceedings,* 46 LA. L. REV. 827, 835 (1986).
[84] *Id.* at 841
[85] *Columbia Gas Transmission Corp. v. An Exclusive Natural Gas Storage Easement*, 620 N.E.2d 48, 49 (Ohio 1993). *See also,* McGrew, *supra* note 76, at 153.
[86] Dunkelman, *supra* note 83, at 836.
[87] *Columbia Gas Transmission Corp.*, 620 N.E.2d at 49. *See also,* McGrew, *supra* note 76 at 158.
[88] OWEN L. ANDERSON ET AL., HEMINGWAY OIL AND GAS LAW AND TAXATION § 3.4(A) (4th ed. 2004).
[89] Actual possession means physical occupancy or control over property. BLACK'S LAW DICTIONARY (8th ed. 2004).
[90] Open and notorious possession means possession or control that is evident to others. *Id.*
[91] Hostile possession means possession asserted against the claims of all others. *Id.*
[92] Adverse use means a use without license or permission. *Id.*
[93] ANDERSON, *supra* note 88, § 3.4(C).

constructive ouster involves a court order ejecting the adverse possessor from the premises.[94]

The scope of ownership acquired by adverse possession depends on whether there has been a prior mineral severance. If the mineral interest has not been severed from the surface interest, adverse possession of the surface will encompass all of the land, including the minerals.[95] Surface occupancy would provide sufficient notice to the true owner of the property interest. Where the mineral interest has been severed from the surface interest, however, adverse possession of the surface will encompass only the surface and not the minerals.[96] Adverse possession of the mineral interest would require acts sufficient to put the true owner on notice that someone is asserting rights to the mineral interest, rather than the surface interest.[97] In addition, there may be limitations that ownership has been acquired under good faith color of title, that is to say that the adverse possessor holds a deed acquired in the good faith belief that it granted ownership of the property.[98]

III. OWNERSHIP OF INJECTED CARBON DIOXIDE

Although the issue of ownership over injected carbon dioxide has not arisen in the courts, they have addressed ownership over injected natural gas injected, and one might expect the holdings concerning natural gas storage to serve as precedent for carbon dioxide storage. The decisions regarding ownership over injected natural gas rely on two fundamental rules of mineral law: the rule of capture and the doctrine of ownership-in-place (and the contrasting doctrine of non-ownership).

The rule of capture analogizes oil and gas to wild animals (*ferae naturae*).[99] Like wild animals, the rule of capture considers oil and gas as fugacious and the landowner does not come into ownership of the property until it has been brought into personal possession by capture.[100] The rule of capture was most notably articulated by the Pennsylvania judiciary in *Westmoreland & Cambria Natural Gas Co. v. De Witt*:

> Water and oil, and still more strongly gas, may be classed by themselves, if the analogy be not too fanciful, as *minerals ferae naturae*. In common with animals, and unlike other minerals, they have the power and the tendency to escape without the volition of the owner. Their 'fugitive and wandering existence within the limits of a particular tract was uncertain' as said by Chief Justice Agnew in Brown v. Vandegrift, 80 Pa. St. 147, 148. They belong to the owner of the land, and are part of it, so long as

[94] *Id.*
[95] *Id.* at § 3.4(B)
[96] *Id.* at § 3.4(C)
[97] *Id.* at § 3.5(A)
[98] *Id.* at § 3.5 (B)
[99] Lewis M. Andrews, *The Correlative Rights Doctrine in the Law of Oil and Gas,* 13 S. CAL. L. REV. 185, 186 (1940). *See also,* W. L. Summers, *Property in Oil and Gas,* 29 YALE L. J. 174, 176 (1919)
[100] *Brown v. Spilman*, 155 U.S. 665, 669 (1895).

> they are on or in it, and are subject to his control; but when they escape, and go into other land, or come under another's control, the title of the former owner is gone. Possession of the land, therefore, is not necessarily possession of the gas.

Westmoreland & Cambria Natural Gas Co. v. De Witt, 18 A. 724, 725 (1889). The consequence of the rule of capture is that there is no liability for drainage of oil and gas from under the lands of neighboring properties, so long as all relevant laws and regulations have been observed.[101]

The rule of capture gives rise to the doctrine of non-ownership, which holds that the owner of a severed mineral interest does not have a present right to possess the oil and gas in place, but only to search for, develop and produce it.[102] The doctrine of non-ownership can be contrasted with the doctrine of ownership-in-place, which holds that the owner has the right to use the land surface to produce oil and gas from property, but that the interest in the oil and gas terminates if the oil and gas flows out from under the owner's land.[103] Thus, under the doctrine of ownership-in-place, the owner of the mineral interest owns the oil and gas beneath the surface; under the doctrine of non-ownership, the owner of the mineral interest does not own the oil and gas beneath the surface until it has been brought into personal possession.

