



**EMPOWER**<sup>LLC</sup>

# **CARBON CAPTURE AND SEQUESTRATION** *in Texas*

**SEPTEMBER 2024**

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# GLOSSARY

**BOEM:** Bureau of Ocean Energy Management

**BSEE:** Bureau Of Safety and Environmental Enforcement

**CBI:** Confidential Business Information

**CCS:** Carbon Capture and Storage, sometimes referred to as CCUS, Carbon Capture Usage and Storage

**CEQ:** White House Council on Environmental Quality

**CO<sub>2</sub>:** Carbon Dioxide

**DAC:** Direct Air Capture

**DOE:** Department of Energy

**EOR:** Enhanced Oil Recovery

**EPA:** Environmental Protection Agency

**FERC:** Federal Energy Regulatory Commission

**FID:** Final Investment Decision

**FOIA:** Freedom of Information Act

**GIS:** Geographic Information System

**GLO:** General Land Office of Texas

**IJA:** Infrastructure Investment and Jobs Act

**IRS:** Internal Revenue Service

**R&D:** Research and Development

**RRC:** Railroad Commission of Texas

**SEC:** Securities Exchange Commission

**TCEQ:** Texas Commission on Environmental Quality

**USACE:** U.S. Army Corps of Engineers

**U.S. Code:** The Code of Laws of the United States of America

**SCCS:** Scottish Carbon Capture & Storage

# EXECUTIVE SUMMARY AND KEY FINDINGS

Empower LLC studied carbon capture and sequestration (CCS) projects in Texas to explore the nature and the extent of the government's role in expediting the deployment of CCS projects. The research concluded that CCS is completely dependent on government tax credits and subsidies, rendering CCS a U.S. government-sponsored effort that financially benefits the fossil fuel sector. Further, this is the result of decades of industry lobbying for strong government support for CCS.

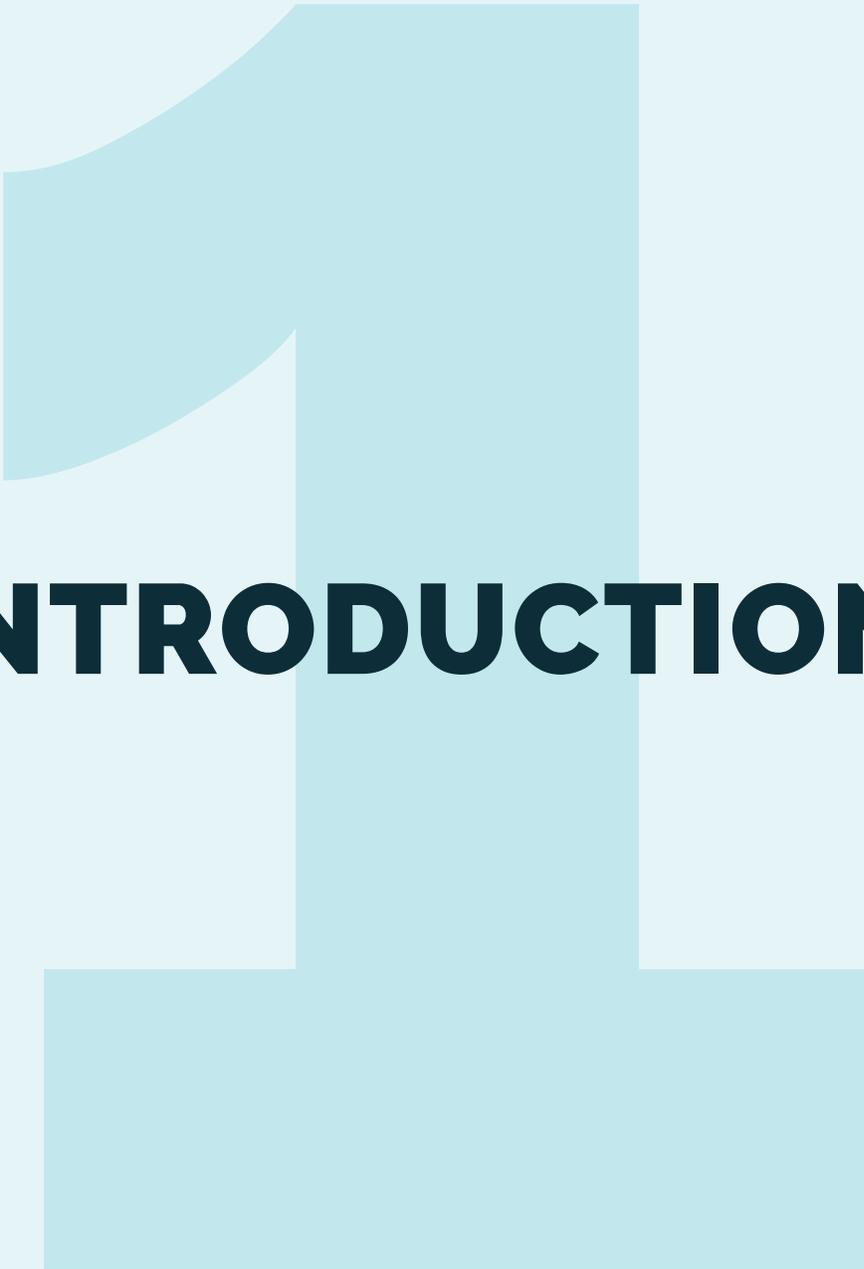
From November 2023 through April 2024, Empower analyzed CCS projects in Texas to understand the relationship between public and private sector financial support. Researchers studied pipelines, storage projects, enhanced oil recovery projects, and "blue" ammonia and hydrogen projects. The project analyzed more than 15,000 existing carbon dioxide injection wells and almost 2,000 miles of carbon dioxide pipelines. Empower compiled records from agency spatial databases, including the Texas Commission on Environmental Quality, the Texas General Land Office, and Bureau of Ocean Energy Management, and the Internal Revenue Service financial records.

