www.ogel.org

ISSN : 1875-418X
Issue : Vol. 21 - issue 3
Published : July 2023

Part of the OGEL 3 (2023) Special Issue on "*Carbon Capture and Storage*"

Prof. Tara Righetti
University of Wyoming
View profile

Dr. Matteo Fermeglia
Hasselt University
View profile

Oil, Gas & Energy Law Intelligence

Carbon Dioxide Transport and Sequestration in the Submerged Lands of the United States Gulf of Mexico Region

by J. Dickens and B.B. Pollett

About OGEL

OGEL (Oil, Gas & Energy Law Intelligence): Focusing on recent developments in the area of oil-gas-energy law, regulation, treaties, judicial and arbitral cases, voluntary guidelines, tax and contracting, including the oil-gas-energy geopolitics.

For full Terms & Conditions and subscription rates, please visit our website at www.ogel.org.

Open to all to read and to contribute

OGEL has become the hub of a global professional and academic network. Therefore we invite all those with an interest in oil-gas-energy law and regulation to contribute. We are looking mainly for short comments on recent developments of broad interest. We would like where possible for such comments to be backed-up by provision of in-depth notes and articles (which we will be published in our 'knowledge bank') and primary legal and regulatory materials.

Please contact us at info@ogel.org if you would like to participate in this global network: we are ready to publish relevant and quality contributions with name, photo, and brief biographical description - but we will also accept anonymous ones where there is a good reason. We do not expect contributors to produce long academic articles (though we publish a select number of academic studies either as an advance version or an OGEL-focused republication), but rather concise comments from the author's professional 'workshop'.

OGEL is linked to **OGELFORUM**, a place for discussion, sharing of insights and intelligence, of relevant issues related in a significant way to oil, gas and energy issues: Policy, legislation, contracting, security strategy, climate change related to energy.

Carbon Dioxide Transport and Sequestration in the Submerged Lands of the United States Gulf of Mexico Region[1]

Josh Dickens[2] - Helton Law Firm, and Buford Boyd Pollett[3] - The University of Tulsa

Summary

The subsurface storage of carbon dioxide (CO2) in offshore geologic formations has the potential to offset greenhouse gas emissions in an environmentally safe, commercially viable, less controversial, with legal advantages and greater storage capacity than onshore storage of CO2.[4] "As with onshore CO2 storage, the aim of offshore will be to inject CO2 thousands of feet below the seafloor into geologic systems, which are fluid reservoirs overlain by confining strata that have sufficient integrity and capacity to contain CO2 without impacting other sub-seafloor resources, the ocean environment, or the atmosphere."[5] Difficulties of onshore CO2 storage often arise in determining and obtaining access to the surface and mineral rights at potential CO2 storage locations. Generally, submerged lands in the United States (U.S.) have a single owner (i.e., the federal or state government). Offshore CO2 storage locations may have lower potential third-party liability risks than onshore CO2 storage sites because onshore storage sites are generally in proximity to populated areas, and offshore storage projects in the United States may benefit from singular, undivided, ownership, distance from populated areas, existing pipelines and infrastructure, and the flexibility provided by maritime vessel transport.

Similarly, federal government officials are working to promulgate regulations and establish a legal framework for incentivizing, transporting, and storing offshore carbon capture and storage (CCS) facilities. Likewise, parties are seeking offshore leases to decarbonize industrial sources by sequestering captured CO2 in offshore reservoirs. As a result, this article examines the current real property legal framework, regulatory framework, and transactional framework for CCS activities in the submerged lands of the States of Texas and Louisiana and the federal submerged lands of the Gulf of Mexico.

[1] The authors would like to thank Mr. Daniel Rhoads, Graduate Student in the Collins College of Business School of Energy, University of Tulsa, for editing, feedback, and insights in the previous versions of this paper. Please note the authors retain all responsibility for any errors in the paper. The authors would like to thank the following people for providing information that substantially contributed to the content of this paper: Director Hadassah Schloss, Open Government – Texas General Land Office, Michael R. Brassett, II, Member – Bradley Murchison, Will R. Huguet, Partner – Kean Miller, and Mark A. Doré, Senior Counsel - – Kean Miller.

[2] Josh Dickens – Of Counsel, Helton Law Firm, Tulsa, Oklahoma: https://www.heltonlawfirm.com/attorney/josh-dickens/. Linkedin profile link: https://www.linkedin.com/in/josh-dickens/.

[3] Buford Boyd Pollett - Genave King Rogers Assistant Professor of Energy Law and Commerce, The University of Tulsa, Collins College of Business, School of Energy Economics, Policy and Commerce website: https://faculty.utulsa.edu/faculty/buford-pollett/ and Managing Attorney, EMC Law PLLC website: https://www.emclaw.us/. Linkedin profile link https://www.linkedin.com/in/bufordpollettattu.

[4] *Southeast Offshore Storage Resource Assessment Initial Geologic Characterization Report*, Southern States Energy Board DE-FE0026086 7/22/2016. https://www.osti.gov/servlets/purl/1582407

[5] *Best Management Practices for Offshore Transportation and Sub-Seabed Geologic Storage of Carbon Dioxide,* OCS Study BOEM 2018-004, US Department of the Interior Bureau of Ocean Energy Management Headquarters (Sterling, VA). https://espis.boem.gov/final%20reports/5663.pdf

I. Introduction

U.S. Locations for Storing Captured Carbon Dioxide

With current technology, we can compress captured carbon dioxide and transport it to a location for injection into underground permanent storage in a process termed carbon capture and sequestration. Geologic formations suitable for carbon dioxide sequestration include depleted oil and gas fields, deep coal seams, and saline formations.[6]

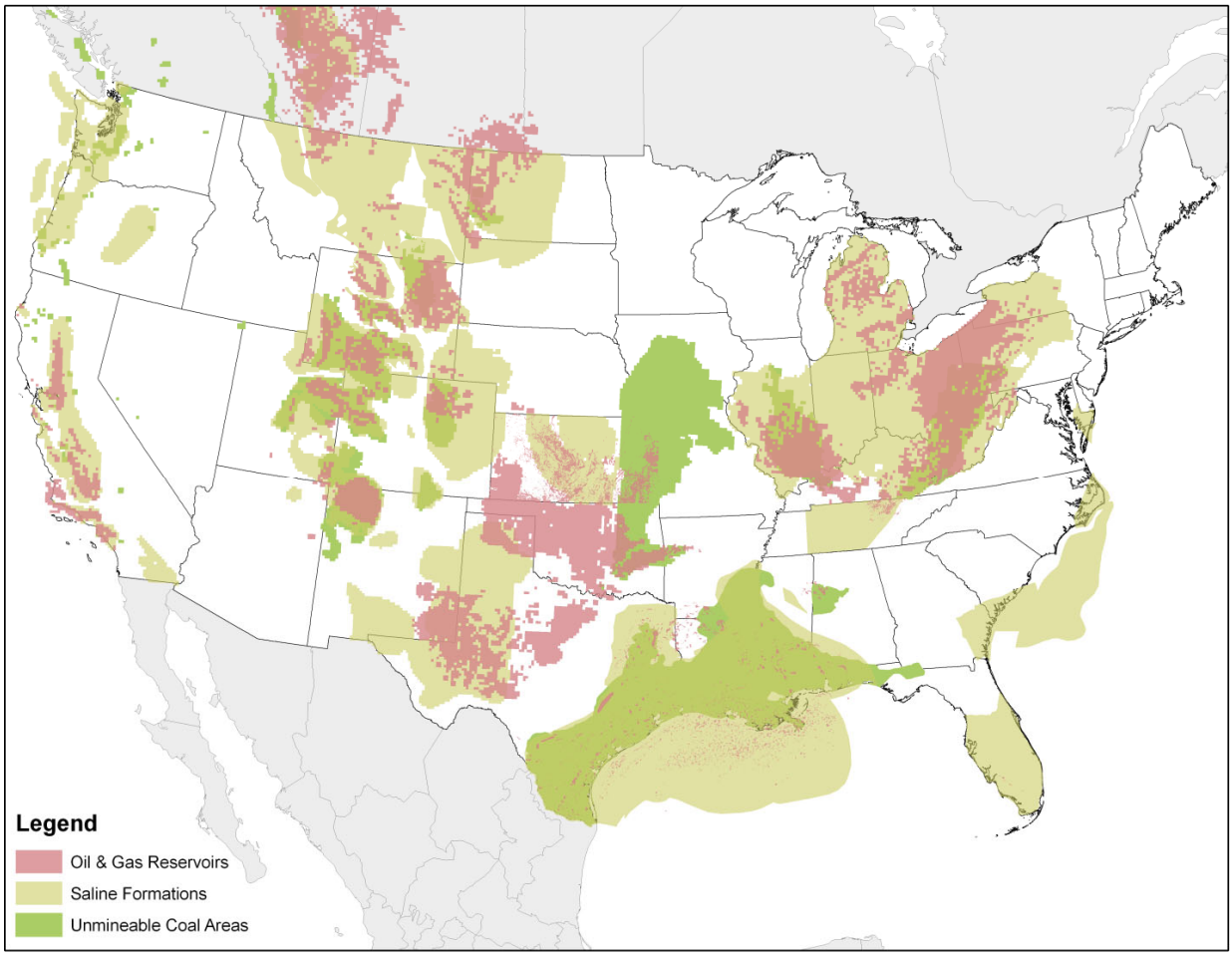


Figure 1. Map Oil & Gas Reservoirs, Saline Formations, Unmineable Coal Areas

Transport to the sequestration location may (depending on the logistical situation, e.g., site characteristics, cost, regulatory situation) be via pipeline, train, truck, or ship. Likewise, the U.S. Department of Energy has estimated that the U.S. could sequester underground roughly 1,800 to 20,000 billion metric tons of carbon dioxide in the United States, which is equal to 600 to 6,700 years of the level of current carbon dioxide emissions from large stationary sources in the United States.

[6] Carbon Dioxide Capture and Sequestration: Overview, EPA, January 19, 2017. https://19january2017snapshot.epa.gov/climatechange/carbon-dioxide-capture-and-sequestration-overview_.html

Geologic Potential for Carbon Dioxide Storage in the United States

For the first time, in 2013, the USGS published a national assessment of geologic carbon sequestration. The USGS now estimates the U.S. has technically feasible (using current engineering and technology) "mean storage potential of 3,000 metric gigatons of carbon dioxide…with a range of 2,400 to 3,700 metric gigatons of potential carbon dioxide storage."[7]

The southeastern region (SECARB – Southeast Regional Carbon Sequestration Partnership – including Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, eastern Texas, Virginia and portions of Kentucky and West Virginia) of the U.S. probably contains more than half of the saline formations suitable for storage of carbon dioxide.[8]

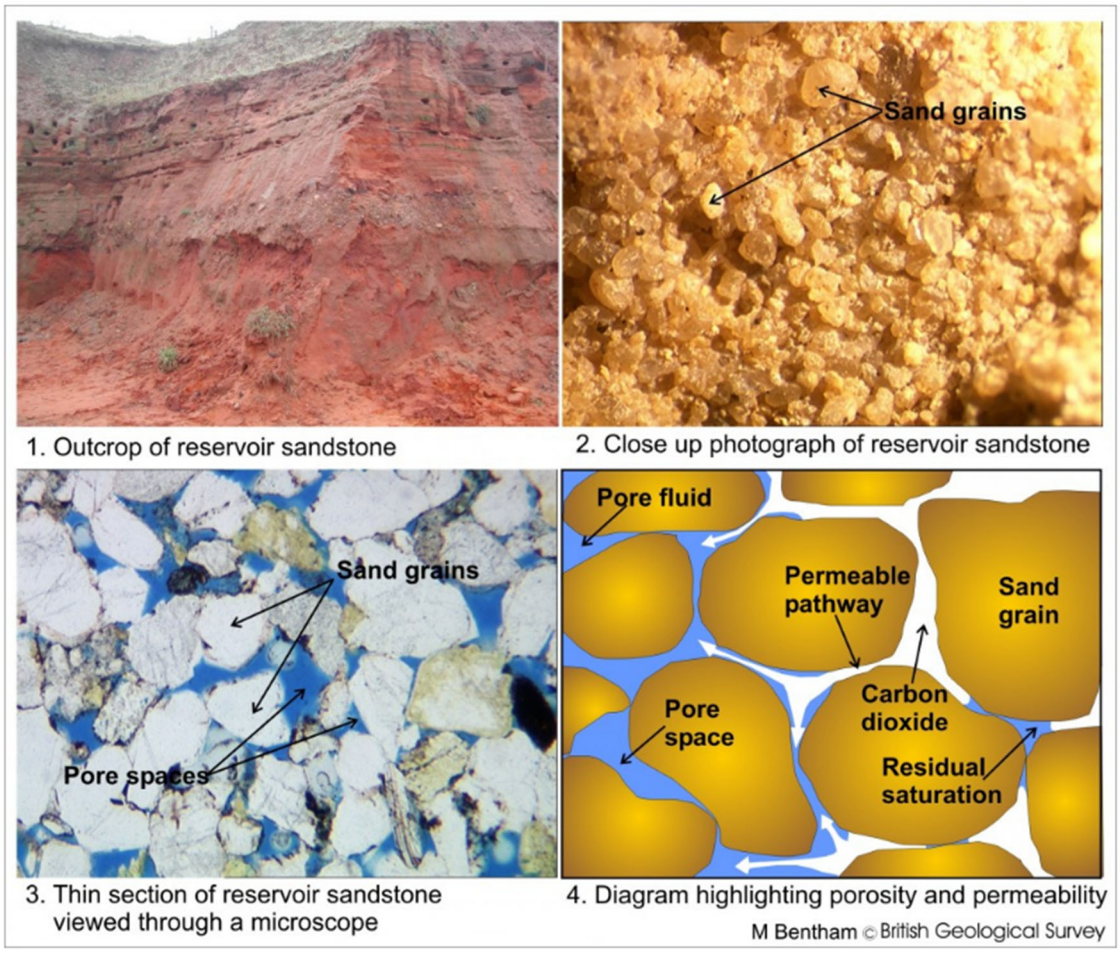


Figure 2. Pore Space Illustration [9]

[7] How much carbon dioxide can the United States store via geologic sequestration? - Frequently Asked Questions – Energy, USGS. https://www.usgs.gov/faqs/how-much-carbon-dioxide-can-united-states-store-geologic-sequestration

[8] *Carbon Storage Atlas 5th Edition*, U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL), 2015. https://www.netl.doe.gov/node/5841

[9] EGU Blogs » Divisions » Energy, Resources and the Environment » *The Pore Space Scramble*, June 15, 2015. https://blogs.egu.eu/divisions/ere/2015/06/15/the-pore-space-scramble/

II. Real Property Framework

Outside the U.S., most governments own the oil, gas, and other minerals even under privately owned land. In the U.S., ownership of oil, gas, and minerals rests in several different types of parties. The federal government owns oil, gas and minerals in lands owned by the federal government. The individual states own the oil, gas, and other minerals in state-owned lands. In addition, in the United States, there is often private ownership of the oil, gas, and other minerals in privately owned land. Thus, there are a variety of potential ownership issues that must be resolved in understanding who owns the pore space needed for carbon capture and sequestration.