A. Non-Ownership Theory of Injected Gas

In the early jurisprudence concerning ownership of injected natural gas, the courts held that title to natural gas was lost upon injection. This doctrine, known as the non-ownership theory of injected gas, was first developed in the case of *Hammonds v. Central Kentucky Natural Gas Co*.[104] In the *Hammonds* case, the plaintiff Hammonds owned 54 acres in fee simple, but within a 15,000 acre depleted natural gas field which the defendant Central Kentucky Natural Gas Co. was using for natural gas storage.[105] Hammonds brought a trespass action against Central Kentucky Natural Gas Co. alleging that the natural gas was entering on her subsurface property without her knowledge or consent.[106]

The question presented to the court was whether gas, having once been reduced to possession and absolute ownership being vested, was restored to its original wild and natural status by being injected into a geologic reservoir.[107] The Kentucky judiciary relied on the rule of capture, the notion that natural gas becomes personal property only after it has been reduced to actual possession by extraction, and the doctrine of non-

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[101] William O. Huie, *Apportionment of Oil and Gas Royalties*, 78 HARV. L. REV. 1113, 1128 (1965). *See also,* Sydney W. Falk, Jr., Note, *Natural Gas Regulation and Vested Property Interests: Ratable Taking, Proration Standards, and Fieldwide Civil Liability*, 62 TEX. L. REV. 691, 734 (1983).
[102] BLACK'S LAW DICTIONARY (8th ed. 2004).
[103] *Id.*
[104] *Hammonds v. Central Kentucky Natural Gas Co.*, 255 S.W.2d 204 (Ky. 1934).
[105] *Id.* at 204.
[106] *Id.*
[107] *Id.* at 205.

ownership, which assumes that natural gas has the tendency to escape without the volition of the owner.[108] As interpreted by the *Hammonds* court, gas must be brought under dominion and into actual possession at the surface in order to gain title to the gas.

The judiciary used these principles to develop the non-ownership theory of injected gas. In particular, the court relied on the analogy of natural gas to wild animals:

> If one capture a fox in a forest and turn it loose in another, or if he catch a fish and put it back in the stream at another point, has he not done with that migratory, common property just what [Central Kentucky Natural Gas Co.] has done with the gas in this case? Did the company not lose its exclusive property in the gas when it restored the substance to its natural habitat?

Hammonds v. Central Kentucky Natural Gas Co., 255 S.W.2d 204, 205 (Ky. 1934). The *Hammonds* court held that if in fact gas was injected into a formation and "wandered" into the plaintiff's land, the defendant would not be liable to her for the value of the use of her property because the defendant lost ownership over the gas; the gas was restored to its wild and natural status (*mineral ferae naturae*).[109] Ironically, Central Kentucky Natural Gas Co. won the case (the company was not held liable for trespass), however, the holding of the case was of much greater loss to the firm; because the company had lost title to the gas and Hammonds would be free to retrieve to extract any of the natural gas stored by Central Kentucky Natural Gas Co. without incurring any liability.

B. Ownership Theory of Injected Gas

The contrast to the *Hammonds* doctrine is the ownership theory of injected gas, which was first articulated in *White v. New York State Natural Gas Corp.* by the Pennsylvania judiciary.[110] Under the ownership theory, title to injected gas is not lost by injection of the gas into a natural underground reservoir for storage purposes. The *White* court rejected the analogy of natural gas injected in a reservoir to wild animals, instead arguing that the stored natural gas was maintained in the possession of storage companies within a well-defined storage field.[111] The Texas judiciary in *Lone Star Gas Co. v. Murchison* also rejected the *Hammonds* doctrine.[112] According to the *Lone Star* court:

> Gas has no similarity to wild animals. Gas is an inanimate, diminishing non-reproductive substance lacking any will of its own, and, instead of running wild and roaming at large as animals do, is subject to be moved solely by pressure or mechanical means. It cannot be logically regarded as personal property of the human race as are wild animals, instead of being turned loose in the woods as the fanciful fox or placed in the streams as

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[108] *Id.*
[109] *Id.* at 206.
[110] *White v. New York State Natural Gas Co.*, 190 F. Supp. 342 (Pa. 1960).
[111] *Id.* at 348.
[112] *Lone Star Gas Co. v. J. W. Murchison*, 353 S.W.2d 870 (Tex. 1962).