CCS projects depend overwhelmingly on the federal tax credits established in section 45Q of the Internal Revenue Code and Department of Energy subsidies to even approach profitability and, therefore, feasibility for the private sector. The 45Q tax credit, which gives tax credits to companies to "reduce emissions" and perform carbon capture, was first approved in 2008. Recent expansions of the 45Q credits have effectively jump-started the industry, as they provide substantial cash flows for projects the private sector has deemed otherwise unprofitable and unattractive.

Corporations are promoting CCS through joint ventures with US government-sponsored consortia, private think tanks, and lobbyists. Large companies with significant financial resources to carry out construction and operation of a CCS facility and storage unit are the only companies able to shoulder the cost burden of CCS at the moment. At the time this research was conducted, CCS projects in Texas were mostly financed internally through companies' own balance sheets and did not directly go to debt and equity markets as individual projects seeking financing for construction and deployment, as they are deemed too risky for financial institutions. The CCS 45Q tax credits and the Department of Energy subsidies are the main sources of cash flow for these companies, because CCS projects are not profitable on their own.

## Key Findings

- 1** Carbon capture and sequestration projects directly depend on tax credits and subsidies from the U.S. Government. In fact, public funding and tax breaks are the largest sources of revenue for CCS projects. Without the massive federal investment, the private sector deems most CCS projects unprofitable or unfeasible.
- 2** Through land leases and other public instruments, local schools and governments in Texas are being or will be indirectly financed by CCS tax credits. This may create financial dependence on the fossil fuel industry for public sector activities.
- 3** Using Internal Revenue Service tax forms, Empower computed estimated tax credits for 34 projects. CCS projects in Texas could receive a minimum of \$3.2 billion in annual tax credits, and up to a maximum of \$33 billion per year.
- 4** State and federal statutes allow CCS companies to withhold most critical information, limiting the amount of information available to the public.
- 5** Companies using CCS create layers of subsidiaries to isolate CCS-related risk from other corporate units and provide only required resources from their balance sheets to the subsidiary developing and operating a CCS project. As a result, the federal government (and taxpayers) bear the financial burden with minimal risk to the private sector.

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# **INTRODUCTION**

# INTRODUCTION

From November 2023 through April 2024, Empower analyzed carbon capture and sequestration projects (CCS) in the State of Texas to obtain a list of existing and planned projects.

CCS has been promoted as one of the main strategies in climate change mitigation by the Biden administration. Although CCS was not introduced by this administration, it was only until once 45Q tax breaks were expanded that the industry became profitable. Prior legislative and executive efforts, far from fruitless, played a crucial role in paving the way for a more expedient deployment of CCS projects during Biden's tenure.

Corporations have successfully promoted CCS deployment by joining U.S. government-sponsored consortia, private think tank groups, or by lobbying at the federal and state levels. Companies interested in CCS-related benefits have and will continue to influence legislation and governance. For instance, recent changes to local legislation allow companies to request which documents are to be kept from the public by claiming confidential business information (CBI), which requires individuals to go through additional legal procedures in order to challenge this disclosure exclusion.

In short, the CCS industry is a U.S. government-sponsored economic project that directly benefits companies with longstanding histories in the fossil fuel sector, one of the largest greenhouse gas emitters on the planet. CCS extends the use of fossil fuels and hinders the creation of a State-sponsored energy transition to directly tackle the effects of the oil and gas sector on the climate crisis.

As of March 2024, Texas CCS projects are divided into two main regions: the Permian Basin and the coastal region (Gulf Coast). Texas has a longstanding history of EOR and has a complex network of CO<sub>2</sub> pipelines in both regions, especially in the Permian Basin. In addition to dividing Texas geographically, CCS projects are also different in nature: in the coastal region, most projects are related to Class VI permits (required for permanent underground storage) and will affect vast marine ecosystems; however, in the Permian Basin, most projects are related to Class II or EOR.