Federal Submerged Lands - Jurisdiction and Ownership

The United States Supreme Court in *United States v. California* stated Article IV, § 3, Cl. 2 of the Constitution vested Congress with the "[p]ower to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States . . . ." and likewise, Congress has limitless constitutional power regulating federal lands and that "neither the courts nor the executive agencies could proceed contrary to an Act of Congress in this congressional area of national power."[10] In *United States v. California*, the Court analyzed "who owns the bare legal title to the lands under the marginal sea… and power to determine in the first instance when, how, and by what agencies, foreign or domestic, the oil and other resources of the soil of the marginal sea, known or hereafter discovered, may be exploited."[11]

Justice Reed stated in his dissent in the case *United States v. California*, determining the ownership of the submerged land rests on the determination of whether the original thirteen states had ownership of "similar lands prior to the formation of the Union. If the original states owned the bed of the sea, adjacent to their coasts, to the three-mile limit, then I think California has the same title or ownership to the lands adjacent to her coast."

In response to United States v. California, 332 U.S. 19, 29 (1947), the US Congress passed and sent the President two bills granting the US coastal states partial ownership of the submerged lands, but President Truman vetoed the bills. See (H.R.J. Res. 225, 79th Cong., 1st Sess. (1946) and S.J. Res. 20, 82d Cong., 2d Sess. (1952)). However, under President Eisenhower, Congress sent President Eisenhower a third bill. President Eisenhower signed this bill intending to reverse the Supreme Court's recent decisions and thus grant coastal states title of partial ownership rights to the submerged lands adjacent to the coastal states.[12]

As a result, under the Submerged Lands Act of 1953 (SLA), "[e]ach Gulf coast state could claim up to three marine leagues if its boundary extended that far when admitted as a state; the federal government sued the five Gulf coast states to limit the claims to three miles, but the Supreme Court extended the claim for Florida and Texas to three marine leagues. The SLA was upheld in 1954 by the U.S. Supreme Court (*Alabama v. Texas*, 347 U.S. 272 (1954)),

[10] *United States v. California*, 332 U.S. 19, 27 (1947) citing *United States v. San Francisco*, 310 U.S. 16, 29-30. (1940)
[11] *Id.*
[12] Submerged Lands Act Agencies - Agencies of several U.S. coastal states, National Oceanic and Atmospheric Administration, Source: Bureau of Ocean and Energy Management, Submerged Lands Act (last visited July 25, 2013); James W. Corbitt, Jr., The Federal-State Offshore Oil Dispute, 11 Wm. & Mary L. Rev. 755 (1970). https://coast.noaa.gov/data/Documents/OceanLawSearch/Summary%20of%20Law%20-%20Submerged%20Lands%20Act.pdf

emphasizing that Congress could relinquish to the states the federal government's property rights over the submerged lands without interfering with U.S. national sovereign interests."[13]

Thus, Federal jurisdiction and ownership of the "submerged lands, subsoil, and seabed" extends from the state lands to 200 nautical miles seaward from the baseline breadth of the territorial sea. For a continental shelf greater than 200 nautical miles, then *"a distance not greater than a line 100 nautical miles from the 2,500-meter isobath or a line 350 nautical miles from the baseline."*[14]

State Submerged Lands - Jurisdiction and Ownership

State jurisdiction to the adjacent US submerged lands is as follows "seaward from the baseline [*i.e.*, baseline level of the adjacent territorial sea] from which the breadth of the territorial sea is measured:"[15] Texas and the Gulf coast of Florida have jurisdictional authority and ownership to 3 marine leagues (9 nautical miles), Louisiana has jurisdictional authority and ownership 3 U.S. nautical miles (U.S. nautical mile = 6080.2 feet), and the other States have jurisdictional authority and ownership to 3 International Nautical Miles (International Nautical Miles = 6076.10333 feet).[16] This paper and the following state-level analysis of the Gulf coast is limited to Louisiana and Texas to best cover the vast majority of Gulf coast lands available for oil and gas exploration leasing.[17] Florida had been under the moratorium on oil and gas leasing of the Gulf of Mexico Energy Security Act through June 30, 2022 which was extended for another ten years through 2032 by Presidential Memorandum in 2020.[18]

Louisiana

Civil law systems such as in the State of Louisiana:

> *conceive of property as ownership, as holistic dominion: exclusive, single, indivisible, and different in nature from lesser property interests. By contrast, property in the common law is pluralistic and fragmented, having at its core the estates system and the many ways of carving up lesser property interests, from life estates to defeasible fees and future interests.*[19]

---

[13] Submerged Lands Act Agencies - Agencies of several U.S. coastal states, National Oceanic and Atmospheric Administration, Source: Bureau of Ocean and Energy Management, Submerged Lands Act (last visited July 25, 2013); James W. Corbitt, Jr., The Federal-State Offshore Oil Dispute, 11 Wm. & Mary L. Rev. 755 (1970). https://coast.noaa.gov/data/Documents/OceanLawSearch/Summary%20of%20Law%20-%20Submerged%20Lands%20Act.pdf

[14] Outer Continental Shelf – Leasing, BOEM, https://www.boem.gov/oil-gas-energy/leasing/outer-continental-shelf

[15] *Id.*

[16] *Id.*

[17] *Gulf of Mexico Data Atlas, Oil and Gas Structures*, NOAA National Centers for Environmental Information, https://www.ncei.noaa.gov/maps/gulf-data-atlas/atlas.htm?plate=Offshore%20Structures

[18] *Areas Under Restriction*, BOEM, https://www.boem.gov/oil-gas-energy/leasing/areas-under-restriction; and *Memorandum on the Withdrawal of Certain Areas of the United States Outer Continental Shelf from Leasing Disposition*, Whitehouse Archives, https://trumpwhitehouse.archives.gov/presidential-actions/memorandum-withdrawal-certain-areas-united-states-outer-continental-shelf-leasing-disposition/

[19] *ARTICLE: Property: A Bundle of Sticks or a Tree?*, 66 Vand. L. Rev. 869, 879.

Thus, Louisiana Civil Code Article 490 states:

> *Unless otherwise provided by law, the ownership of a tract of land carries with it the ownership of everything that is directly above or under it. The owner may make works on, above, or below the land as he pleases, and draw all the advantages that accrue from them, unless he is restrained by law or by rights of others.*[20]

In Louisiana, ownership of the land includes all minerals occurring naturally in a solid state. Solid minerals are insusceptible of ownership apart from the land until reduced to possession."[21] However, "ownership of land does not include ownership of oil, gas, and other minerals occurring naturally in liquid or gaseous form… but the landowner has the exclusive right to explore and develop his property for the production of such minerals and to reduce them to possession and ownership."[22]

As the Court expressed in the case *United States v. 43.42 Acres of Land*:

- *Louisiana Civil Code Article 477 provides:*
- *Ownership is the right that confers on a person direct, immediate, and exclusive authority over a thing. The owner of a thing may use, enjoy, and dispose of it within the limits and under the conditions established by law.*
- *Further, Louisiana Civil Code 478 provides in part:*
- *The right of ownership may be subject to a resolutory condition, and it may be burdened with a real right in favor of another person as allowed by law.*[23]

In Louisiana, a landowner may burden her land with a servitude, and "there are two kinds of servitudes: personal servitudes and predial servitudes."[24] A personal servitude that is a charge on land is a servitude for the benefit of a person, which may be a usufruct, a right of habitation, or a right of use.[25] A predial servitude on land creates a "charge on a servient estate for the benefit of a dominant estate. The two estates must belong to different owners."[26] If there is ambiguity concerning the creation of a servitude, the following rules of interpretation apply.[27] If the right granted confers an advantage on an estate that runs with the land, the servitude is presumed to be a predial servitude.[28] If the right granted in the land "is merely for the convenience of a person, it is not considered to be a predial servitude, unless it is acquired by a person as owner of an estate for himself, his heirs and assigns."[29]

Likewise, Louisiana does not permit severance of the minerals from the surface but enables a landowner to create mineral servitude in the land which is a "right of enjoyment of land belonging to another for the purpose of exploring for and producing minerals and reducing

---

[20] *United States v. 43.42 Acres of Land*, 520 F. Supp. 1042, 1044 (W.D. La. 1981) quoting Louisiana Civil Code Article 490.
[21] La. Rev. Stat. Ann. § 31:5.
[22] La. Rev. Stat. Ann. § 31:6.
[23] *United States v. 43.42 Acres of Land*, 520 F. Supp. 1042, 1044 (W.D. La. 1981).
[24] La. Civ. Code Ann. § art. 533.
[25] La. Civ. Code Ann. § art. 534.
[26] La. Civ. Code Ann. § art. 646.
[27] La. Civ. Code Ann. § art. 732.
[28] La. Civ. Code Ann. § art. 733.
[29] La. Civ. Code Ann. § art. 734.

them to possession and ownership."[30] In addition, a mineral servitude in Louisiana gets extinguished by:

> (1) prescription resulting from nonuse for ten years; (2) confusion; (3) renunciation of the servitude on the part of him to whom it is due, or the express remission of his right; (4) expiration of the time for which the servitude was granted, or the happening of the dissolving condition attached to the servitude; or (5) extinction of the right of him who established the servitude.[31]

Balancing a Mineral Servitude with Pore Utilization

The balancing of mineral servitude and pore space utilization is an open question in Louisiana and would be a completely *res nova* question for the courts under Louisiana law. However, we might understand how a court might handle this question by examining the case *United States v. 43.42 Acres of Land*.

In *United States v. 43.42 Acres of Land*, the Court had "to enter a heretofore unchartered sea in the realm of property and mineral rights" involving land in Cameron Parish Louisiana known as the Hackberry salt dome used for storage of crude oil following expropriation by the federal government "as described by Justice Barham in the case of Louisiana Power and Light Co. v. United Lands Co., 254 La. 885, 228 So.2d 140, at p. 142 (1969)" in utilizing the "*subsurface for the extraction of brine and the creation of storage facilities a well similar to the usual oil or gas 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 jugshaped cavity, or "jug' formed by this leaching is used for the storage of hydrocarbons.*[32]

The sole issue the Court in case *United States v. 43.42 Acres of Land* had to decide was who "entitled to be compensated for the value of the hole in the ground to be created by construction of the underground storage cavern the landowners of the mineral owners? The question is completely res nova in Louisiana law."[33] In the case, the land was conveyed from the Barbe heirs to the Hamiltons, while "the Barbes reserved all mineral rights in the land in the act of sale. The United States has deposited certain funds in the registry of the court to compensate the Barbe heirs and the Hamiltons for the value of their respective interests."[34]

The Court noted, "When crude oil is stored in a salt cavern, however, it should no longer be considered a fugacious mineral." The crude oil "remains confined within the limits of the salt cavern to the same extent it would if stored in a tank above the ground. By withdrawing the crude oil from the cavern, the United States cannot be said to be exercising any right to explore for and produce minerals on the land in question; the minerals are confined within a readily ascertainable area until withdrawn as needed."[35]

The Court found the case analogous to the general rule in common law states which provides that, after the removal of minerals, the opening left by the mining operations belongs to the

[30] La. Rev. Stat. Ann. § 31:21.
[31] La. Rev. Stat. Ann. § 31:27.
[32] *United States v. 43.42 Acres of Land*, 520 F. Supp. 1042, 1044 (W.D. La. 1981).
[33] *Id.*
[34] *Id.*
[35] *Id.*

landowner by operation of law." The Court continued by saying "whether a state is governed by an "ownership" or a "non-ownership" theory of mineral rights, the mineral owner cannot be considered to have ownership of the subsurface strata containing the spaces where the minerals are found."[36] Thus, the Court concluded that the Hamiltons (i.e., the landowners) owned all remaining rights in the land, and were thus entitled to be compensated for the underground storage value of the land.[37] Therefore, if a company expropriates land in Louisiana for a gas storage reservoir, the company must compensate the landowner for right to use the surface lands and the reservoir underlying the land for storage purposes.