> the fictitious fish, gas, a privately owned community, has been stored for use as required by the consuming public being, as alleged by appellant, subject to its control and withdrawal at any time. Logic and reason dictates the application of the *White* decision rather than *Hammonds*, to the end, that in Texas, the owner of gas does not lose title thereof by storing the same in a well-defined reservoir.

Lone Star Gas Co. v. J. W. Murchison, 353 S.W.2d 870, 879 (Tex. 1962).

Notably, the Kentucky judiciary, with attention paid to the *White* and *Lone Star* cases, decided to limit the scope of the Hammonds doctrine in the 1987 case of *Texas American Energy Corp. v. Citizens Fidelity Bank & Trust Co.*[113] The court rationalized this by arguing that in the *Hammonds* case, the storage company did not acquire all the property rights for the storage reservoir, whereas in the case at hand, the reservoir had total integrity, and the storage company owned all property rights.[114] Thus where an underground reservoir is capable of being defined with certainty and the integrity of the reservoir is capable of being maintained, the *Hammonds* doctrine does not apply.[115] Title to the oil or gas is not lost, and the fugacious minerals remain the property of the original owner.[116] Virtually all states now follow the ownership theory of injected gas.

IV. LIABILITY

There are three sources of liability deriving from the property interests of the geologic formation and injected carbon dioxide: geophysical surface trespass, geophysical subsurface trespass, and liability from confusion of goods. Geophysical surface trespass and geophysical subsurface trespass are tort property liabilities deriving from trespass.[117] Liability from confusion of goods derives from the mixture of things of the same nature but belonging to different owners so that the identification of the things is no longer possible.[118]

A. Geophysical Surface Trespass

Geophysical surface trespass takes place when a trespassing party uses the surface to conduct seismic and other surface or near-surface geophysical operations.[119] In general, this is for the purpose of identifying geological formations that may be favorable for retaining oil or gas.[120] A logical extension to geologic carbon dioxide storage would be

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[113] *Tex. Am. Energy Corp. v. Citizens Fidelity Bank & Trust Co.*, 736 S.W.2d 25 (Ky. 1987).
[114] *Id.* at 28.
[115] *Id.*
[116] *Id.*
[117] A trespass is an unlawful act committed against the property of another, generally in the context of wrongful entry on another's real property. BLACK'S LAW DICTIONARY (8th ed. 2004).
[118] *Id.*
[119] ANDERSON, *supra* note 88, § 4.1(B).
[120] *Id.*

trespass associated with geophysical operations to determine the suitability of a geologic storage reservoir.

Traditionally, when a mineral interest is severed from the surface interest, the mineral interest includes those surface rights necessary to find and develop the minerals.[121] Thus seismic geophysical operations conducted on the surface by the mineral interest owner would not constitute a geophysical surface trespass.[122]

Geophysical surface trespass can be divided into three types: surface geophysical exploration where a trespass is involved, surface geophysical exploration with no physical entry, and surface geophysical exploration that causes physical damage.

Surface geophysical exploration where a trespass is involved occurs where geophysical tests have been run on lands without proper authorization, causing the geophysical explorer to become a trespasser.[123] The trespasser may be able to recover actual damage done to the land, lost value of exploration rights, and possibly lost value of the right to execute leases (if the geophysical exploration deems the subsurface unsuitable for storage operations, or valueless for oil and gas production).[124]

For the case of surface geophysical exploration with no physical entry, the landowner has generally been denied recovery, however, recovery could theoretically derive from the fact that valuable subsurface information has been obtained, allowing for recovery under theories of invasion of privacy, theft of trade secrets, unjust enrichment, or interference with prospective advantage.[125]

Where surface geophysical operations cause physical damage (such as blasting during a seismic survey causing cracks in a neighboring house or the drying up of wells), one could recover for actual damages as long as a causal connection has been proven between the geophysical operations and resulting damage, and it has been demonstrated that the operator did not comply with the standard of conduct required in such operations.[126] The geophysical operator (e.g., the operator of the seismic equipment) would then be found liable on the grounds of strict liability, where liability is imposed for inherently dangerous activities.[127]

B. Geophysical Subsurface Trespass

Geological carbon dioxide storage faces two potential types of geophysical subsurface trespass: subsurface trespass that results in production or drainage of stored carbon dioxide from the storage reservoir, and trespass caused by underground intrusion of injected carbon dioxide.