In Fall 2022, Empower first conducted research on CCS technology being deployed in the State of Louisiana, which received state primacy from the Environmental Protection Agency (EPA) in January 2024, authorizing the state permission to grant Class VI permits to companies without going through EPA approval.<sup>1</sup> Although, as of March 2024, Texas had not been granted state primacy for Class VI permits, the Railroad Commission (RRC) may issue Class II permits without prior EPA approval.

In the coming months, some Class II permit holders will likely request to transform their permits into Class VI, whose tax breaks are twice those for Class II permits.<sup>2</sup> In addition to oil and gas facilities, other fossil fuel-related chemical companies are also applying for CCS-related subsidies considered under section 45Q, including so-called "blue" ammonia or hydrogen. Also, some projects are designed to retrofit existing facilities in order to capture CO<sub>2</sub> from these older facilities.

**At the time this research was conducted, CCS projects in Texas were mostly financed internally through companies' own balance sheets and did not directly go to debt and equity markets as individual projects seeking financing for construction and deployment. In fact, CCS projects are dependent on 45Q tax breaks and Department of Energy (DOE) subsidies; without them, projects are deemed unprofitable and unfeasible.**

In recent years, legislation has targeted sections 45Q and 45V of the Internal Revenue Service (IRS) code, which provide tax credits to companies developing and investing in CCS technology.<sup>3,4</sup> Companies developing CCS technology may request these tax credits for storing carbon dioxide (CO<sub>2</sub>) underground. However, section 45Q includes two eligible forms of underground storage: injecting CO<sub>2</sub> beneath a geological layer, which purportedly precludes CO<sub>2</sub> from reaching the surface, and by storing CO<sub>2</sub> in a geological formation, such as a cavern, from which oil and gas are recovered using CO<sub>2</sub> — also referred to as enhanced oil recovery (EOR).<sup>5</sup>

1 Rachel Franzin, "EPA gives Louisiana authority to approve projects storing carbon dioxide underground," *The Hill*, 2 January 2024, <https://thehill.com/policy/energy-environment/4385657-epa-gives-louisiana-authority-to-approve-projects-storing-carbon-dioxide-underground>.

2 "Geologic Storage of Carbon Dioxide (CO<sub>2</sub>)," Railroad Commission of Texas (RRC), <https://rrc.texas.gov/oil-and-gas/applications-and-permits/injection-storage-permits/co2-storage>.

3 H.R.3684 - Infrastructure Investment and Jobs Act.

4 H.R.5376 - Inflation Reduction Act of 2022.

5 Legal Information Institute, "26 U.S. Code § 45Q - Credit for carbon oxide sequestration," Cornell Law School, [www.law.cornell.edu/uscode/text/26/45Q](http://www.law.cornell.edu/uscode/text/26/45Q).



By owning a CCS project through a subsidiary, ultimate parent companies may finance projects internally by transferring funds to them without reporting them publicly. Subsidiaries can also protect ultimate parent companies from liability and risk. Corporate structures consisting of several layers of subsidiaries often limit public access to key financial information, as even publicly-traded companies are not strictly required to report balance sheet operations that occur within or among their subsidiaries. In other words, if a large company is financing its own CCS project, financial information will likely remain undisclosed. Furthermore, only large companies are able to invest in and deploy a CCS project without having to request project-specific equity and debt from the market.

Companies interested in CCS-related benefits have and will also continue to influence legislation and governance. For instance, recent changes to local legislation allow companies

to request which documents are to be kept from the public by claiming confidential business information (CBI), which requires individuals to go through additional legal procedures in order to challenge this disclosure exclusion.

Empower conducted research on 44 pipelines, 15 Class VI projects, 5 EOR-related projects, and 8 "blue" ammonia and hydrogen projects. Only seven projects stated they would retrofit existing facilities with CCS technology. Additionally, Empower analyzed 15,000+ CO<sub>2</sub> injection wells and 1,948 miles of CO<sub>2</sub> pipelines, which are mainly owned by Occidental Petroleum Corporation (NYSE:OXY) and Kinder Morgan, Inc. (NYSE:KMI). As of March 2024, Occidental was developing new CCS-related endeavors, in addition to already owning a vast number of CO<sub>2</sub> injection wells and pipeline systems. However, several new players have either announced or filed a Class VI permit since the 45Q tax breaks were expanded in 2022.



**METHODS AND  
SOURCES**

## METHODS AND SOURCES

Two stages of research were conducted for this report: the first, consisting of a broad scoping to located existing and new CCS projects in Texas; and the second, an in-depth review of corporate ownership, financing, emerging trends, and geographic analysis. Scoping sources included a list provided from commercial data available in CCUS Map and Scottish Carbon Capture & Storage (SCCS), public data from Oil and Gas Watch, official EPA data, press releases and local reporting, as well as state records available at the Texas RRC.

Injection well and drilling permit data available at the RRC is stored in a complex digital format, which had to be "reversed engineered" and parsed with code developed by Empower. Using Nim, R, Python, and Bash to process such information, we structured and stored the data in a format that includes data researched and compiled by Empower in a spreadsheet, available as part of our supporting files. In addition, the data processed was also included in a geographic information system (GIS) file and expressed through cartographic images produced by Empower.