Ownership of Submerged Lands in Louisiana

In contrast to other US coastal states, Louisiana's coastal lands are mostly private, and these lands are swiftly submerging. Louisiana loses roughly a football field area of coastal land every hour. Under Louisiana law, "many of these large tracts of coastal land remain in private hands after they submerge. As a result, even to the trained eye, the line between public and private coastal property is often indiscernible."[38]

A 2018 legislative audit of the Louisiana State Land Office's Inventory of State Lands found that the state claimed ownership of 5,751,583 acres of water bottoms while 286,467 acres or five percent of these water bottoms are dual claimed by the State of Louisiana and private parties.[39] Louisiana classifies submerged land in a variety of categories such as "bottoms of navigable waterways, seashores, the banks of streams and rivers, and beds and bottoms of bays and lagoons... may be common, public, or private things."[40] Under "Article IX, section 3 of the Louisiana Constitution of 1974 prohibits the state from alienating the bottoms of navigable water bodies "unless that land became bottom via erosion, and the previous landowners want to rebuild the land*."*[41] Consequently, the state of Louisiana owns the navigable water bottoms that became submerged land via erosion. *"*Similarly, Louisiana Revised Statutes section 49:3 states that the State owns all seawater and sea bottom of the Gulf of Mexico and its arms within Louisiana's territorial boundary. Though this statute does not directly address sea bottoms and seashores that natural forces created after state alienation, its spirit dictates that no sea bottom or seashore is susceptible to private ownership."[42]

Louisiana Civil Code Article 450 also captures this view by stating that "public things are owned by the state or its political subdivisions in their capacity as public persons. Public things that belong to the state are such as running waters, the waters and bottoms of natural navigable water bodies, the territorial sea, and the seashore…."[43]

Texas

In the State of Texas, Spanish influence on land has been far-reaching since Spain claimed Texas in 1519, "when the explorer Alonzo Alvarez de Piñeda sailed along the Gulf Coast to

---

[36] *Id.*
[37] *Id.*; See also Miss. River Transmission Corp. v. Tabor, 757 F.2d 662 (5th Cir. 1985).
[38] Jacques Mestayer, *COMMENT: Saving Sportsman's Paradise: Article 450 and Declaring Ownership of Submerged Lands in Louisiana*, 76 La. L. Rev. 889, 890 (2016).
[39] M. Taylor Darden - General Counsel Louisiana Landowners Association, *Presentation Private Property and Public Access: A Possible Solution*. https://www.dnr.louisiana.gov/assets/Legal/PRATF/C13.pdf
[40] Mestayer, *supra*, at 898.
[41] Mestayer, *supra*, at 918.
[42] *Id.*
[43] La. Civ. Code Ann. § art. 450

the Rio Grande." In 1840, the Congress of the Republic of Texas retained certain provisions of Spanish civil law when the Republic adopted English common law.[44] "But perhaps the most important Spanish land laws that have carried over deal with submerged land. Under Spanish law, the government retained ownership of the riverbeds of perennial streams. Spanish law also provided for government ownership of submerged coastal or tideland to three marine leagues (10.4 miles) from shore."[45] When the U.S. Congress passed the SLA in 1953, the U.S. Congress recognized this boundary, even though most of the other U.S. coastal states are limited to the three miles provided for by English common law. As a result, the U.S. Congress recognized Texas's ownership of significantly more submerged lands rich in oil and other resources than most other states.

Balancing the Scope of the Mineral Estate with Scope of the Surface Estate

The ownership of pore space by the mineral or surface estate is an open question in Texas and would be a completely *res nova* question for the courts under Texas law. *Moser v. United States Steel Corp.*, 676 S.W.2d 99 (Tex. 1984) is the sentinel case in determining the scope of the mineral estate with the scope of the surface estate in interpreting a reservation or conveyance of "oil, gas and other minerals" under Texas law.[46] In making the determination, the Court in Moser expressly refused to "**employ the *ejusdem generis* rule of construction to limit the term 'oil, gas and other minerals' to hydrocarbons**" as a limiting principle to the scope of the mineral estate in Texas.[47] The Court in *Moser* held "a severance of minerals in an oil, gas and other minerals clause **includes all substances within the ordinary and natural meaning of that word, whether their presence or value is known at the time of severance**;" and thus the Court determined that the mineral owner had title to uranium. In addition, the Court continued to adhere to the line of cases "which held certain substances to belong to the surface estate as a matter of law" (*e.g.*, building stone, limestone caliche, surface shale, gravel, surface lignite, iron, and coal).[48]

In the case *Lightning Oil Co. v. Anadarko E&P Onshore*, the Texas Supreme Court examined "whose permission is necessary for an oil and gas operator to drill through a mineral estate it does not own to reach minerals under an adjacent tract of land." As part of the Court's analysis, the Court noted the holdings in previous cases that:

- ***The surface overlying a leased mineral estate*** *is the surface owner's property, and those ownership rights* ***include the geological structures beneath the surface***;
- ***The surface owner, and not the mineral owner, "owns all non-mineral 'molecules' of the land, i.e., the mass that undergirds the surface" estate***; and

[44] History of Texas Public Lands, The Texas General Land Office. https://www.glo.texas.gov/history/archives/forms/files/history-of-texas-public-lands.pdf
[45] *Id*.
[46] *Moser v. United States Steel Corp.*, 676 S.W.2d 99 (Tex. 1984).
[47] *Id.* at 101. **Emphasis** added. Citing *Southland Royalty Co. v. Pan American Petroleum Corp.*, 378 S.W.2d 50 (Tex. 1964). This contrasts with the rule employed by the Oklahoma Supreme Court in 1987 in the case *State ex rel. Comm'rs of the Land Office v. Butler*, 753 P.2d 1334 (Okla. 1987). Likewise consistent with the limit principle of the *ejusdem generis* rule of construction, the Oklahoma State Legislature expressly provided the pore space is expressly within the scope of the surface estate by enacting Section 6 of Title 60. See Trae Gray and Ryan Ellis, *Don't Space Out Protecting That Empty Space for Your Next Natural Resource Client*, Oklahoma Bar Journal -- OBJ 88 pg. 289 (Feb. 11, 2017). https://www.okbar.org/barjournal/feb2017/obj8802grayellis/
[48] *Id.* at 102. **Emphasis** added.

- Under *the rule of capture …* ***the mineral estate owner is only entitled to "a fair chance to recover the oil and gas in place or under" the surface estate.***[49]

In *Lightning Oil Co. v. Anadarko E&P Onshore*, the Court ultimately used a balance of interest test in ruling that "the small loss of minerals a lessee such as Lightning will suffer, if drilling through the minerals is determined to be a non-actionable interference with its property rights, is the longstanding policy of this state to encourage maximum recovery of minerals and to minimize waste."[50] Thus, the Court relied on the necessity of drilling and passing through the mineral estate owned by one party to prevent waste and develop the mineral estate of another party. Since Lightning did not "own specific oil and gas molecules, and thus [Lightning's] bundle of rights as mineral lessee [did] not include the right to exclude pass-through drilling."[51] As a result in Texas, the mineral estate maintains the "right to develop [as] an "exclusive right to appropriate [the minerals] to any extent desired by the grantee and his assigns"; "the exclusive right to conduct operations to mine, **store**, and transport [the minerals]"; and "the exclusive right to prospect for, produce, and dispose of the minerals."[52]

Even if a court in Texas found the surface estate owned the subsurface pore space, the mineral estate would still maintain the right to explore and remove the components of the mineral estate from the land. Likewise, the mineral estate continues to maintain a right of reasonable use of the pore space for exploiting the mineral estate. Thus, a Texas court could not simply say "that pore space belongs solely to the surface estate. It must also be determined if the reservoir has been depleted of [the oil, gas, and other minerals] because until depletion occurs, the mineral estate still has a right to use the pore space."[53] Typically in primary recovery, only ten percent of the oil in place in the reservoir gets produced. Currently, secondary recovery techniques may recover twenty to forty percent of the original oil in place, and enhanced oil recovery (EOR), techniques may result in production of thirty to sixty percent of the reservoir's original oil in place.[54]

However, it is important to remember that depleted oil and gas reservoirs are reservoirs that are not currently producing oil or gas under the current commercial conditions and with current technology. Similarly, a mineral estate in Texas does not terminate with a cessation of "*e.g.*, production in paying quantities" in the way that a mineral lease may terminate. Likewise, the legal principle of liberative prescription does apply to a severed mineral estate in Texas in the way liberative prescription applies to a mineral servitude on the holistic approach to land ownership in Louisiana. Thus, in Texas, the functional reality may be the mineral estate

---

[49] *Lightning Oil Co. v. Anadarko E&P Onshore*, LLC, 520 S.W.3d 39, 46-47 (Tex. 2017). **Emphasis** added.
[50] *Id*. at 51 citing "TEX. CONST. art. XVI, § 59(a) ("The conservation and development of all of the natural resources of this State, . . . are each and all hereby declared public rights and duties."); Tex. Nat. Res. Code § 85.045; West, 508 S.W.2d at 816."
[51] *Id.* at 45. Citing e.g., *Heinatz v. Allen*, 147 Tex. 512 (1949) (building stone and limestone); *Atwood v. Rodman*, 355 S.W.2d 206 (Tex. Civ. App.--El Paso 1962, writ ref'd n.r.e.) (limestone, caliche, and surface shale); *Fleming Foundation v. Texaco*, 337 S.W.2d 846 (Tex. Civ. App.--Amarillo 1960, writ ref'd n.r.e.) (water); *Psencik v. Wessels*, 205 S.W.2d 658 (Tex. Civ. App.--Austin 1947, writ ref'd) (sand and gravel); *Reed v. Wylie*, 597 S.W.2d 743 Tex. 1980) (near surface lignite, iron and coal).
[52] *Id.* at 49. **Emphasis** added.
[53] Trae Gray and Ryan Ellis, *Don't Space Out Protecting That Empty Space for Your Next Natural Resource Client*, Oklahoma Bar Journal -- OBJ 88 pg. 289 (Feb. 11, 2017). https://www.okbar.org/barjournal/feb2017/obj8802grayellis/
[54] *Enhanced Oil Recovery*, Office of Fossil Energy and Carbon Management - Science & Innovation - Office of Resource Sustainability - U.S. Department of Energy. https://www.energy.gov/fecm/enhanced-oil-recovery

remains dominant and continues to maintain the right to reasonably use the surface pore space, even if a court in Texas finds the surface estate owns the subsurface pore space.

During the 2023 legislative session, the Texas legislators proposed Texas Pore Space Bills (i.e., SB 2107 and HB 4484) in the respective Committees on Natural Resources & Economic Development in the Texas House and Senate. The two bills seek to create a legislative framework for CO2 capture and sequestration projects in Texas. These bills expressly provide that the surface estate owns the pore space underlying the surface of land. Currently, there is an active push for changes in the bills to include strong protections to preserve and protect the bundle of rights of the mineral estate owners in Texas.

III. Regulatory Framework

Government Incentives

With respect to government incentives, the first quote that comes to mind for me is "If you want more of something, subsidize it; if you want less of something, tax it."[55] The next is "An incentive is a bullet, a key: an often-tiny object with astonishing power to change a situation."[56]

Federal Incentives

Over the years the United States has set various goals in regard to reducing greenhouse gases including carbon oxide emissions, and goals to meet international commitments.[57] The Biden Administration's goals include:

- *Reducing U.S. greenhouse gas emissions 50-52% below 2005 levels in 2030*
- *Reaching 100% carbon pollution-free electricity by 2035*
- *Achieving a net-zero emissions economy by 2050*
- *Delivering 40% of the benefits from federal investments in climate and clean energy to disadvantaged communities*[58]

As part of the means to achieve earlier greenhouse gas reduction goals, Section 45Q of Title 26 of the Internal Revenue Code ("45Q") was established in 2008 which provided the incentive of federal tax credits related to "carbon oxide sequestration" including carbon capture and storage (CCS) and carbon capture utilization and storage (CCUS).[59] 45Q was subsequently amended in 2009, 2014, 2018 and 2021.[60]

---

[55] Generally attributed to Ronald Reagan. Reflective of *Remarks to State Chairperson of the National White House Conference on Small Business*, August 15, 1986, https://www.reaganlibrary.gov/archives/speech/remarks-state-chairpersons-national-white-house-conference-small-business

[56] Dubner, Stephen J. and Levitt, Steven D., *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything.*

[57] *FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies*, April 22, 2021, The White House, https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/

[58] National Climate Task Force, The White House, https://www.whitehouse.gov/climate/

[59] 26 U.S.C. §45Q, Statutory Notes and Related Subsidiaries

[60] *Id*.

The Inflation Reduction Act of 2022 ("IRA") was passed and signed into law in August 2022.[61] The Whitehouse Inflation Reduction Act Guidebook described it as "the most significant action Congress has taken on clean energy and climate change in the nation's history."[62] Regarding its purpose and impact the EPA described it as "the most significant climate legislation in U.S. history, offering funding, programs, and incentives…".[63]

The IRA amended 45Q with extensive changes greatly increasing the incentives available for CCS in addition to those available for CCUS and related projects such as direct air capture of carbon oxides (DAC).[64]

The IRS, in updated instructions for IRS form 8933 Carbon Oxide Sequestration Credit, noted that "Section 45Q was impacted by the Inflation Reduction Act of 2022 (the Act) and further guidance is pending for some of the changes listed below" with the instructions going on to provide the listed "summary of major changes"[65] ("IRS Summary" with list numbers added):

1) Extended the deadline to begin construction of a qualified facility from 2026 to 2033.
2) Changed the base rate for section 45Q(b)(1)(A)(i)(I) and (ll) rates to $17 and $12 ($85 and $60 if section 45Q(h)(2) requirements are met), respectively, for tax years beginning after 2022.
3) Changed the base rate for section 45Q(b)(1)(B)(i) and (ii) rates to $36 and $26 ($180 and $130 if section 45Q(h)(2) requirements are met), respectively, for direct air capture facilities, for tax years beginning after 2022.
4) Reduced annual thresholds of captured carbon oxide for qualified electric generating facility, a qualified direct air capture facility, and any other facility. See Qualified facility.
5) Changed credit reduction percentage to 15%. See Coordination with Section 142 Bond Financing.
6) Added definitions for new terms, including Applicable electric generating unit, Baseline carbon oxide production, and Capacity factor.
7) Allows the section 45Q(f)(9) election for carbon oxide captured and disposed of after 2021 for a qualified facility located in a federally declared disaster area. See Section 45Q(f)(9) Election.
8) Made prevailing wage and apprenticeship requirements. See Notice 2022-61, 2022-52 I.R.B. 561, available at IRS.gov/irb/2022-52_IRB#NOT-2022-61, Prevailing Wage Requirements, and Apprenticeship Requirements to determine your qualification for the increased credit or deduction amounts by meeting the prevailing wage and apprenticeship requirements.
9) Made payment options for the credits, for which regulations and guidance are pending. See Elective Payment of Applicable Credits and Transfer of Carbon Oxide Sequestration Credits.[66]

[61] Pub. L. 117-169, "Inflation Reduction Act of 2022"
[62] Inflation Reduction Act Guidebook, The White House, https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/
[63] https://www.epa.gov/green-power-markets/inflation-reduction-act
[64] Inflation Reduction Act Guidebook, The White House, https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/
[65] Instructions for Form 8933 (12/2022), IRS, https://www.irs.gov/instructions/i8933
[66] *Id*.