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[121] *Id. See also*, Hunt Oil Co. v. Kerbaugh, 283 N.W.2d 131, 135 (N.D. 1979).
[122] ANDERSON, *supra* note 88, § 4.1(C).
[123] *Id.* at § 4.1(B).
[124] *Id.*
[125] *Id.* at § 4.1(C).
[126] *Id.* at § 4.1(D).
[127] *Id.*

Liability for subsurface trespass that results in production or drainage will depend on whether the trespasser acted in good faith.[128] In the case of oil and gas production, the good faith trespasser has generally been allowed to offset against the value of the extracted oil and gas the reasonable costs of drilling, completing, and operating wells producing the oil and gas.[129] The bad faith trespasser, however, will be liable for the full value of the products converted, without deduction of costs of any kind.[130] In addition, if gas is wrongfully withdrawn and commingled with other gas owned by the bad faith trespasser, the bad faith trespasser will be liable for the value of all the gas produced and sold from both wells.[131] The test for good faith is whether there is some reasonable doubt of the other party's exclusive or dominant right, with the action of the trespasser classified as having an innocent unintentional, or honest belief.[132]

A second type of geophysical subsurface trespass occurs with the underground intrusion of injected carbon dioxide. This liability derives from carbon dioxide injected into a storage reservoir and migrating into lands where the property interests have not been acquired. The oil industry has confronted this liability in the course of secondary and tertiary recovery operations, where fluids are injected into a reservoir to increase the amount of recoverable oil and the possibility exists for fluids to migrate through the subsurface and trespass upon a neighboring property.[133] The issue of trespass caused by underground intrusion for secondary recovery operations has been addressed by *Railroad Commission of Texas v. Manziel*, which held that injection associated with a state-authorized secondary recovery project would not cause a trespass, even where fluids moved across property lines; technical rules of trespass have no bearing on the issue.[134] According to the resulting rule of non-liability, which has come to be known as the negative rule of capture, less valuable substances can migrate through the subsurface and replace more valuable substances without incurred liability.[135] Where an oil field has been unitized, meaning the combination of multiple tracts to form a large unit for the purpose of conducting a field-wide oil recovery operation,[136] there would not be liability for underground intrusion. As a result, secondary and tertiary recovery operations are traditionally conducted on a unitized field, which is accomplished through a voluntary agreement among the property interest owners or through a compulsory process before the oil and gas conservation agency.[137]

C. Liability for Confusion of Goods

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[128] *Id.* at § 4.1(B)(1)
[129] *Id.*
[130] *Id.*
[131] *Id.*
[132] *Id.* at § 4.1(B)(2). *See also, Swiss Oil Corp. v. Hupp*, 69 S.W.2d 1037 (Ky.App. 1934).
[133] *See* ANDERSON, *supra* note 88, § 4.2(C).
[134] *Railroad Commission of Tex. v Manziel*, 361 S.W.2d 560, 568 (Tex. 1962).
[135] PATRICK H. MARTIN & BRUCE M. KRAMER, 1-2 WILLIAMS & MEYERS, OIL AND GAS LAW § 204.5 (2004).
[136] ANDERSON, *supra* note 88, § 7.13.
[137] *Id.*

Liability for confusion of goods occurs when different persons' goods are intermixed such that the property of each cannot be distinguished.[138] For example, this would be the case of injected carbon dioxide intermixing with native gas in a reservoir where the full property interests have not been obtained. Where the substances are deemed willfully, fraudulently, or wrongfully inseparably intermingled, the person forfeits his right in the goods to the innocent party. Forfeiture does not occur where the confusion is not done willfully, with a fraudulent or other improper purpose. Confusion of goods assumes that the intermixed goods are unidentifiable; where the goods mingled are readily identifiable, no forfeiture applies. For geologic carbon dioxide storage, the extent of liability for confusion of goods would need to be determined on a case-by-case basis; intermixing of carbon dioxide and the ability to identify it is a function of carbon dioxide's miscibility with the native substance.