Location data also included leases from the Bureau of Ocean Energy Management (BOEM), Texas General Land Office (GLO), Texas Commission on Environmental Quality (TCEQ), and Texas appraisal districts. Multiple spatial analyses were conducted, including geographic distribution of main corporate players in the region, wetland proximity analysis, and classification of CO<sub>2</sub> infrastructure.

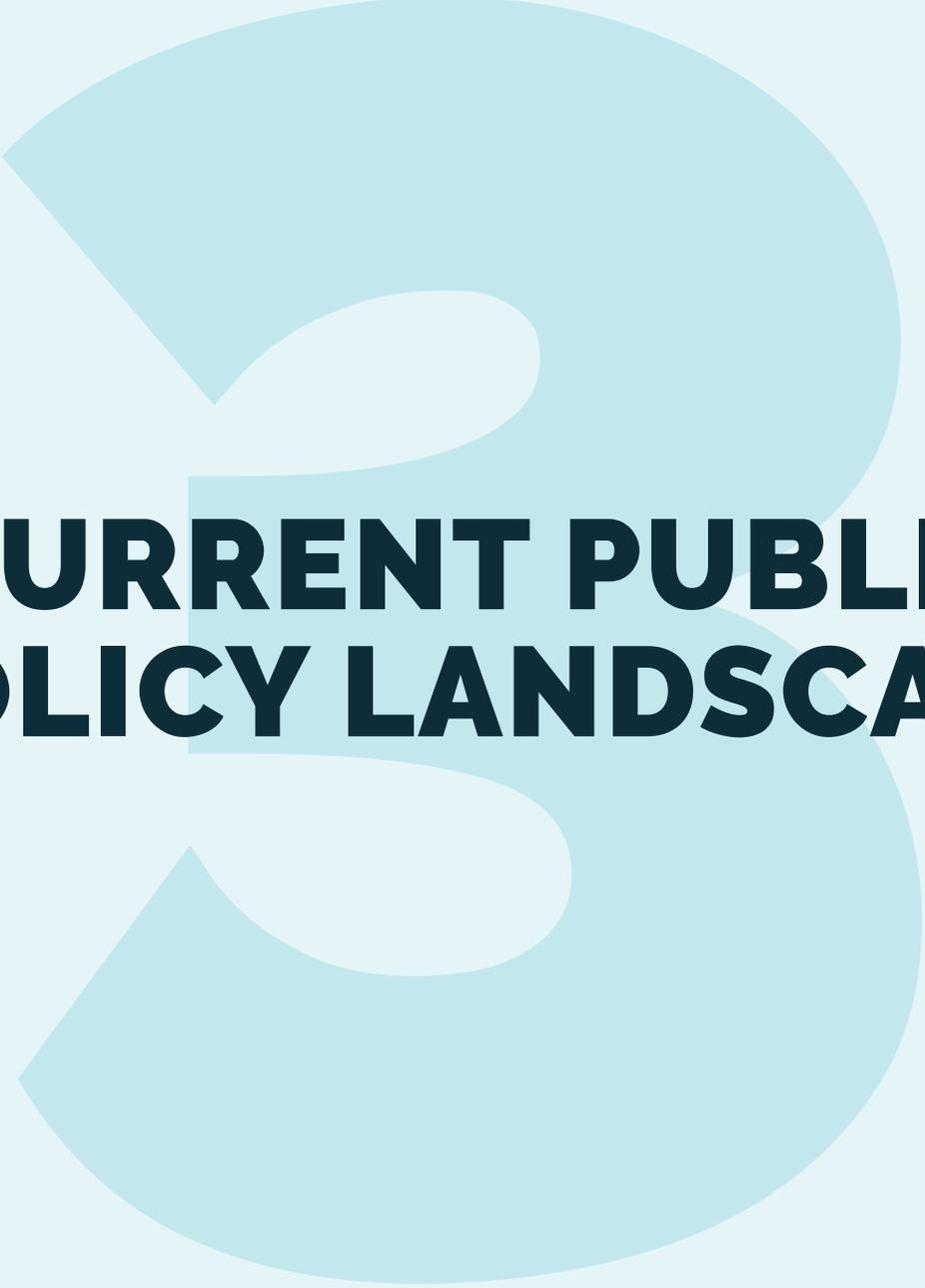
Empower reviewed and analyzed public and private sources to retrieve ownership and financial data. Although most projects were still in early stages of development at the time of this research and debt information was seldom available, corporate structure information was retrieved from private subscription data sources, including S&P Capital IQ and Preqin, as well as from records available in multiple state-level Secretaries of State and corporate websites. Empower submitted public information requests to the RRC and a Freedom of Information Act (FOIA) request to the EPA. The responses to both were limited and heavily redacted under CBI.