In the context of incentives for carbon dioxide transport and sequestration in the submerged lands of the U.S. Gulf of Mexico region, the focus of this paper is primarily on the tax credit and "qualified facility," which is "any industrial facility or direct air capture facility,"[67] where such facility also meets certain construction timing requirements and performance specifications, discussed below, including:

1. Tax credits
   a. Tax Credit Amounts - IRS Summary numbers 2), 3) and 8).
   b. Tax Credit Payment Options – IRS Summary number 9).
   c. Tax Credit Transfer Options – IRS Summary number 9).
2. Qualified Facilities
   a. Construction Timing for Qualified Facilities – IRS Summary number 1).
   b. Emissions Quantities for Qualified Facilities – IRS Summary number 4).

Tax Credit Amounts

The changes made in the IRA to the incentive amounts in 45Q were headline-worthy and indeed did produce some interesting headlines: "*45Q Tax Credit Boosts Values Of Carbon Sequestration Projects, Yet Most Still In Development*" from Forbes,[68] "*There Are Fortunes to Be Made in the Carbon Capture Gold Rush*" from Bloomberg[69] and "*The Inflation Reduction Act Includes a Bonanza for the Carbon Capture Industry*" from Time magazine.[70] The tax credits per metric ton that were grabbing everyone's attention were changed as shown in the following table:

Source	Destination	Former Amount	45Q as Amended	
Direct Air Capture	Sequestered	Up to $50	$36	$180*
	Used	Up to $35	$26	$130*
Other Source	Sequestered	Up to $50	$17	$85*
	Used	Up to $35	$12	$60*
* 5 x value if Wage and Apprenticeship Requirements are met				

Table 1. Tax Credits Per Metric Ton

As set out in the Internal Revenue Code, and shown in the table above, the amount of credit applicable is determined by the source of the carbon oxides, whether DAC or another industrial qualified facility, the destination, whether used or permanently sequestered, and meeting

[67] 26 U.S.C. §45Q (d)
[68] Bryce Erickson, *45Q Tax Credit Boosts Values of Carbon Sequestration Projects, Yet Most Still in Development*, Forbes, November 4, 2022, https://www.forbes.com/sites/bryceerickson1/2022/11/04/45q-tax-credit-boosts-values-of-carbon-sequestration-projects-yet-most-still-in-development/?sh=5e218ce1296b
[69] Leslie Kaufman and Kevin Crowley, *There Are Fortunes to Be Made in the Carbon Capture Gold Rush*, Bloomberg, January 11, 2023, https://www.bloomberg.com/news/articles/2023-01-11/there-are-fortunes-to-be-made-in-the-carbon-capture-gold-rush#xj4y7vzkg
[70] Alejandro De La Garza, *The Inflation Reduction Act Includes a Bonanza for the Carbon Capture Industry*, August 11, 2022, https://time.com/6205570/inflation-reduction-act-carbon-capture/

certain employment requirements.[71] The largest variable in determining the amount of credit depends on the "qualified facility" meeting the employment "wage and apprenticeship" requirements which when met provide for the five-fold jump from the base credit to the highest available.[72] The second largest variable is the source of the carbon dioxide. If the qualified facility is DAC then the credit value nearly doubles for CCS and slightly more than doubles for CCUS. The last differentiator is whether or not the carbon oxides are sequestered or used. As seen in the table sequestration is more highly valued in the current incentive structure. It is worth noting here that there are legislative efforts to equalize the tax credit treatment of use and sequestration such as the Captured Carbon Utilization Parity Act introduced in February 2023.[73]

Tax Credit Payment

The IRA also adds Section 6417 "Elective Payment of Applicable Credits" to Subchapter B of Chapter 65 of the IRC which allows an election for payment with respect to carbon capture equipment credit as though the credits had been an overpayment of taxes: "…such entity shall be treated as making a payment against the tax imposed…"[74] This "elective payment" also referred to as "direct payment" is available for five (5) years in the case of for-profit entities and is available to non-profit entities "during the 12-year period beginning on the date the equipment was originally placed in service."[75] Though not a monetary incentive, the ability to receive a "direct payment" of tax credit value, as though it had been an overpayment of taxes and not limited to offsetting a tax due, is a significant change that broadens the possible participants and project financing structures. Possible structures would not need to include an entity with sufficient tax liability to make the credits of value within the time frame and other limitations set out in the revised 45Q.

Tax Credit Transfer Options

As with the new Section 6417, the IRA adds Section 6418 "Transfer of Certain Credits" which includes in its open paragraph that "…the transferee taxpayer specified in such election (and not the eligible taxpayer) shall be treated as the taxpayer…".[76] In addition to this relatively clear portion of the IRC, the IRA changes also allow cash received for such transfers to not be taxed.[77] Such transfers are subject to exceptions and limitations elsewhere in the IRC and may be further limited by future IRS guidance. Despite these limitations, this addition also broadens the options for project finance and structure.

---

[71] 26 U.S.C. §45Q(d)
[72] 26 U.S.C. §45Q(h)
[73] *Whitehouse Introduces Legislation to Create Parity Between Captured Carbon Utilization and Sequestration*, Office of Senator Whitehouse, February 28, 2023, https://www.whitehouse.senate.gov/news/release/whitehouse-introduces-legislation-to-create-parity-between-captured-carbon-utilization-and-sequestration
[74] 26 U.S.C. §6417
[75] 26 U.S.C. §6417(d)(3)
[76] 26 U.S.C. §6418
[77] *Id*.

Construction Timing for Qualified Facilities

The IRA amends Section 45Q(d) "Qualified Facility" extending the former construction deadline of January 1, 2026, to "any industrial facility or direct air capture facility…the construction of which begins before January 1, 2033…".[78]

Emissions Quantities for Qualified Facilities

Prior to the 45Q amendments of the IRA a "qualified facility" was "any industrial facility or direct air capture facility" which also met the construction timing as described above and annually captured carbon oxides in the shown in the "Former Amounts" column in the table below, subject to some other conditions then in effect.[79] As amended by the IRA, these emission and capture minimums are drastically reduced such that DAC must only capture "not less than 1,000 metric tons", electricity generating facilities must only capture "not less than 18,750 metric tons," and the equipment must have a "capture design capacity of not less than 75 percent of the baseline carbon oxide production…", all other facilities must only capture "not less than 12,500 metric tons" as shown in the table below.[80]

Qualified Facility Minimum Capture by Type in Metric Tons			
Facility Type	**Facility Emissions**	**Former Amount**	**45Q as Amended**
Any	< 500,000	25,000	12,500
Electricity Generating	> 500,000	500,000	18,750*
Direct Air Capture	Any	100,000	1,000
Any Other	>500,000	100,000	12,500
*also requires that design capacity is not less than 75% of the emissions			

Table 2. Qualified Facility Minimum Capture by Type in Metric Tons

The expanded eligibility and simplification of qualifying are drastic. As a point of comparison, within the 2017 EIA emissions summary report only 929 of 34,599 (2.69%) facilities listed as emitting Carbon Monoxide or Carbon Dioxide were shown to have emitted greater than 500,000 metric tons per year.[81] In contrast, the same report lists 4,066 (11.75%) facilities emitting greater than 12,500 metric tons per year.

Funding Programs as Incentives

In addition to the extensive changes to 45Q noted above, the U.S. has established many funding programs including grants and loans which may be used to benefit the development of U.S. Gulf transport and sequestration. The bulk of these programs come from the Infrastructure

[78] 26 U.S.C. §45Q(d)
[79] 26 U.S.C. §45Q(d), 2021
[80] 26 U.S.C. §45Q(d)
[81] Author's calculations from: *Facility-level by pollutant*, emis_sum_fac_2017.xls, EPA, https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

Investment and Jobs Act also known as the Bipartisan Infrastructure Law of 2021[82] and the Energy Act of 2020.[83] Providing a complete list of programs, amounts and status of applications, review and award is beyond the scope of this paper, however; several notable programs with brief descriptions are listed below:

Carbon Storage Assurance Facility Enterprise (CarbonSAFE) Initiative

Though the CarbonSAFE initiative began in 2016 the DOE issued a new funding opportunity announcement (FOA) of up to $2.25 billion in grant funding as authorized under the BIL.[84] The funding will go to awardees sharing 20-50% of costs "toward the development of new and expanded large-scale, commercial carbon storage projects with capacities to store 50 or more million metric tons of CO2, along with associated CO2 transport infrastructure." Projects will focus on detailed site characterization, permitting, and construction stages of project development under CarbonSAFE."[85] Recent CarbonSAFE awards included some related to Gulf Coast sequestration: Louisiana Offshore CO2 Hub Repurposing Infrastructure to Decrease Greenhouse Emissions (Project Lochridge) and Coastal Bend Carbon Management Project and Storage Complex Feasibility: Coastal Bend Offshore Carbon Storage.[86]

Carbon Dioxide Transport/Front-End Engineering Design (FEED) Program

The DOE's Office of Clean Energy Demonstrations (OCED) describes this $100 million co-operative grant program as follows: "The Front-End Engineering and Design Program Out Activities Under Carbon Capture Tech Program 962 Of Environmental Protection Agency expands the Department of Energy's Carbon Capture Technology program to include a program for carbon dioxide transport infrastructure necessary to deploy Carbon Capture Utilization and Storage technologies.[87]

Carbon Capture Large-Scale Pilots

"The Carbon Capture Large-Scale Pilot Programs are designed to establish a carbon capture technology program for the development of transformational technologies that will significantly improve the efficiency, effectiveness, costs, emissions reductions, and environmental performance of coal and natural gas use, including in manufacturing and industrial facilities."[88] The federal government funded this cooperative grant program with

---

[82] Pub. L. 117-58, "Infrastructure Investment and Jobs Act" also known as the "Bipartisan Infrastructure Law of 2021"

[83] Pub. L. 116-260, "Consolidated Appropriations Act, 2021, Division Z - Energy Act of 2020" also known as "Energy Act of 2020"

[84] CarbonSAFE Initiative, National Energy Technology Laboratory, https://netl.doe.gov/carbon-management/carbon-storage/carbonsafe

[85] *Funding Notice: Carbon Storage Validation and Testing*, Office of Fossil Energy and Carbon Management, https://www.energy.gov/fecm/funding-notice-carbon-storage-validation-and-testing

[86] *Project Selections for FOA 2610: CarbonSAFE Phase II - Storage Complex Feasibility*, Office of Fossil Energy and Carbon Management, https://www.energy.gov/fecm/project-selections-foa-2610-carbonsafe-phase-ii-storage-complex-feasibility.

[87] *Front-End Engineering and Design Program Out Activities Under Carbon Capture Tech Program 962 Of Environmental Protection Agency (Sec 40303)*, Office of Clean Energy Demonstrations, https://www.energy.gov/oced/front-end-engineering-and-design-program-out-activities-under-carbon-capture-tech-program-962

[88] *Carbon Capture Large-Scale Pilot Programs*, Office of Clean Energy Demonstrations, https://www.energy.gov/oced/carbon-capture-large-scale-pilot-programs

$937 million, and eligible projects will be focused on scaling technologies up to large-scale commercial development.[89]

Carbon Capture Demonstration Projects Program

The text of the BIL recommended that six facilities be funded cooperatively with two projects each in the categories of natural gas electricity generation, coal electricity generation and industrial non-generating facilities,[90] as described by the DOE, the program "provides $2.5 billion to develop six carbon capture facilities to significantly improve the efficiency, effectiveness, costs, emissions reductions, and environmental performance of coal and natural gas use."[91]

CO2 Infrastructure and Innovation Act (CIFIA)

The DOE Loan Program Office describes this loan and loan guarantee program, which is administered in conjunction with the DOE's Office of Fossil Energy and Carbon Management (FECM), as one that "offers access to capital for large-capacity, common-carrier carbon dioxide (CO2) transport projects (e.g., pipelines, rail, shipping, and other transport methods) under the Carbon Dioxide Transportation Infrastructure Finance and Innovation Act (CIFIA), as incorporated into and enacted under the Bipartisan Infrastructure Law of 2021."[92] The $2.1 billion in funding will be appropriated to the DOE incrementally from 2022 to 2026.[93]

Carbon Utilization Program

An eligible entity shall use a grant received under this paragraph to procure and use commercial or industrial products that (i) use or are derived from anthropogenic carbon oxides; and (ii) demonstrate significant net reductions in lifecycle greenhouse gas emissions compared to incumbent technologies, processes, and products.[94]

Qualifying Advanced Energy Project Credit

As required by the IRA, the IRS has established "a program to allocate credits for qualified investments in eligible qualifying advanced energy projects."[95] In the IRS Notice 2023-18, Initial Guidance Establishing Qualifying Advanced Energy Project Credit Allocation Program Under Section 48C(e), "qualifying advanced energy projects" include investment in facilities

---

[89] *Id*.
[90] Pub. L. 117-58, "Infrastructure Investment and Jobs Act" also known as the "Bipartisan Infrastructure Law of 2021"
[91] *Carbon Capture Demonstration Projects Program*, Office of Clean Energy Demonstrations, https://www.energy.gov/oced/carbon-capture-demonstration-projects-program
[92] *Carbon Dioxide Transportation Infrastructure*, DOE, Loan Programs Office, https://www.energy.gov/lpo/carbon-dioxide-transportation-infrastructure
[93] *Id*.
[94] *Carbon Utilization Program*, Office of Fossil Energy and Carbon Management, https://www.energy.gov/fecm/carbon-utilization-program
[95] *IRS and Treasury provide guidance on the Qualifying Advanced Energy Project Credit*, February 13, 2023, https://www.irs.gov/newsroom/irs-and-treasury-provide-guidance-on-the-qualifying-advanced-energy-project-credit

for the manufacturing and recycling of "property designed to capture, remove, use, or sequester carbon oxide emissions" and other "carbon capture" investments subject to limitations.[96]

Regional Direct Air Capture Hubs

The $3.5 billion in funding via grants, including cooperative investment, is to be deployed evenly over five (5) years through 2026.[97] An eligible "direct air capture hub" is described as:

- Facilitates the deployment of direct air capture projects;
- Has the capacity to capture and sequester, utilize, or sequester and utilize at least 1,000,000 metric tons of carbon dioxide from the atmosphere annually from a single unit or multiple interconnected units;
- Demonstrates the capture, processing, delivery, and sequestration or end-use of captured carbon; and
- Could be developed into a regional or interregional carbon network to facilitate sequestration or carbon utilization.[98]

The DOE timeline announced in December of 2022 included the submission of letters of intent, applications, and the start of the OCED "Merit Review Process" all in the first quarter of 2022.[99]

DOE Loan Programs Office (LPO) Title XVII

Title XVII of the Energy Policy Act of 2005 authorized the DOE to issue loan guarantees for a wide range of projects.[100] "Eligible projects for the Title XVII program must: Utilize a new or significantly improved technology; Avoid, reduce or sequester greenhouse gases; Be located in the United States; and, Have a reasonable prospect of repayment."[101] As described, CCS technologies could be eligible.