V. POTENTIAL FOR LEGISLATION OF PROPERTY INTERESTS AND LIABILITY

Federal or state eminent domain legislation specific to geologic carbon dioxide storage would be necessary to obtain property rights to the geologic formation by involuntary means.[139] In addition, although property interests and liability for mineral rights have traditionally been addressed by common law, there exists the potential for legislation to define the circumstances of ownership and trespass. Eminent domain legislation and property rights clarification could be done on either the state or the federal level. Federal legislation would be limited to those circumstances where the carbon dioxide storage is deemed to be within interstate commerce or having a substantial effect on interstate commerce.[140]

A. Federal Legislation: The Case of Natural Gas Storage

An example of federal legislation of property ownership is the case of natural gas storage. The Natural Gas Act of 1938 provides federal eminent domain power for natural gas companies seeking to operate natural gas pipelines.[141] A statutory prerequisite to exercising eminent domain power is the acquisition of a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission.[142] Although not specifically stated in the language of the statute, the Natural Gas Act has been interpreted to also provide eminent domain power over natural gas storage.[143] According to the statute, if property rights cannot be obtained by voluntary methods, the pipeline operator may exercise eminent domain for:

> [T]he necessary right-of-way to construct, operate, and maintain a pipe line or pipe lines for the transportation of natural gas, and the necessary land or other property, in addition to right-of-way, for the location of

[138] 15A C.J.S. *Confusion of Goods* § 1
[139] *Strain v. Cities Service Gas Co.*, 83 P.2d 124, 126 (Kan. 1938).
[140] *U.S. v. Lopez*, 514 U.S. 549, 559 (1995).
[141] *Columbia Gas Transmission Corp. v. An Exclusive Gas Storage Easement*, 776 F.2d 125, 129 (1985).
[142] 15 U.S.C. § 717f(c).
[143] *Columbia Gas Transmission Corp.*, 776 F.2d at 129.

> compressor stations, pressure apparatus, or **other stations or equipment necessary to the proper operation** of such pipe line or pipe lines… [Emphasis Added]

15 U.S.C. § 717f(h). In *Columbia Gas Transmission Corp. v. An Exclusive Gas Storage Easement*, the Sixth Circuit Court of Appeals held that the language emphasized above ("other stations or equipment necessary to the proper operation") was sufficiently broad enough to encompass an underground natural gas storage facility, thus allowing for the exercise of eminent domain power if a Certificate of Public Convenience and Necessity had been obtained.[144] Although the eminent domain language does not specifically mention the use of condemnation procedures for underground gas storage, the court held that it was within the spirit and intent of the Natural Gas Act because underground gas storage facilities are a necessary and integral part of the operation of piping gas from the area of production to the area of consumption.[145] The Supreme Court agreed with this interpretation in dicta in the case of *Schneidewind v. ANR Pipeline Co.*[146]

B. State Legislation: The Case of the IOGCC Conceptual Framework Statute

State legislation could also be used to clarify property interests and liability. This has been proposed in a report by the Interstate Oil and Gas Compact Commission (IOGCC) CO_2 Geological Sequestration Task Force.[147] According to the report, ownership of storage rights (reservoir pore space) and payment for use of those storage rights is a noteworthy post-injection storage consideration that needs to be addressed by state legislation.[148] The IOGCC Task Force developed a conceptual framework for a carbon dioxide geological storage statute designed for U.S. states, with the centerpiece of the framework being eminent domain and the recognition of certain property rights over the geologic formation and injected carbon dioxide. The conceptual framework is reproduced in the appendix to this essay. According to the framework, the Model Oil and Gas Conservation Act already deals with geologic storage of carbon dioxide through its provisions on the regulation of underground gas storage, however, the conceptual framework is necessary to identify initial ownership of carbon dioxide storage rights with regard to the surface and mineral interest owners.[149]

1. IOGCC Proposed Ownership of Geologic Storage Reservoir

Part I of the framework allows carbon capture and geological storage operators to exercise state eminent domain power over any subsurface stratum or formation found to be suitable and in the public interest for geologic storage of carbon dioxide.[150] The property interest provided is essentially an easement to the subsurface; for example, the

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[144] *Id.* at 128.
[145] *Id.* at 129.
[146] *Schneidewind v. ANR Pipeline Co.*, 485 U.S. 293, 295 n.1 (1988).
[147] INTERSTATE OIL AND GAS COMPACT COMMISSION CO_2 GEOLOGICAL SEQUESTRATION TASK FORCE, A REGULATORY FRAMEWORK FOR CARBON CAPTURE AND GEOLOGICAL STORAGE (2005).
[148] *Id.* at 55.
[149] *Id.*
[150] *Id.* at 74.

mineral interest owner is still authorized to drill through the geologic storage facility for hydrocarbon production purposes.[151] In the declaration of purpose to the conceptual framework, geologic storage of carbon dioxide is deemed to be in the public interest because of the environmental and economic importance of carbon dioxide, conservation of property for geologic storage, the prevention of waste, and the protection of health, safety and the environment.[152] In addition, the framework states that by providing a mitigation strategy aimed at reducing carbon dioxide emissions into the atmosphere, which has been shown to be a contributing factor to global warming, geologic storage of carbon dioxide is in the public interest.