**In 2022, Empower submitted a FOIA request that uncovered communications between EPA officials and companies in which public officials suggested that businesses hold off on submitting Class VI applications until CBI statutes were in place in**

**Louisiana. The CBI clause allows companies to choose which information may be withheld from public scrutiny. As a result, under Texas and federal CBI statutes, searchable text was removed from the FOIA response requested by Empower for CCS projects in Texas, in which 20,000 pages were grouped into 20 separate files of one-thousand pages each. Empower conducted optical character recognition (OCR) to reinsert searchable text by first enhancing contrast using OpenCV and then ingesting pages through Tesseract. Further, Empower indexed pages and ran multiple text queries to find project information. Due to time constraints, an expedited manual page review was performed. FOIA response will be made available in this report's supporting material.**

Although financial data was seldom available due to projects' current stages of development, Empower reviewed press releases and corporate presentations to retrieve the advertised amounts of captured CO<sub>2</sub> per project. We used the IRS's Form 8933, which is used to translate tons of captured CO<sub>2</sub> to tax credits, in order to reverse engineer advertised CO<sub>2</sub> amounts to approximate cash flows. Additionally, Empower also reviewed documents available at the Texas Comptroller of Public Accounts, particularly reports issued by companies as required by school districts when developing a potentially hazardous activity in the vicinity; these documents regularly include total investment estimates for CCS and EOR projects.

Using Python and R, Empower created a GIS file, included among the supporting files for this report. We are providing a geopackage file, which may be used in multiple GIS software, and a KML file, which can be viewed using Google Earth (directly on the web). In addition, Empower conducted a preliminary analysis of affected water bodies by using a 30-kilometer radius and analyzing the area of water bodies reported by the U.S. Fish and Wildlife Services; computation was parallelized and 26 gigabytes were offloaded to a database.



**CURRENT PUBLIC  
POLICY LANDSCAPE**

## CURRENT PUBLIC POLICY LANDSCAPE

CCS technology has been at the forefront of the Biden administration's climate change mitigation plan. Although claims of its efficacy have been questioned by environmental groups across the country, the U.S. Government has taken steps to assure financial viability for CCS projects. In fact, as covered throughout this report, public funding and tax breaks are the largest sources of revenue for CCS projects.

Public sources of financing include the DOE, which has directly funded CCS research and development (R&D) since 1997,<sup>6</sup> and IRS 45Q tax breaks, which were first introduced in 2008. Since their inclusion in the U.S. Code, 45Q tax breaks have undergone changes to expand total amounts, add new technologies such as direct air capture (DAC), and allow for tax credits to be transferred to another company in exchange for cash.<sup>7</sup> In June 2021, the White House Council on Environmental Quality (CEQ) released a report outlining the Biden administration's nationwide CCS plan. The 84-page report, which also gathered data from academia and industry, outlined permitting requirements and best practices aimed at developing and scaling CCS projects.

The report stated as top priorities the construction of a 25,000-kilometer interstate CO<sub>2</sub> pipeline system and an additional 85,000 kilometers of pipelines connected to the main CO<sub>2</sub> pipeline system. The report estimated an approximate capital cost of 230 billion USD to undertake this endeavor. As of 2021, the report stated that CO<sub>2</sub> pipeline infrastructure was insufficient to deploy a country-wide carbon capture system and, in addition to building new pipelines, natural gas pipelines could be converted into CO<sub>2</sub> transport systems.<sup>8</sup> However, multiple advocacy groups have stressed pipeline conversion currently lacks federal safety standards, and companies are rushing construction and deployment without sufficient guidelines and oversight.<sup>9</sup>

Map 1 illustrates potential routes for the nationwide CO<sub>2</sub> pipeline system and the Gulf Coast is a major area of interest. According to these potential routes, Texas is strategic to this plan: pipelines would reach the state through two regions mentioned above: the Permian Basin, where EOR plays a key role, and the Gulf, where

major Class VI projects are currently being developed or planned. CCS projects along the Gulf Coast of Texas are closely connected to CCS projects developed next door in Louisiana, where multiple CO<sub>2</sub> storage sites are already planned or under construction.

Since its inception and purported technical viability, CCS has lacked financial backing, particularly for so-called permanent geological sequestration, as CO<sub>2</sub> does not re-enter the fossil fuel value chain as it does in EOR, which reuses CO<sub>2</sub> as a fluid for extracting oil and gas. As of March 2024, CCS was a heavily subsidized industry and endeavors to promote research, construction, and deployment have occurred across multiple legislatures and presidential terms, not reaching partial financial viability until 2021.



6 Traci Rodosta, Grant Bromhal, Darin Damiani, "U.S. DOE/NETL Carbon Storage Program: Advancing Science and Technology to Support Commercial Deployment," *Energy Procedia*, Volume 114, 2017, <https://doi.org/10.1016/j.egypro.2017.03.1730>.

7 Internal Revenue Service (IRS), "About Form 8933, Carbon Oxide Sequestration Credit," 15 September 2023, [www.irs.gov/forms-pubs/about-form-8933](http://www.irs.gov/forms-pubs/about-form-8933).