DOE Advanced Research Projects Agency-Energy (ARPA-E)

Current funding opportunities do include carbon sequestration but not in the context of geological sequestration.[102] The diversity and history of the ARPA-E projects make this resource worth mentioning as geological sequestration innovation could be a future focus.

DOE Small Business Innovation Research (SBIR)

The SBIR and Small Business Technology Transfer (STTR) "works collaboratively with 13 program offices throughout the DOE" and provides funding via grant awards for research

---

[96] *Notice 2023-18*, IRS, https://www.irs.gov/pub/irs-drop/n-23-18.pdf
[97] *Regional Direct Air Capture Hubs*, Office of Clean Energy Demonstrations, https://www.energy.gov/oced/regional-direct-air-capture-hubs
[98] *Id*.
[99] *Regional Direct Air Capture Hubs Update*, Office of Clean Energy Demonstrations, https://www.energy.gov/oced/regional-direct-air-capture-hubs-update
[100] *Title XVII*, DOE, Loan Programs Office, https://www.energy.gov/lpo/title-xvii
[101] *Id.*
[102] *ARPA-E Funding Opportunity Announcements*, DOE, Advanced Research Projects Agency-Energy (ARPA-E) https://arpa-e-foa.energy.gov/

across many CCS-related areas.[103] A recent example was announced by recipient MicroSeismic, Inc..[104]

The incentives described above present a wide range of opportunities for investment in offshore Gulf CCS and though many of the incentives are relatively new, increased favorably in the most recent amendments and broadly supported it is worth noting that as stated by Benjamin Franklin, "nothing is certain except death and taxes."[105] The concern for certainty in this case is taxes, in that for large, long-term investment decisions greater certainty of the established tax incentives is a significant factor in the viability and profitability of projects and accordingly those involved must watch proposed changes closely. At present the only notable proposed change is referenced above in regard to seeking to equalize the credit value of carbon oxides used and carbon oxides stored.

State Incentives - Texas and Louisiana

At the state level, incentives which could benefit Gulf Coast CCS-related projects are available, but certainly not on the broad scale of Federal incentives and often more narrowly limited.

Texas Clean Energy Tax Credit

Texas provides for a Clean Energy Tax Credit which could benefit entities upstream of offshore CCS.[106] The credit is a franchise tax credit for "clean energy projects" which as defined in the Natural Resources Code must be certain electricity-generating facilities producing at least 200 megawatts that capture and geologically sequester at least 70% of the produced carbon dioxide among other requirements.[107] The credit is limited to the lesser of $100 million or 10 percent of the project cost.[108] The credit also has some limited transferability,[109] and may be carried forward for 20 years.[110]

Texas - Anthropogenic Carbon Dioxide Storage Trust Fund

Texas has established the Anthropogenic Carbon Dioxide Storage Trust Fund.[111] The fund is not a direct incentive and does not relieve operators of liability,[112] but where Texas has established the fund in support of the Railroad Commission's essential regulatory functions, it can be deemed a benefit to operators of CCS resources.

---

[103] *Research Areas & Impact*, DOE, Office of Science, https://science.osti.gov/sbir/Research-Areas-and-Impact
[104] *Microseismic Awarded Second Department of Energy (DOE) Grant – CSEM Monitoring for Carbon Storage Site Characterization*, Press Release, March 10, 2023, https://www.microseismic.com/news-events/press-releases/microseismic-awarded-second-department-of-energy-doe-grant-csem-monitoring-for-carbon-storage-site-characterization/
[105] Translation from: *Letter to Jean-Baptiste LeRoy*, Benjamin Franklin, November 13, 1789. http://www.notable-quotes.com/f/franklin_benjamin.html
[106] Tex. Tax Code §§ 171.601 and 171.602; See also: *Franchise Tax Credit for Clean Energy Projects*, Comptroller of Texas, https://comptroller.texas.gov/taxes/franchise/clean-energy.php;
[107] Tex. Natural Resources Code § 120.001
[108] Tex. Tax Code § 171.602
[109] Tex. Tax Code § 171.908
[110] Tex. Tax Code § 171.602
[111] Tex. Natural Resources Code § 120.003
[112] Tex. Natural Resources Code § 120.002

Texas – Enhanced Recovery Project Incentives

Texas provides a severance tax rate reduction for EOR projects using anthropogenic carbon dioxide which, among other requirements, is geologically sequestered following the EOR process and is certified by the Railroad Commission that 99% of the sequestered carbon dioxide will remain sequestered "for at least 1,000 years."[113] Though beyond the scope of this paper, it is also worth noting that Texas also has a property tax exemption for certain property used in connection with carbon sequestration as part of enhanced oil recovery (EOR) projects and subject to other requirements.[114]

Louisiana – Assumption of Liability

Louisiana provides the indirect incentive of legislative certainty surrounding various CCS issues, particularly that of long-term liability following the completion of sequestration operations. The Louisiana Geologic Sequestration of Carbon Dioxide Act ("Sequestration Act"), in addition to setting a broad framework for the regulation of sequestration, established the Carbon Dioxide Geologic Storage Trust Fund as a "special custodial trust fund" ("Trust Fund").[115] Fees and penalties of the Sequestration Act, in addition to other sources such as interest and donations, will build the balance of the Trust Fund.[116] With respect to liability, ten (10) years after cessation of injection into a storage facility operators may have the liability for the facility transferred to the Trust Fund.[117] Such a transfer requires "… a showing by the storage operator that the reservoir is reasonably expected to retain mechanical integrity and the carbon dioxide will reasonably remain emplaced."[118] Once secured: "…the storage operator, all generators of any injected carbon dioxide, all owners of carbon dioxide stored in the storage facility, and all owners otherwise having any interest in the storage facility, shall be released from any and all duties or obligations under this Chapter and any and all liability associated with or related to that storage facility which arises after the issuance of the certificate of completion of injection operations."[119] The opportunity to transfer liability is further subject to some conditions, such as not having concealed or misrepresented material facts.[120]

Regulation of Storage

International Law

Globally governments have amended their resource extraction regulations to allow for carbon capture and sequestration regulation and at the same time developing independent regulations for commercial-scale CCS operations (e.g., IEA/OECD 2010a, 2012). Likewise, the International Energy Agency/Organization for Economic Co-operation and Development (IEA/OECD 2012) has stated governments need not treat CCS in depleted O&G differently than CCS in saline storage areas.

[113] Tex. Tax Code § 202.0545
[114] Tex. Tax Code §§ 151.334 and 151.001
[115] La. Rev. Stat. § 30:1110
[116] *Id*.
[117] La. Rev. Stat. § 30:1109
[118] *Id*.
[119] *Id*.
[120] *Id*.

The London Convention and 1996 London Protocol

The International Maritime Organization developed the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), to regulate the disposal of wastes and other matter at sea. "The London Convention prohibits the dumping of all wastes, except those listed in Annex 1, which must be permitted under the conditions of Annex 2. Currently, 87 countries are party to the treaty, including the US, which became a party in 1975."[121]

The 1996 Protocol to the London Convention (London Protocol) was adopted with the intent to modernize and supersede the London Convention further regulating the disposal of waste materials at sea by prohibiting all dumping, except for potentially permissible wastes on the "reverse list" (Annex 1). "The London Protocol entered into force in March 2006. Currently, 47 countries are party to the Protocol; the US is not a party. The US signed the treaty in 1998, but because Congress has not ratified it, it has not been implemented into US law."[122]

The London Convention is implemented under federal law via the EPA under the Marine Protection, Research, and Sanctuaries Act (MPRSA). Under 16 U.S.C. § 1431 *et seq.*; 33 U.S.C. § 1401 *et seq.*, the MPRSA, regulates the transporting and storing of CO2 in the offshore United States. Likewise, "the EPA may issue permits [under 33 U.S.C. § 1414(f)] for the transportation and ocean disposal of material like CO2 in the ocean."[123] The United States enacted the MPRSA to regulate disposal of wastes in marine waters that are within U.S. jurisdiction. The MPRSA "implements the requirements of the London Convention, which is the international treaty governing ocean dumping. The MPRSA requires the Environmental Protection Agency (EPA) Administrator, to the extent possible, to apply the standards and criteria binding upon the United States that are stated in the London Dumping Convention."[124] Under the MPRSA, the EPA "may issue permits for the transportation and ocean disposal of material like CO2 in the ocean. For MPRSA permitting and site designation, a permit applicant would need to provide environmental information to EPA for review."[125]

---

[121] *Best Management Practices for Offshore Transportation and Sub-Seabed Geologic Storage of Carbon Dioxide,* OCS Study BOEM 2018-004, US Department of the Interior Bureau of Ocean Energy Management Headquarters (Sterling, VA). https://espis.boem.gov/final%20reports/5663.pdf

[122] *Best Management Practices for Offshore Transportation and Sub-Seabed Geologic Storage of Carbon Dioxide,* OCS Study BOEM 2018-004, US Department of the Interior Bureau of Ocean Energy Management Headquarters (Sterling, VA). https://espis.boem.gov/final%20reports/5663.pdf

[123] *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration*, Delivered to the Committee on Environment and Public Works of the Senate and the Committee on Energy and Commerce, the Committee on Natural Resources, and the Committee on Transportation and Infrastructure of the House of Representatives, as directed in Section 102 of Division S of the Consolidated Appropriations Act, 2021. https://whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf

[124] *Ocean Dumping Act: A Summary of the Law*, Congressional Research Service, Updated October 18, 2016. https://crsreports.congress.gov/product/pdf/RS/RS20028/18.

[125] *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration*, Delivered to the Committee on Environment and Public Works of the Senate and the Committee on Energy and Commerce, the Committee on Natural Resources, and the Committee on Transportation and Infrastructure of the House of Representatives, as directed in Section 102 of Division S of the Consolidated Appropriations Act, 2021. https://whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf

Federal

US Constitutional Authority

Article 4, Section 3, Clause 2 of the Constitution expressly grants Congress the power "to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States; and nothing in this Constitution shall be so construed as to Prejudice any Claims of the United States, or of any particular State."[126]

IV. Federal Law Governing the Federal Submerged Lands of the Outer Continental Shelf

The Outer Continental Shelf Lands Act (OCSLA), originally passed by Congress in 1953 and amended by Congress since 1953, most recently as a result of the Energy Policy Act of 2005, remains the important legislation governing the use and activities permitted on the Federal Submerged Lands of the Outer Continental Shelf. The OCSLA facilitates the federal government's leasing (via the Bureau of Ocean Energy Management under the Department of Interior) of the federal government's offshore mineral resources and energy resources. The OCSLA states, "The outer Continental Shelf is a vital national resource reserve held by the Federal Government for the public, which should be made available for expeditious and orderly development, subject to environmental safeguards, in a manner which is consistent with the maintenance of competition and other national needs" (43 U.S.C. § 1332(3))."[127]

Even though the OCSLA establishes the BOEM's jurisdiction and regulatory authority over the federal submerged lands of the outer continental shelf, other federal laws also apply to the federal government's management of offshore operations. Likewise, the BOEM's actions must also comply with other federal laws such as the following:

- National Environmental Policy Act of 1970 (NEPA
- Clean Air Act of 1970 (CAA, reauthorized in 1990)
- Coastal Zone Management Act of 1972 (CZMA, reauthorized in 1990)
- Clean Water Act of 1977 (CWA)
- Federal Oil and Gas Royalty Management Act of 1982 (FOGRAMA)
- Marine Mammals Protection Act of 1972 (MMPA)
- Endangered Species Act of 1973 (ESA)
- National Historic Preservation Act of 1966 (NHPA)[128]

Likewise, the federal regulations promulgated under the EPA's underground injection (UIC) program regulate the injection of CO2 into geologic formations offshore under submerged lands within the territorial jurisdiction of the federal government and govern the protection of

[126] Article Four, section 3, clause 2 of the Constitution.
[127] OCS Lands Act History – Home - Leasing, BOEM, https://www.boem.gov/oil-gas-energy/leasing/ocs-lands-act-history#:~:text=The%20Outer%20Continental%20Shelf%20Lands,which%20are%20under%20U.S.%20jurisdiction
[128] BOEM Governing Statutes https://www.boem.gov/about-boem/regulations-guidance/boem-governing-statutes.

underground sources of drinking water under the Safe Drinking Water Act and the reduction of carbon dioxide emissions into the atmosphere under the Clean Air Act.[129]

Federal laws concerning storage

Congress has granted the U.S. Environmental Protection Agency (EPA) through the Safe Drinking Water Act (SDWA) (see 42 USC 300 et seq. regulations promulgated by the EPA - See 40 CFR 141-149) with jurisdictional authority to protect underground sources of drinking water (USDWs) by regulating the injection of fluids underground for storage or disposal. Under the SDWA, the term ''underground injection'' means the subsurface emplacement of fluids by well injection; but excludes underground storage of natural gas and "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities."[130]

Under the Safe Drinking Water Act (SDWA), the EPA created the Underground Injection Control (UIC) program as the primary regulatory framework for protecting USDWs from Underground Injection. Also, from inception until 2010, the EPA established and regulated the following five classes of wells based on the type of fluid injected, injection depth, and risk to USDWs:[131]