As a prerequisite to exercising eminent domain power, the storage operator must obtain a certificate setting out that the storage facility is in the public interest, designate the amount of proven minerals located in the reservoir, demonstrate that carbon dioxide injection will not contaminate groundwater or mineral formations, and demonstrate that the storage facility will not unduly endanger lives or property.[153] The designation of proven minerals is necessary to determine compensation for the mineral interest owner. Any condemnation action requires reasonable notice and an opportunity for a hearing. Under the framework, valuation of the property interest is to consider the amount of proven commercially producible accumulations of oil or natural gas remaining in the formation.[154]

The conceptual framework also contains provisions concerning cessation of injection activities and closure of the injection well.[155] When the owner of the storage facility has ceased injection operations, the owner is to file a notice of cessation of injection with the appropriate state regulatory body.[156] All property rights are to remain with the storage operator or to be transferred to a successor with the approval of the state regulatory body.[157]

2. IOGCC Proposed Ownership of Injected Carbon Dioxide

According to Part II of the framework, ownership of injected carbon dioxide is to remain the property of the injector, and in no event shall the carbon dioxide be deemed the property of a surface owner or mineral owner.[158] If carbon dioxide migrates into an adjoining subsurface property where property rights have not been acquired, the injector will not lose title to the carbon dioxide if the injector can prove by a preponderance of the evidence that the carbon dioxide was originally injected into the geologic storage facility.[159] The owner of the subsurface will be entitled to compensation for use or of

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[151] *Id.* Part I, § 3, at 75.
[152] *Id.* at 55.
[153] *Id.* Part I, § 4, at 76.
[154] *Id.* Part I, § 5, at 77.
[155] *Id.* Part I, § 6, at 77.
[156] *Id.*
[157] *Id.*
[158] *Id.* Part II, § 1, at 78.
[159] *Id.* Part II, § 3(a), at 78.

damage to the surface or substratum, the value of the storage right and recover all costs and expenses.[160]

VI. CONCLUSION

Because property law in the United States is predominantly an issue of state law, there are irregularities between jurisdictions concerning the property interests of geologic carbon dioxide storage. In particular, there are three key areas of distinction: (1) the distinction between ownership rights needed for injection of carbon dioxide into a mineral formation and rights needed for injection into a deep saline formation; (2) the distinction between voluntary and involuntary methods of acquisition; and (3) the distinction between ownership of the geologic formation and ownership of the injected carbon dioxide.

Although common law concerning natural gas storage will serve as precedent for establishing property interests over carbon dioxide storage, the issue remains whether federal or state legislation of natural gas storage will govern carbon dioxide storage. The IOGCC conceptual framework implies that state oil and gas conservation statutes already govern carbon dioxide. Federal law has been seemingly inconsistent concerning the application of natural gas statutes to carbon dioxide; for example, the Tenth Circuit has held that Safe Drinking Water Act legislation concerning "natural gas" storage did not encompass carbon dioxide,[161] but that carbon dioxide did fall under legislation governing "natural gas" pipelines right-of-ways.[162] These decisions were based not on an evaluation of the health, safety and environmental effects of carbon dioxide, but rather were based on statutory intent with regard to whether "natural gas" included naturally occurring gases such as carbon dioxide. One can rationalize these decisions as the Tenth Circuit deferring to an agency's expertise; in both cases, the Tenth Circuit upheld the agency's determination regarding whether carbon dioxide was "natural gas" for the purposes of the relevant statute.

Not only is there liability associated with property rights, including geophysical surface trespass, geophysical subsurface trespass, and liability for commingling of goods, but the determination of property interests also has implications for climate liability and HSE (health, safety, and environment) liability. Climate liability is the liability associated with damage caused to the climate when a quantity of carbon dioxide is emitted from the geologic storage reservoir, while HSE liability derives from emitted carbon dioxide leading to public health effects, environmental damage, or induced seismicity. Because of the heterogeneous nature of property law governing carbon dioxide storage, there may

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[160] *Id.* Part II, § 3(c), at 78.

[161] *ARCO Oil and Gas Co. v. EPA*, 14 F.3d 1431, 1436 (10th Cir. 1993) (affirming a decision of the Environmental Protection Agency that the definition of natural gas under the natural gas storage exemption of the Safe Drinking Water Act did not include carbon dioxide).