8 White House Council on Environmental Quality (CEQ), "Council on Environmental Quality Report to Congress on Carbon Capture, Utilization and Sequestration," July 2021, [www.whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf](http://www.whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf).

9 Nicholas Kusnetz, "Rush to Build Carbon Pipelines Leaps Ahead of Federal Rules and Safety Standards," *Inside Climate News*, 1 July 2023, <https://insideclimatenews.org/news/01072023/carbon-pipelines-safety-standards/>

## Map 1 – Optimized U.S. transportation network for economy-wide CCS (2021)

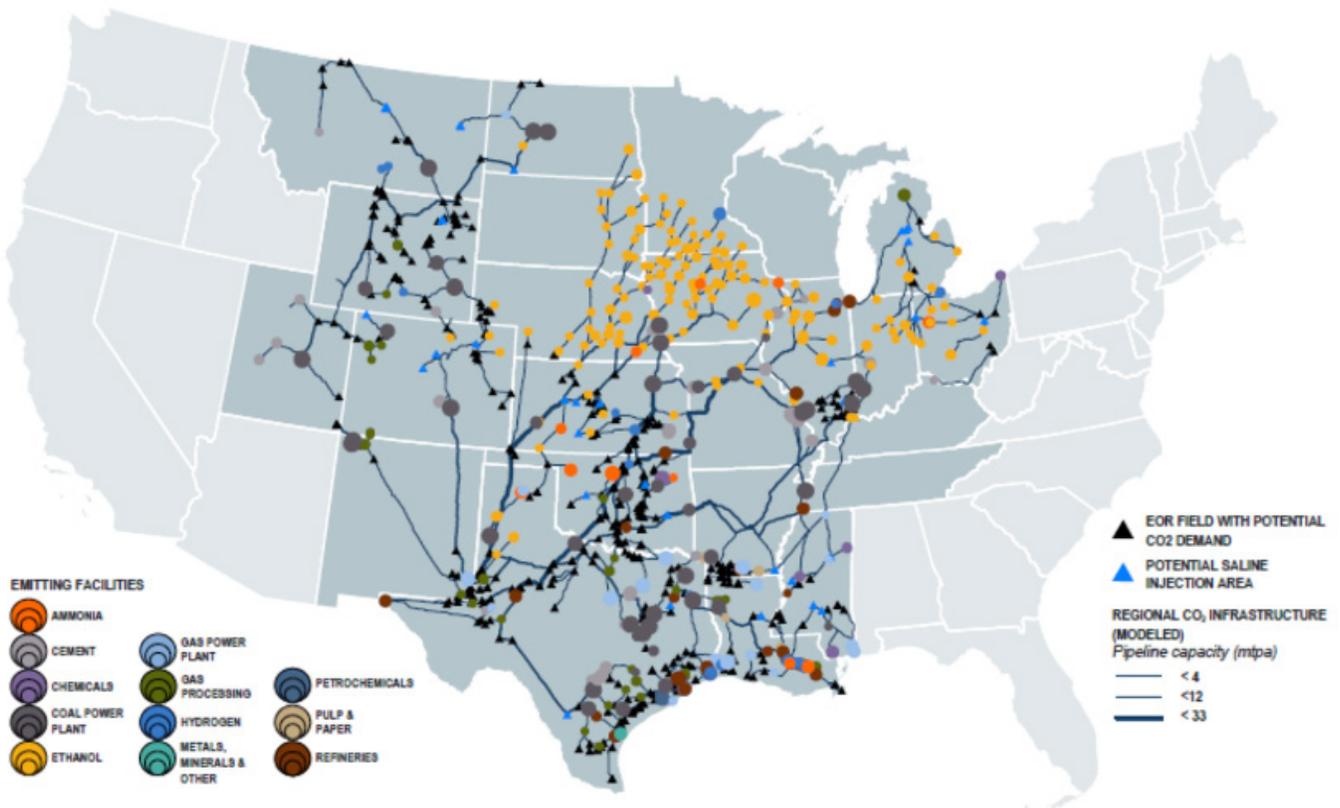


Figure authored by GPI based on results from the SimCCS model.

Source: CEQ.<sup>10</sup>

The U.S. Congress first introduced the 45Q tax credit via the Energy Improvement and Extension Act in 2008<sup>11</sup> and, subsequently, modified it in the Bipartisan Budget Act of 2018,<sup>12</sup> the Taxpayer Certainty and Disaster Tax Relief Act of 2020,<sup>13</sup> and, most importantly, the Inflation Reduction Act of 2022 (Graph 1).<sup>14</sup> Both the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act of 2022 have played crucial roles in ensuring economic feasibility for CCS projects. In fact, although CCS-related legislation can be traced back to the George W. Bush administration, recent changes to 45Q are responsible for effectively jump-starting the industry, as they provide substantial cash flows for projects deemed otherwise unprofitable and unattractive.<sup>15</sup>

In contrast, DOE funding does not require direct modifications to the U.S. Code to increase spending. Each year, Congress authorizes CCS-related funding for the DOE via annual appropriations acts. According to the Congressional Budget Office, “from 2011 to 2023, lawmakers appropriated a total of \$5.3 billion [...] to DOE for CCS research and related program.” Congress has also provided additional CCS-related funding through specific legislation, such as the American Recovery and Reinvestment Act of 2009 and the IIJA.<sup>16</sup>

<sup>10</sup> *Ibid.*

<sup>11</sup> Division B of the Public Law 110-343, [www.govinfo.gov/content/pkg/PLAW-110publ343/pdf/PLAW-110publ343.pdf](http://www.govinfo.gov/content/pkg/PLAW-110publ343/pdf/PLAW-110publ343.pdf).