- Class I wells - inject hazardous and non-hazardous wastes into deep and isolated rock formations,
- Class II wells - inject fluids associated with oil and natural gas production,
- Class III wells - inject fluids to dissolve and extract minerals,
- Class IV wells - shallow wells used to inject hazardous or radioactive wastes into or above a geologic formation that contains a USDW, and
- Class V wells - to inject non-hazardous fluids underground, generally to dispose of wastes into or above underground sources of drinking water.[132]

Generally, states seek and obtain primacy from the EPA over one or more classes of wells. For example, most oil and gas-producing states have sought and obtained primacy over Class II wells for storing hydrocarbons or enhancing the recovery of hydrocarbons.[133]

The EPA promulgated rules in 2010 creating Class VI wells for regulating the injection and storing of CO2 in deep subsurface geologic formations, and establishing *"the minimum technical criteria for permitting, site characterization, area of review and corrective action,*

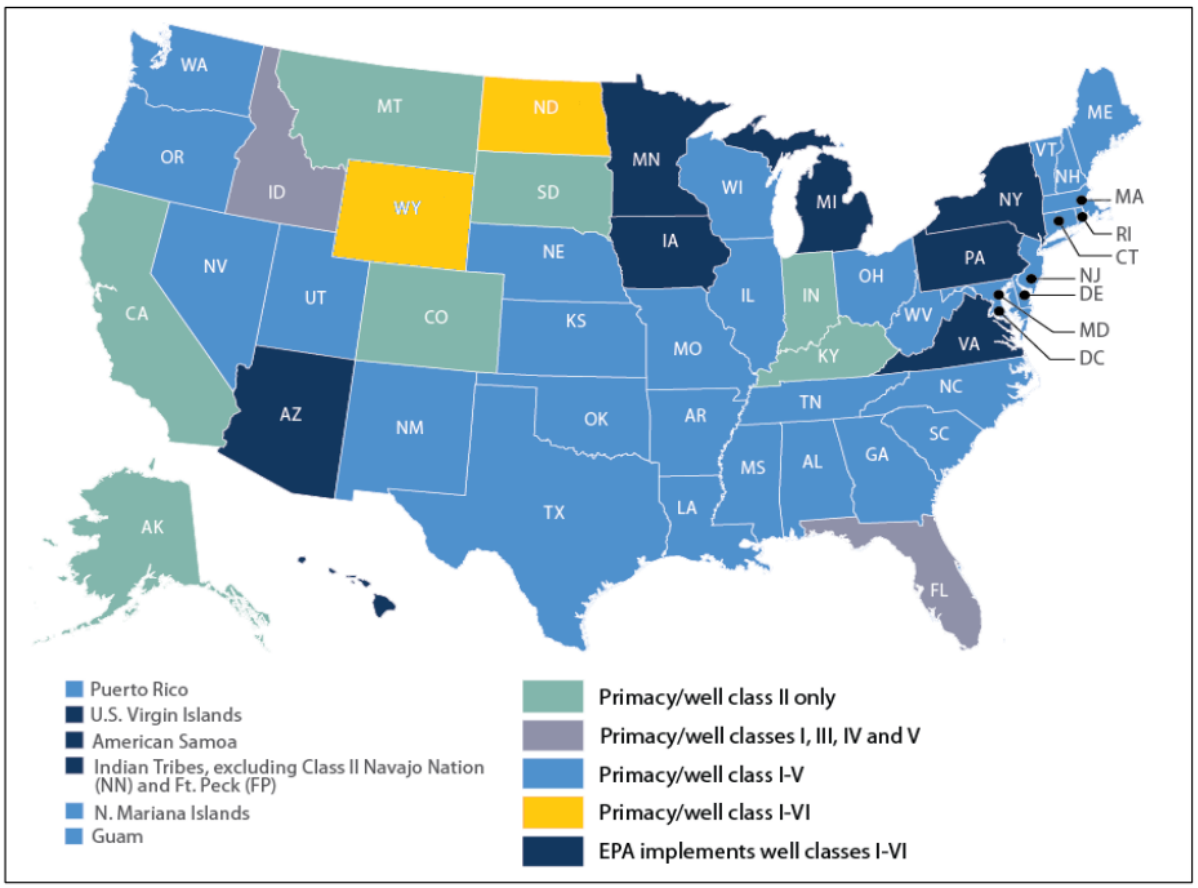
[129] *Best Management Practices for Offshore Transportation and Sub-Seabed Geologic Storage of Carbon Dioxide,* OCS Study BOEM 2018-004, US Department of the Interior Bureau of Ocean Energy Management Headquarters (Sterling, VA). https://espis.boem.gov/final%20reports/5663.pdf

[131] Haley Cochran, Attorney- Office of General Counsel, *Memorandum - Amendments to 16 TAC Chapter 5, relating to Carbon Dioxide (CO2)*, Railroad Commission of Texas, August 30, 2022. https://www.rrc.texas.gov/media/0tta0c3k/adopt-amend-ch5-hb1284-epa-primacy-sig-08302022.pdf

[132] UIC well classes - General Information About Injection Wells, EPA. https://www.epa.gov/uic/general-information-about-injection-wells#well_classes

[133] Haley Cochran, Attorney- Office of General Counsel, *Memorandum - Amendments to 16 TAC Chapter 5, relating to Carbon Dioxide (CO2)*, Railroad Commission of Texas, August 30, 2022.

financial responsibility, well construction, operation, mechanical integrity testing, monitoring, well-plugging, post-injection site care, and site closure requirements" for Class VI wells.[134]



Source: CRS, from EPA, "Primary Enforcement Authority for the Underground Injection Control Program," accessed on September 22, 2022, at https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program-0, accessed on September 22, 2022.

Notes: North Dakota and Wyoming have primacy for all well classes, including Class VI. EPA implements the Class VI program for all other states, territories, and tribes.

Figure 3. State Underground Injection Control Primacy Map[135]

Though states may gain primacy over Class VI wells as of this writing only North Dakota and Wyoming have completed the approval process.[136]

State

Louisiana

The State of Louisiana has established a legal framework for carbon capture and storage (CCS) and for carbon capture utilization and storage (*i.e.*, related to enhanced hydrocarbon recovery)

[134] Haley Cochran, Attorney- Office of General Counsel, *Memorandum - Amendments to 16 TAC Chapter 5, relating to Carbon Dioxide (CO2)*, Railroad Commission of Texas, August 30, 2022.
[135] Injection and Geologic Sequestration of Carbon Dioxide: Federal Role and Issues for Congress, Congressional Research Service, September 22, 2022. https://crsreports.congress.gov/product/pdf/R/R46192
[136] *Primary Enforcement Authority for the Underground Injection Control Program*, EPA, https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program-0

(CCUS). The Department of Natural Resources - Office of Conservation regulates CCS and CCUS activities in Louisiana.[137]

Carbon Capture Utilization and Storage

Louisiana permits the creation of CCUS pilot programs, but ultimately the state "requires the creation of a unit by the Commissioner of Conservation for the purpose of secondary or tertiary recovery under La. R.S. 30:5(C)."[138]

Prior to issuing such a unit, the Commissioner shall provide notice and hold a hearing concerning the proposed unit.[139] The order creating the unit must also designate a unit operator and must also allocate the cost and expense of the unit operation to the owners (lessees or owners of unleased interests), and the "allocation shall be in the same proportion that the separately owned tracts share in unit production".[140]

Likewise, the designated unit operator under the order creating the unit must obtain approval for these Class II injection wells under the Underground Injection Control (UIC) program regulated by the Office of Conservation, since the Office of Conservation has obtained primary enforcement authority from the federal Environmental Protection Agency under the applicable EPA guidelines. "The pertinent regulations are in Statewide Order No. 29-B and address permitting, construction, operations, monitoring, testing, reporting, and closure for Class II wells."[141]

Geologic Sequestration

In 2009, the State of Louisiana asserted jurisdiction by passing into law the Sequestration of Carbon Dioxide Act (La. R.S. 30:1101-1111). Louisiana declared Louisiana's public interest and public policy that:

- Geologic storage of carbon dioxide benefits Louisiana citizens and the environment by reducing greenhouse gas emissions;
- Carbon dioxide is a valuable commodity to Louisiana's citizens;
- Geologic storage of carbon dioxide may be withdrawn from storage for "commercial, industrial, or other uses, including the use of carbon dioxide for enhanced recovery of oil and gas."[142]

Louisiana's new public policy has created a "coordinated statewide program related to the storage of carbon dioxide and to also fulfill the state's primary responsibility for assuring

[137]Jeff Lieberman, *A Primer on CCUS Regulation in Louisiana*, The Energy Blog, March 28, 2022. https://www.theenergylawblog.com/2022/03/articles/energy/a-primer-on-ccus-regulation-in-louisiana/
[138] [138]Jeff Lieberman, *A Primer on CCUS Regulation in Louisiana*, The Energy Blog, March 28, 2022. https://www.theenergylawblog.com/2022/03/articles/energy/a-primer-on-ccus-regulation-in-louisiana/
[139] La. Rev. Stat. Ann. § 30: 30:5 (C)(2).
[140] La. Rev. Stat. Ann. § 30: 30:5 (C)(3).
[141] Jeff Lieberman, *A Primer on CCUS Regulation in Louisiana*, The Energy Blog, March 28, 2022. https://www.theenergylawblog.com/2022/03/articles/energy/a-primer-on-ccus-regulation-in-louisiana/
[142] La. Rev. Stat. Ann. § 30: 1102.

compliance with the federal Safe Drinking Water Act, including any amendments thereto related to the underground injection of carbon dioxide."[143]

Likewise, the Commissioner of Conservation now has "jurisdiction and authority over all persons and property necessary to enforce effectively the provisions of this Chapter relating to the geologic storage of carbon dioxide and subsequent withdrawal of stored carbon dioxide."[144]

In Louisiana, the creation of a geologic carbon sequestration storage facility requires approval to use a specific reservoir for the injection and storage of carbon dioxide, but not the creation of a unit.[145]

Likewise, the **Commissioner of Conservation has the authority to**:

- Regulate the development and operation of storage facilities and pipelines transmitting carbon dioxide to storage facilities, and **issue certificates of public convenience and necessity** for storage facilities and pipelines serving such approved projects;
- Require the drilling, casing, and plugging of wells to be done in a way to prevent the escape of carbon dioxide out of one stratum to another;
- Prevent the intrusion of carbon dioxide into oil, gas, salt formation, or other commercial mineral strata;
- Prevent the pollution of freshwater supplies by oil, gas, salt water, or carbon dioxide;
- Require the plugging of each abandoned well and decommissioning of the associated surface facilities.[146]

The Louisiana Geologic Sequestration of Carbon Dioxide Act also creates a trust fund in LA RS 30:1110 to make disbursements from the fund for purposes authorized and a liability release upon cessation of storage operations as specified in LA RS 30:1109.

Consequently, the operator of the storage facility must also obtain approval for these Class VI injection wells under the Underground Injection Control (UIC) program. At the time of the writing of this paper, Louisiana's application for primary enforcement authority for Class VI wells remains pending. "In the meantime, the Environmental Protection Agency remains the primary enforcement authority for Class VI wells. The State regulations that will govern Class VI wells once primacy is achieved are in Statewide Order No. 29-N-6, which addresses permitting, construction, operations, monitoring, testing, reporting, and closure for Class VI wells."[147]

Texas

In 2009, the State of Texas created the legal framework for projects involving the capture, injection, sequestration, or geologic storage of anthropogenic carbon dioxide in passing Senate

[143] *Id.*
[144] *Id.*
[145] Jeff Lieberman, *A Primer on CCUS Regulation in Louisiana*, The Energy Blog, March 28, 2022. https://www.theenergylawblog.com/2022/03/articles/energy/a-primer-on-ccus-regulation-in-louisiana/
[146] La. Rev. Stat. Ann. § 30: 1104. **Emphasis added.**
[147] Jeff Lieberman, *A Primer on CCUS Regulation in Louisiana*, The Energy Blog, March 28, 2022. https://www.theenergylawblog.com/2022/03/articles/energy/a-primer-on-ccus-regulation-in-louisiana/

Bill 1387, 81st Texas Legislature, R.S., 2009, which also required the state to pursue primacy for the Class VI UIC program. In 2021, the State of Texas enacted House Bill 1284 (HB 1284, 87th Legislature, R.S., 2021), giving the Texas Railroad Commission sole jurisdiction over carbon sequestration wells. Previously, the Texas Railroad Commission had shared jurisdiction over carbon sequestration wells with the Texas Commission on Environmental Quality (TCEQ). Likewise, the State of Texas passed HB 1284 in law and thus also amending the Texas Water Code, §27.043, to prohibit the Texas Railroad Commission from issuing a permit to convert a previously plugged and abandoned Class I injection well into a Class VI injection well.[148]

The Texas Railroad Commission has adopted amendments to Chapter 5 – Carbon Dioxide so Texas could meet and comply with the EPA's Class VI UIC requirements and obtain primary enforcement authority ("primacy") for Class VI wells from the EPA. In December 2022, the State of Texas submitted its official application for primacy to the EPA, and the application is still pending EPA review as of the date of the writing of this article.[149]

Pipelines

Federal

The Bureau of Safety and Environmental Enforcement (BSEE) within the Department of Interior has the primary regulatory authority for regulating offshore pipelines on the federal submerged lands of the Outer Continental Shelf. The Pipeline and Hazardous Materials Safety Administration (PHMSA) within the Department of Interior shares regulatory oversight with BSEE of certain offshore pipeline facilities.[150]

Thus in 2020, BSEE and PHMSA executed a Memorandum of Understanding (MOU) to outline the regulatory jurisdictional oversight responsibility of US offshore pipelines, and as a result, PHMSA is responsible for:

> *all OCS pipelines beginning downstream of the point at which operating responsibility transfers from a producing operator to a transporting operator, or downstream of the last valve on the last production facility on the OCS for pipelines that cross into State waters.*[151]

PHMSA has:

> *promulgated regulations under [C.F.R. §§190, 195-199] for the construction, operation and maintenance, and emergency response planning for CO2 pipelines. Although CO2 is listed as a Class 2.2 (non-flammable gas) hazardous material under DOT regulations, PHMSA currently applies safety requirements to CO2 pipelines*