[162] *Exxon Corp. v. Lujan*, 970 F.2d 757, 763 (10th Cir. 1992) (affirming a decision of the Bureau of Land Management to issue a right-of-way for a carbon dioxide pipeline under the Mineral Leasing Act, rather than under the Federal Land Policy and Management Act).

be apparent irregularities concerning which entities are legally responsible under these various liability theories.

VII. APPENDIX

Interstate Oil and Gas Compact Commission
CO_2 Geological Sequestration Task Force Final Report

Conceptual Framework For A CO_2 Geological Storage Statute
(Not an IOGCC-approved model statute)

(Although this conceptual framework statute was designed for U.S. states, it is assumed that Canadian provinces could, if desired, easily adapt the document to meet the requirements of their specific jurisdictions and regulatory legislation.)

Preface
The Interstate Oil and Gas Compact Commission (IOGCC) has prepared the following provisions to supplement Part VIII of the Model Oil and Gas Conservation Act, which deals with the regulation of Underground Gas Storage including geologic storage of CO_2. These provisions address the acquisition of properties suitable for geologic storage of CO_2through eminent domain and recognize certain property rights in stored CO_2. These Model Provisions do not address the initial ownership of CO_2storage rights vis-à-vis the surface and mineral interest owner. These supplementary provisions should not be codified under a state's conservation act, but Part I should be included in a state's eminent domain or public utilities code and Part II should be included in a state's property code.

Declaration of Purpose
Because of the economic and environmental importance of CO_2, the conservation of property suitable for geologic CO_2 storage, the prevention of waste, and the protection of public health, public safety, and the environment, the geologic storage of CO_2 is declared to be in the public interest. Accordingly, the purpose of these provisions is to conserve property suitable for geologic CO_2 storage, to prevent waste of the storage facility, and to protect correlative rights, public health, public safety, and the environment.

PART I

SECTION 1. DEFINITIONS.

"CCGS operator" means any person, firm or corporation authorized to do business in this state and that holds a certificate of convenience from the [commission] or the Federal Energy Regulatory Commission to engage in the business of transporting, injecting, storing or distributing CO_2 by means of pipelines into, within or through this state for use in enhanced oil and gas recovery, other industrial processes or storage for the purpose of greenhouse gas mitigation.

"CO_2" means CO_2 from an anthropogenic source as a gas or as a supercritical fluid with physical properties between a liquid and a gas at pressures greater than 1073 psi at 87.7 degrees F, and with a purity of 95% or as a constituent in a processed emission stream with commercial value.

"Geologic Storage Facility" means underground geologic formations, strata, reservoirs, or caverns into which CO_2 is injected for storage.

SECTION 2. PUBLIC INTEREST.

The geologic storage of CO_2 provides a mitigation strategy aimed at reducing CO_2 emissions into the atmosphere, which has been shown to be a contributing factor in global warming, thereby promoting the public interest and the general welfare. Therefore, the [legislature of this state] finds that the orderly and efficient geologic storage of CO_2 is in the public interest.

SECTION 3. APPROPRIATION OF CERTAIN PROPERTY.

Any CCGS operator may appropriate for its use for the geologic storage of CO_2 any subsurface stratum or formation in any land which the [oil and gas conservation commission] shall have found to be suitable and in the public interest for the geologic storage of CO_2, and in connection therewith may appropriate other interests in property as may be required adequately to examine, prepare, maintain, and operate geologic storage facilities. The right of appropriation shall be without prejudice to the rights of the owner of the land, minerals, or other rights or interests therein, as to all other uses of property, including the right to drill or bore through the appropriated geologic storage facility, if done in accordance with any order, permit, rule, or regulation that the [oil and gas conservation commission] may issue for the purpose of protecting the geologic storage facility against waste and against the escape of CO_2.

SECTION 4. APPLICATION FOR CO_2 GEOLOGIC STORAGE FACILITY CERTIFICATE; NOTICE AND HEARING; ASSESSMENT OF COSTS.

(a) Any CCGS operator desiring to exercise the right of eminent domain as to any property for use for geologic storage of CO_2 shall, as a condition precedent to the filing of its petition in the district court, obtain from the [oil and gas conservation commission] a certificate setting out findings of the [oil and gas conservation commission] that:
   (1) the geologic storage facility sought to be acquired is suitable for the storage of CO_2 and that its use for this purpose is in the public interest; and
   (2) the amount of proven commercially producible accumulations of oil or native gas, or both, if any, remaining in the proposed geologic storage facility.