<sup>12</sup> Public Law 115-123, [www.govinfo.gov/app/details/PLAW-115publ123](http://www.govinfo.gov/app/details/PLAW-115publ123).

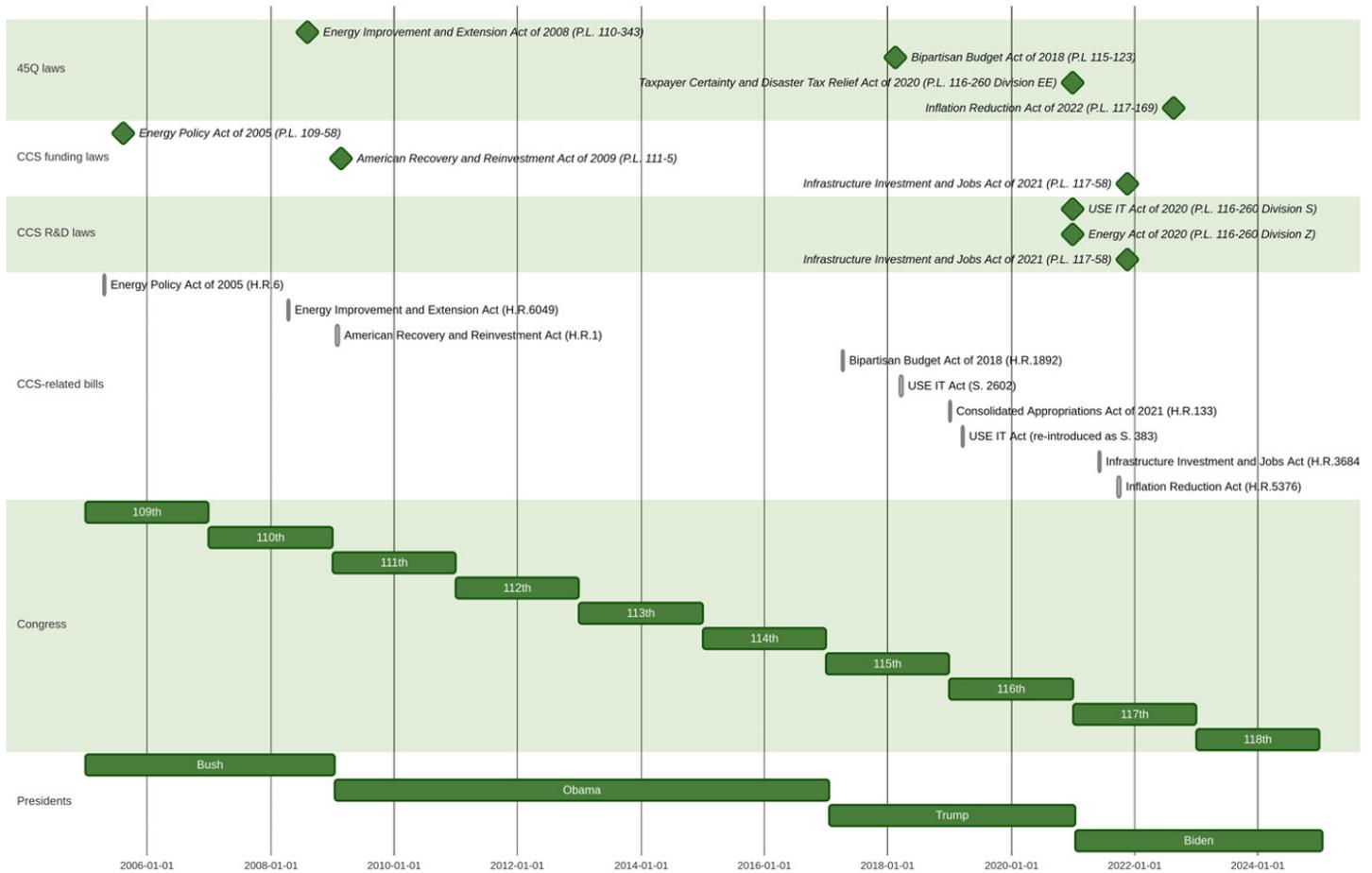
<sup>13</sup> Division EE of the Public Law 116-260, [www.congress.gov/116/plaws/publ260/PLAW-116publ260.pdf](http://www.congress.gov/116/plaws/publ260/PLAW-116publ260.pdf).