[148] Haley Cochran, Attorney- Office of General Counsel, *Memorandum - Amendments to 16 TAC Chapter 5, relating to Carbon Dioxide (CO2)*, Railroad Commission of Texas, August 30, 2022.
[149] Geologic Storage of Anthropogenic CO2, Texas Railroad Commission. https://www.rrc.texas.gov/oil-and-gas/applications-and-permits/injection-storage-permits/co2-storage/
[150] DOT's Federal Pipeline Safety Program: Background and Issues for Congress, Congressional Research Service, March 31, 2023 https://sgp.fas.org/crs/misc/R44201.pdf
[151] *Id.*

similar to those for pipelines carrying hazardous liquids such as crude oil and anhydrous ammonia [under 49 C.F.R. §172.101].[152]

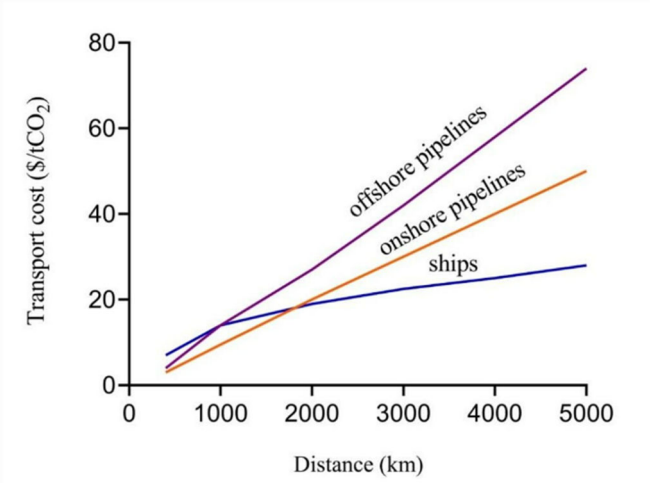
Vessels

Maritime vessels provide another potential option for transporting CO2, especially for longer distances or for shipping CO2 overseas. For decades, parties have shipped large amounts of liquefied natural gas and liquefied petroleum gases (*i.e.*, propane and butane) via maritime vessels. Current technology exists for shipping CO2 today via maritime vessel, but to date, such shipping takes place on a small scale due to limited demand.[153]

Since transport via pipelines over long distances can be more expensive than transport via ships and also controversial in local communities, we should also look to provide flexibility and optimize shipping options as we seek to:

solve the transportation puzzle for carbon capture technologies, two researchers at the University of Houston, Texas have proposed filling up LNG carriers with liquefied carbon dioxide on their backhaul routes…. [Likewise] there are already patents and designs to build ships with the exact specifications for dual-use shipping of LNG and carbon, though it is only approved for smaller ships at present.[154]

CO2 Transportation Costs[155]



Comparative costs for offshore pipelines, onshore pipelines and ship transport of CO2 as a function... [+] PROVIDED BY AUTHORS

Figure 4. CO2 Transportation Costs Graph

[152] *Id.*
[153] Carbon Capture and Sequestration (CCS) in the United States, Congressional Research Service, October 5, 2022. https://sgp.fas.org/crs/misc/R44902.pdf
[154] Study: "Dual-Use" LNG Shipping Could Transform Carbon Capture, The Maritime Executive, January 16, 2022, https://maritime-executive.com/article/study-dual-use-lng-shipping-could-transform-carbon-capture
[155] Ramanan Krishnamoorti and Aparajita Datta, *Dual Use LNG Shipping: A Gamechanger for Carbon Management?*, Forbes, Feb 28, 2019. https://www.forbes.com/sites/uhenergy/2019/02/28/dual-use-lng-shipping-a-gamechanger-for-carbon-management/?sh=40d790161f47

V. Transactional Framework

Federal Submerged Lands

In 2021, Congress passed, and the President signed the Infrastructure Investment and Jobs Act (IIJA) amending Section 40307 of the Outer Continental Shelf Lands Act (OCSLA). The IIJA authorized the Department of Interior authority to grant federal leases, easements, or rights of ways on federal submerged lands and provide support for the injection of a carbon dioxide stream into sub-seabed geologic formations for the purpose of long-term CCS activities on the Outer Continental Shelf (OCS) and requiring the DOI Secretary to promulgate such regulations within one year of enacting of the IIJA.[156] Likewise, the DOI determined the (BSEE) Bureau of Safety and Environmental Enforcement would be responsible for the offshore CCS activities involving the installation, operations, emergency response plans, and decommissioning activities, while the Bureau of Ocean Energy Management (BOEM) would be responsible for the leasing activities and assessing the environmental impact of the federal offshore CCS program.[157]

State Submerged Lands

With the additional certainty and broader opportunity provided by the incentives described above, companies have already taken the first steps to implement offshore CCS & transportation. Given the public-private relationships required by the regulatory framework governing offshore CCS, the deal terms which will govern such projects are in some cases available for review and others for analysis, yet to be finalized and publicly available.[158] Following is a discussion of some of those deal terms currently available and the status of jurisdictions in which terms have yet to be developed.

The following review of select terms is based on two Gulf Coast state lease forms: from Louisiana the "DWF Lease" and from Texas the "GLO Lease" each defined below.

Louisiana Lease Form

The "DWF Lease" is the agreement form titled "Carbon-Dioxide Storage Agreement" used between the State of Louisiana the Louisiana Department of Wildlife & Fisheries ("DWF"), and parties agreeing to carbon sequestration under its terms.[159] More specifically, the DWF Lease refers to that certain State Lease Number CS004 which covers 18,022.95 acres of Louisiana State offshore blocks of Cameron Parish under agreement with Venture Global

[156] With A New Regulatory Framework on The Horizon, There Is Still Much Uncertainty Concerning the Future of Offshore Carbon Storage, The Energy Blog, Liskow. https://www.theenergylawblog.com/2022/11/articles/energy/with-a-new-regulatory-framework-on-the-horizon-there-is-still-much-uncertainty-concerning-the-future-of-offshore-carbon-storage/

[157] *With A New Regulatory Framework on The Horizon, There Is Still Much Uncertainty Concerning the Future of Offshore Carbon Storage*, The Energy Blog, Liskow. https://www.theenergylawblog.com/2022/11/articles/energy/with-a-new-regulatory-framework-on-the-horizon-there-is-still-much-uncertainty-concerning-the-future-of-offshore-carbon-storage/

[159] Carbon-Dioxide Storage Agreement CS004, https://www.dnr.louisiana.gov/assets/OMR/media/forms_pubs/CS004.pdf, [hereinafter DWF Lease]

LNG.[160] As of this writing, the DWF Lease has been signed with three (3) different companies as seven (7) different leases.[161]

Texas Lease Form

The "GLO Lease" refers to the form of lease which was included in April 7, 2021, the Texas General Land Office and School Land Board Request for Proposals (RFP) No. 21-SLB-1-ST "…requesting proposals for the lease of Permanent School Fund ("PSF") land in Jefferson County, Texas for the establishment and operation of a geologic carbon dioxide storage repository under submerged land in a Miocene formation, including construction of necessary transportation and storage infrastructure."[162] The GLO Lease form was the basis of the lease approved by the Texas School Land Board on March 1, 2022, lease #SL20220050 made in favor of Bayou Bend CCS LLC effective April 1, 2022.[163] The GLO Lease covers 40,864.34 acres in the Gulf of Mexico, Jefferson County, Texas as set out in the Memorandum of Lease.[164] The discussion of terms utilizes the publicly available GLO Lease form which was provided as part of the RFP.[165]

[160] *Id*.
[161] List available under document type "Carbon Sequestration Agreement", Content Management Search, Louisiana Department of Natural Resources, https://ucmwww.dnr.state.la.us/ucmsearch/Doctypes.aspx
[162] *RFP No 21-SLB-1-ST at Exhibit B* (See: ESBD_File_233235_RFP No, 21-SLB-1-ST School Land Board Leases for CCS Infrastructure Combined.pdf), Electronic State Business Daily Search, Texas Comptroller of Public Accounts, https://www.txsmartbuy.com/esbddetails/view/21-SLB-1-ST, [hereinafter GLO Lease]
[163] The GLO Lease form included a Memorandum of Lease, also completed and recorded as document number 2022010753, March 29, 2022 in the real property records of Jefferson County, Texas. The authors were provided a copy of the completed lease #SL20220050 for academic review but in keeping with the intent of the parties do not disclose negotiated financial and competitive terms herein.
[164] Memorandum of Lease, March 29, 2022, document number 202210753 of the real property records of Jefferson County, Texas.
[165] GLO Lease, *supra* note 159

Louisiana Lands

As mentioned above, the DWF Lease has been used in several instances but only the offshore use referenced is shown here:[166]

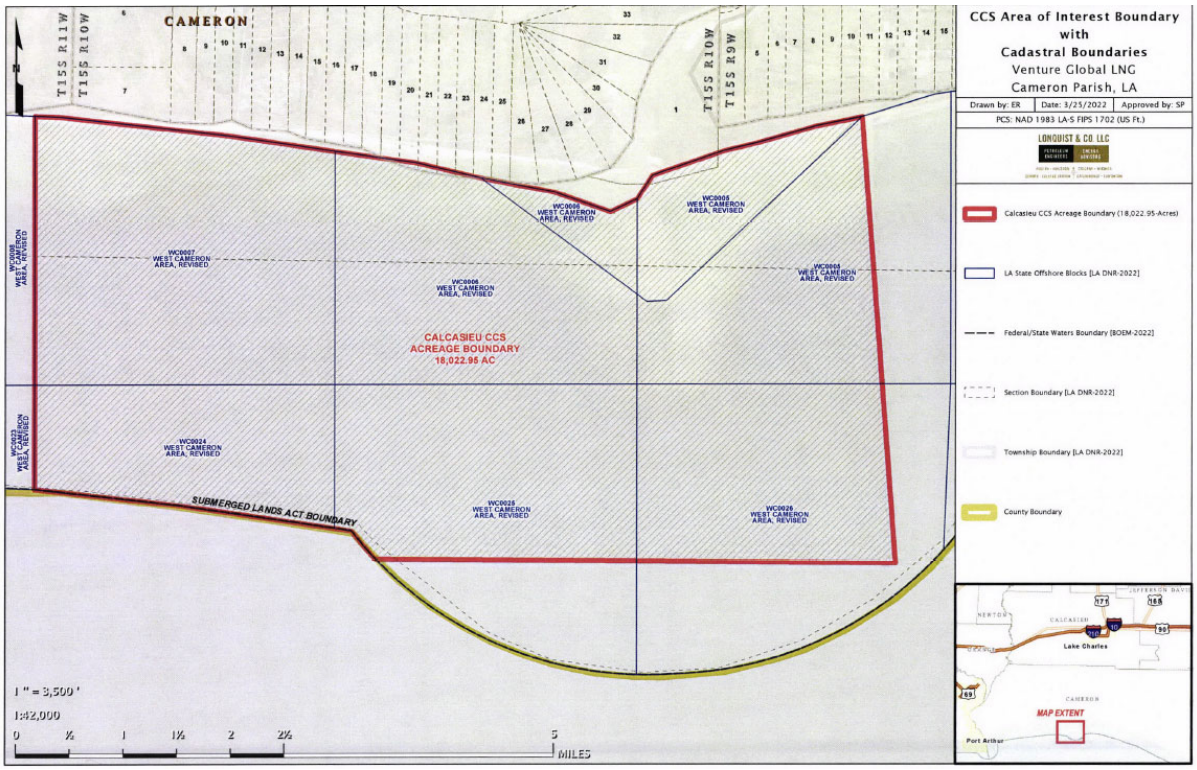


Figure 5. Map of Louisiana State Lease Number CS004 Boundary

[166] DWF Lease, *supra* note 156, at page 25

Texas Lands

The GLO Lease covers the offshore tracts of Jefferson County shown below:[167]

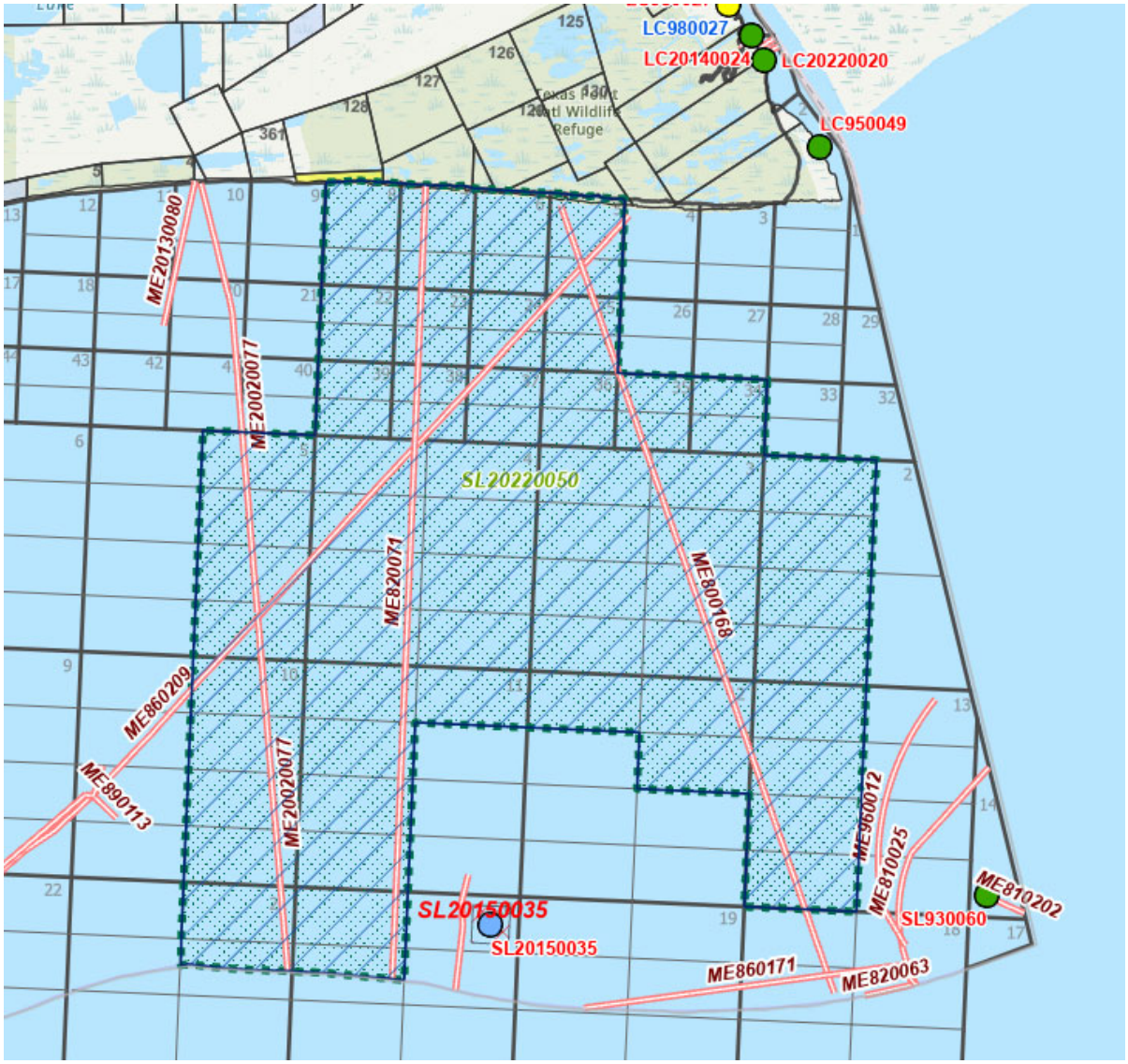


Figure 6. Map of the Texas GLO Lease Boundary

Scope of Review

The scope of our review covers the Term; Rent, Royalty and Proceeds; and Liability set out in the agreements. Terms capitalized but not defined in this paper are defined terms within the respective lease under discussion and the reader is directed to the source for the full definition. It has been noted that sequestration agreement terms have strong parallels to standard oil and gas terms such as bonus, rental, royalty, minimum royalty, initial term and secondary term,