(b) The [commission's] finding under subparagraph (2) above that the geologic storage facility is suitable for the geologic storage of CO_2 shall include specific findings, including:
   (1) that the use of the geologic storage facility for CO_2 storage will not contaminate other formations containing fresh water or containing oil, natural gas or other commercial mineral deposits; and
   (2) that the proposed geologic storage facility will not unduly endanger lives or property.

(c) the [oil and gas conservation commission] shall not issue a certificate without reasonable notice to interested parties and an opportunity for a hearing. [The applicant shall be responsible for all costs of this proceeding.]

SECTION 5. EMINENT DOMAIN PROCEDURE.

Any CCGS operator having first obtained the certificate specified in [Section 4] from the [oil and gas conservation commission] and desiring to exercise the right of eminent domain for the purpose of acquiring property for the geologic storage of CO_2, shall proceed in accordance with [eminent domain procedure of this state]. The petitioner shall file the certificate as a part of its petition and no order by the court granting said petition shall be entered unless accompanied by the certificate. The appraisers in awarding damages shall also take into consideration the amounts of proven commercially producible accumulations of oil or natural gas or both, if any, remaining in the property sought to be appropriated and, for this purpose, shall receive the findings of the [oil and gas conservation commission] as prima facie evidence of these amounts.

SECTION 6. NOTICE OF CLOSURE OF GEOLOGIC CO_2 STORAGE FACILITY; DISPOSITION OF PROPERTY RIGHTS.

When the owner of a geologic storage facility has ceased active injection operations of CO_2 and closes the storage facility and that facility was certificated by the [oil and gas conservation commission], the owner shall file with the [oil and gas conservation commission] a notice of cessation of injection. If any storage facility was certificated pursuant to federal authority, the owner shall file a copy of any federal closure authority with the [oil and gas conservation commission]. Unless notice of closure authority has been filed with the [oil and gas conservation commission], there shall be a presumption that the geologic storage facility and all rights

associated with it remain as certificated. In either case the owner shall file an instrument with the [recorder] in the appropriate county or counties, stating that injection has ceased and that the ownership of all property acquired by the CCGS operator, both mineral and surface, remains with or will be transferred to a successor owner with approval of the [oil and gas commission].

PART II.

SECTION 1. OWNERSHIP OF INJECTED CO_2.

All CO_2 that has previously been reduced to possession, and which is subsequently injected into a geologic storage facility, whether storage rights were acquired by eminent domain or otherwise, shall at all times be the property of the injector, or the injector's heirs, successors or assigns, whether owned by the injector or stored under contract. Absent a final judgment of willful abandonment rendered by a court of competent jurisdiction, in no event shall this CO_2 be deemed the property of a surface owner or mineral owner, or the property of persons claiming by or under these owners, under whose lands the CO_2 is stored. Only the injector, or the injector's heirs, successors and assigns, may produce, take, reduce to possession this stored CO_2.

SECTION 2. EFFECT ON SURFACE AND MINERAL RIGHTS.

Nothing in this subsection shall be deemed to affect the otherwise lawful right of a surface or mineral owner to drill or bore through the geologic storage facilities, if done in accordance with [commission] rules for protecting the geologic storage facility against the escape of CO_2.

SECTION 3. IDENTIFICATION OF MIGRATING CO_2 —COSTS—INJUNCTION.

(a) If CO_2 that has been injected into property or has migrated to adjoining property or to a stratum, or portion thereof, which has not been acquired by eminent domain or otherwise acquired, the injector shall not lose title to or possession of injected CO_2 if the injector can prove by a preponderance of the evidence that the CO_2 was originally injected into the geologic storage facility. The court, on its own motion or upon motion of a party, may appoint the [oil and gas conservation commission] as a special master to provide assistance regarding this issue.

(b) If CO_2 that has been injected into property or has migrated to adjoining property or to a stratum, or portion thereof, which has not been acquired by eminent domain or otherwise acquired, the injector, at the injector's sole risk and expense, shall have the right to conduct reasonable testing on any existing wells on adjoining property including tests to determine ownership of the CO_2, and to determine the value of any lost production of other than the injector's CO_2.

(c) If CO_2 that has been injected into property or has migrated to adjoining property or to a stratum, or portion thereof, which has not been acquired by eminent domain or otherwise acquired, the owner of the stratum and the owner of the surface shall be entitled to compensation for use of or damage to the surface or substratum, the value of the storage right, and shall be entitled to recover all costs and expenses, including reasonable attorney fees.

(d) The injector shall have the right to interim relief through injunctive or other appropriate relief.