[167] GLO Lease map image, generated via *Texas General Land Office Land/Lease Mapping Viewer*, https://gisweb.glo.texas.gov/glomapjs/index.html

though these concepts are at times used under a different name.[168] Readers familiar with oil and gas agreements will likely see these parallels as well.

Louisiana Term

The Louisiana DWF Lease covers two (2) separately defined tracts of land, each a Specific Area of Interest, and the Term provisions apply distinctly to each so that either may continue or terminate without the other.[169] The DWF Lease begins with an Initial Term of three (3) years during which the Lessee must apply for a Class VI permit and "good cause" may be extended another two (2) years known as the Initial Discretionary Term.[170] If a Class VI application has been made during the described terms, then the four (4) year Permit/Construction Term begins at the end of the Contract Year in which the application was made.[171] Subject to certain conditions, the Permit/Construction Term may also be extended with "Discretionary Terms" up to four (4) one (1) year periods.[172]

If the Lessee begins Injection, then the DWF lease will have entered the Operational Term which is more akin to a secondary term of a habendum clause of an oil and gas lease[173] where Injection must continue without periods of cessation in excess of one (1) year.[174] The Operation Term may also be extended with Operational Discretionary Terms where cessation exceeds one (1) year and the Lessee has complied with notice requirements.[175]

Texas Term

Under the Texas GLO Lease, the Term is divided into three (3) defined components: Development Term, Construction Term and Operations Term.[176]

In the Development Term, the Lessee, subject to some operational limitations and obligations for consulting with the Lessor "may conduct its due diligence and take any action that the Lessee believes is reasonably necessary to determine whether the Property is suitable for the Project."[177] The Development Term is a set number of months for the actions described which includes an application for a Class VI permit, and upon the expiration of the set time period, if Lessee has not then applied for a Class VI permit, then the Lessor may terminate the lease upon written notice to the Lessor.[178]

The Construction Term begins upon the expiration of the Development Term or earlier notice from the Lessee that the Lessee intends to proceed with construction and extends until "the Facility is complete and fully permitted" or until set time periods have passed, subject to

[168] Huguet, Will R. and Doré, Mark A., Carbon Capture and Sequestration: Overview, Multi State Review and Selected Topics, presented April 7, 2023, Rose Rock: An Energy Panel - Hosted by the TCBA Energy & Mineral Law Section
[169] DWF Lease, *supra* note 156, at Article 3
[170] *Id*.
[171] *Id*.
[172] *Id*.
[173] Lowe, John S.*, Oil and Gas Law in a Nutshell 5th Edition,* page 192
[174] DWF Lease, *supra* note 156, at Article 3
[175] *Id*.
[176] GLO Lease, *supra* note 159
[177] *Id*.
[178] *Id*.

extensions options and subject to a Lessor termination option regarding obtaining a Class VI permit.[179]

The Operations Term begins as the Construction Term ends and extends for the lesser of thirty (30) years, the Maximum Capacity Date, or other termination pursuant to the terms of the lease.[180]

Louisiana Rent, Royalty, and Proceeds

The structure of payments from Lessee to the Lessor, though not named rent, royalty, or bonus, strongly parallel those concepts and functions as they have been used in upstream oil and gas production.

The DWF Lease provisions noted in this section are those included in the offshore Cameron Parish lease.[181] The DWF Lease requires a lump sum payment of $171 per acre and an annual rental of $50 per acre to be paid until the Operational Term begins.[182] That period could extend as long as thirteen (13) years assuming all possible Discretionary Terms discussed above were utilized and could only be as short as the fastest possible Class VI permit issuance and actual construction to the commencement of injection.

Once the Operational Term begins, the flat annual rate of $50 per acre noted above ceases and the annual payment becomes dependent on injected volumes, the Minimum Guaranteed Annual Payment (MGAP), and dependent on rate escalation tied to the amount per ton of 45Q tax credit received by the Lessee.[183] The initial rate per ton of $6.50 assumes that the Lessee receives $85 per ton in 45Q credits.[184] If the credit "is increased by Congress," the Lessor will receive ten percent (10%) of such an increase in the per ton rate.[185]

The Annual Injection Fee Per Ton is calculated by applying the rate to the volumes injected or the minimum payment due as the MGAP.[186] The annual minimum is the equivalent of 750,000 tons per year.[187]

Texas Rent, Royalty, and Proceeds

The GLO Lease as a draft form included with the RFP did not include any rental, royalty or proceeds terms in detail but included the following description:

> *Rent shall include a minimum rent paid during the Development Term and Construction Term, a rent paid during the Operations Term based on throughput, storage capacity, Sec. 45Q tax credit or other carbon credit values, Lessee's monetization of the value of*

[179] *Id*.
[180] *Id*.
[181] DWF Lease, *supra* note 156
[182] *Id*.
[183] *Id*.
[184] *Id*.
[185] *Id*.
[186] *Id*.
[187] *Id*.

the CO2 to be stored, and/or other factors, and consideration paid to support post-closure obligations, including monitoring, described in this Agreement.[188]

No detailed information regarding proposed or final financial terms is available in the GLO Lease draft proposed with the RFP, and none is in the final recorded Memorandum of Lease.[189]

Liability

Traditional oil and gas operations inherently carry a level of risk and with that risk the potential for liability. Those operations have long included the injection of carbon dioxide used in enhanced recovery operations.[190] Operations for production eventually hit a financial limit followed at some point by plugging and abandonment, the regulations of which will ultimately relieve the operator of liability for the abandoned well.[191] With respect to CCS wells, as only two (2) Class VI wells have been permitted, the issue of post-operational liability is relatively new.[192] CCS wells also differ in that throughout their operational life the expectation is that they are approaching a storage limit or "storage potential," not an economic limit.[193] Some states have already adopted statutes that, following certain requirements, allow operators to leave the liability for permanently stored CO2 with the State.[194] Parties also address the balance of liability, including post-operational liability, in leases and related agreements in addition to operational liability that may arise. The following is a review of the Louisiana DWF Lease and Texas GLO Lease treatment of liabilities between the parties.

Louisiana Liability

Within the DWF Lease, the issue of liability is addressed most in terms of insurance requirements, indemnification obligations to the Lessor, responsibility for Property damage and the obligation to restore the surface after operations. The insurance requirements set out agency rating minimums as well as coverage amounts and certificate requirements typical of large upstream exploration and production operations.[195] In the DWF Lease, the Operator/Lessee is required to broadly indemnify Lessor from a broad list of claims, costs and more, that may arise out of a broad list of agreement-related activities.[196] As to Property damage, the Lessee is expressly liable for surface damages under the surface use provisions.[197] Lessee is also liable for damages under the defined Restoration Obligations which state that Lessee is "obligated to plug and abandon all wells," restore the surface, and is liable for any cost incurred by the State for failure to timely perform the Restoration Obligations.[198] The

[188] GLO Lease, *supra* note 159
[189] Memorandum of Lease, March 29, 2022, document #202210753, property records of Jefferson County, Texas.
[190] *Carbon Dioxide Enhanced Oil Recovery*, page 10, National Energy Technology Laboratory (NETL), https://www.netl.doe.gov/sites/default/files/netl-file/co2_eor_primer.pdf
[191] *Economic Limit Definition*, http://oilgasglossary.com/economic_limit.html
[192] *Underground Injection Control (UIC), Class VI Wells Permitted by EPA*, EPA, https://www.epa.gov/uic/class-vi-wells-permitted-epa
[193] NATCARB/ATLAS, Carbon Storage Atlas, National Energy Technology Laboratory (NETL), https://www.netl.doe.gov/coal/carbon-storage/strategic-program-support/natcarb-atlas
[194] *States look to attract CCS projects through laws shifting long term CO2 storage liabilities*, Nixon Peabody, May 2, 2022, https://www.nixonpeabody.com/insights/articles/2022/05/02/states-look-to-attract-ccs-projects-through-laws-shifting-long-term-co2-storage-liabilities
[195] DWF Lease, *supra* note 156, at Article 6
[196] DWF Lease, *supra* note 156, at Article 8
[197] DWF Lease, *supra* note 156, at Article 12
[198] *Id*.

DWF Lease also notes in several places that the Lessee is not relieved from and is still subject to all Applicable Laws which, as defined of course, include Louisiana's statutes.

Outside of the DWF Lease, the Lessee may benefit from a balance of liability that is relatively unique to Louisiana as it is one of the few states that have addressed post-operational liability related to CCS.[199] As discussed in the Incentives section of this paper, after ten (10) years after cessation of injection operations, an operator upon meeting certain requirements may transfer liability for the facility to the Carbon Dioxide Geologic Storage Trust Fund established by the Louisiana Geologic Sequestration of Carbon Dioxide Act.[200]

Texas Liability

Lessee broadly accepts all liability for all penalties, fines or other consequences arising from the operation and closure of the Project.[201] The Lessee also broadly accepts liability for anything arising from its acts or omissions related to exercising its rights under the GLO Lease.[202]

With respect to a potential transfer of liability, the GLO Lease contemplates that once certain requirements are met, including that "storage has met all applicable State and federal requirements for closure of CO2 storage sites" the "SLB shall acquire title to the CO2 stored in the facility".[203] Presumably the SLB would also assume all liabilities related to such ownership of the CO2, except that it further states that Lessee is not relieved of liability for acts or omissions regarding the "construction, operation or closure" of the Facility.[204]

The transfer of liability provisions of the GLO Lease parallel Sections 382.507 and 382.508 of the Texas Clean Air Act, Subchapter K. Offshore Geologic Storage of Carbon Dioxide which set out the same general requirements before the transfer of liability including that "permanent storage has been verified" and leaving with the Lessee liability for acts and omissions regarding "construction, operation or closure."[205]

VI. Conclusion

Recent federal and state legislation has incentivized the evaluation of CCS in the energy industry. CCS is still an emerging technology for capturing, compressing, and transporting CO2 to suitable locations for injecting and storage in deep geologic formations. The overall objective of CCS is to reduce emissions of industrial CO2 by sequestering the CO2 deep geologic formations. For decades, the energy industry has used carbon capture, utilization, and storage (CCUS), for enhanced oil recovery (EOR). We now have the potential for scalable offshore CCS operations on the submerged lands of the United States.

According to the BOEM, best management practices for offshore transport and storage include consideration of the following operational activities during the full lifecycle of a CCS project: "1) Site Selection and Characterization, 2) Risk Assessment, 3) Project Planning and

[199] Louisiana Geologic Sequestration of Carbon Dioxide Act, La. Rev. Stat. § 30:1101- 30:1111
[200] La. Rev. Stat. § 30:1109
[201] GLO Lease, *supra* note 159, at Section 2.06
[202] GLO Lease, *supra* note 159, at Section 10.12
[203] GLO Lease, *supra* note 159, at Article 4
[204] *Id*.
[205] Tex. Health and Safety Code §§ 382.507 and 382.508

Execution, 4) Monitoring, 5) Mitigation, 6) Safety Inspection and Performance Assessment, 7) Reporting Requirements, 8) Emergency Response and Contingency Planning, 9) Decommissioning and Site Closure."[206] Parties considering potential offshore CCS projects must develop an appreciation of the commercial and legal frameworks surrounding the full lifecycle of these projects, and also the pace of regulatory approvals (*e.g.*, permitting approval timeframes and litigation risk surrounding regulatory approvals). Government officials and stakeholders seeking a reduction of emissions via CCS activities must appreciate that delays in permitting and approvals can impact the commercial viability or competitiveness of CCS projects in the United States. This reality should not overlook the potential risk to third parties or the environment.

Likewise, federal and state officials should work collaboratively and accelerate the EPA's delegation of state primacy over the Class VI well permitting process to the respective states demonstrating compliance with federal guidelines and best practices for lands under state jurisdiction. Otherwise, the pace of change or regulatory inertia in approvals might substantially diminish the potential reduction of anthropogenic CO2 via CCS activities, especially in the submerged lands of the United States under state jurisdiction.

[206] *Best Management Practices for Offshore Transportation and Sub-Seabed Geologic Storage of Carbon Dioxide,* OCS Study BOEM 2018-004, US Department of the Interior Bureau of Ocean Energy Management Headquarters (Sterling, VA). https://espis.boem.gov/final%20reports/5663.pdf