<sup>14</sup> Public Law 117-169, [www.congress.gov/117/plaws/publ169/PLAW-117publ169.pdf](http://www.congress.gov/117/plaws/publ169/PLAW-117publ169.pdf).

<sup>15</sup> Sam Kamyans, John Marciano, Sam Guthrie, “Financing Carbon Capture Projects,” Allen & Overy, 6 May 2021, [www.allenoverly.com/global/-/media/allenoverly/2\\_documents/news\\_and\\_insights/publications/2021/05/financing\\_us\\_carbon\\_capture\\_projects.pdf](http://www.allenoverly.com/global/-/media/allenoverly/2_documents/news_and_insights/publications/2021/05/financing_us_carbon_capture_projects.pdf).

<sup>16</sup> Congressional Budget Office, “Carbon Capture and Storage in the United States,” December 2023, [www.cbo.gov/system/files/2023-12/59345-carbon-capture-storage.pdf](http://www.cbo.gov/system/files/2023-12/59345-carbon-capture-storage.pdf), pg. 14.

## Graph 1 – CCS-related bills and acts



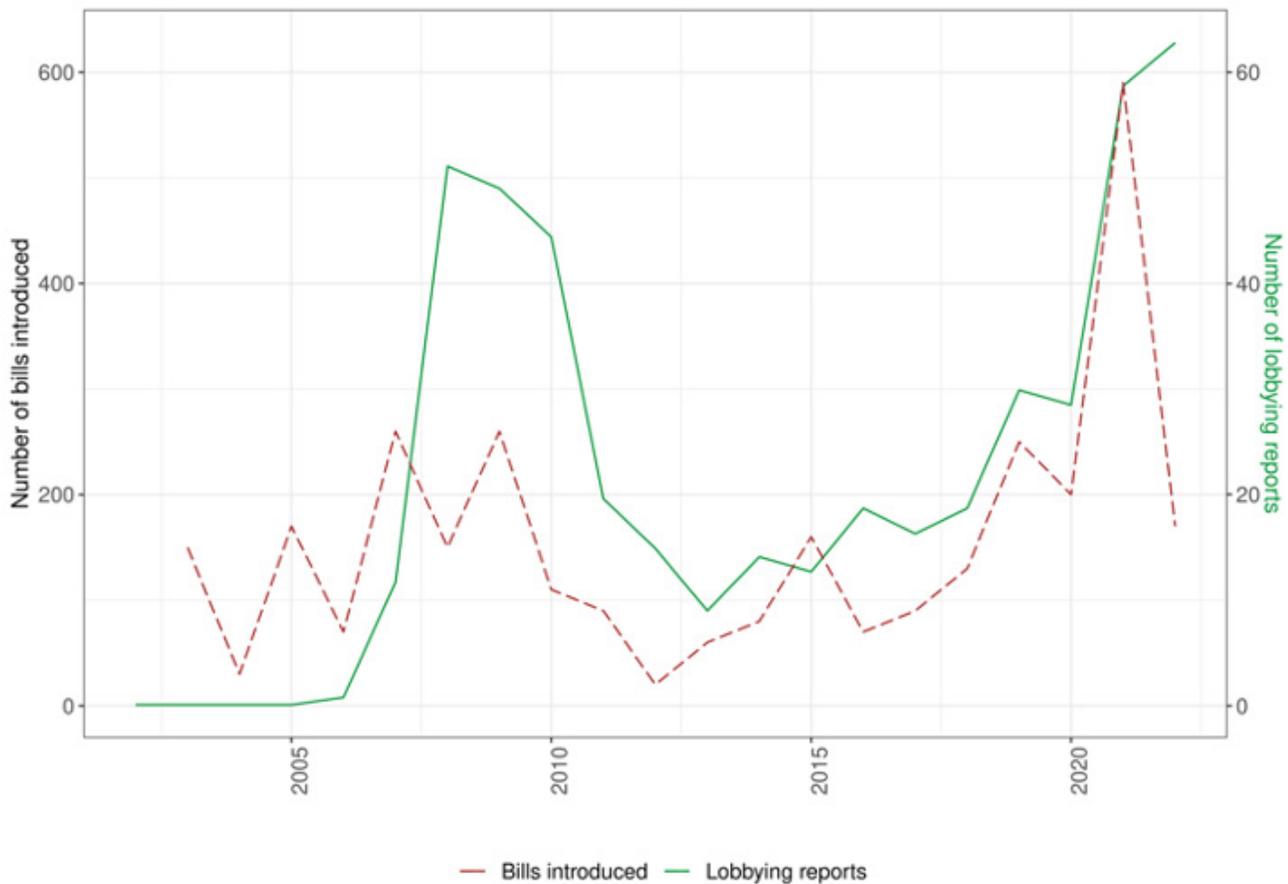
Source: Empower, using federal legislative data.

As stated by Okwudiri Onyedum, treasurer of ExxonMobil Low Carbon Solutions, at the 2023 DC Forum on Carbon Capture & Storage hosted by the Global CCS institute, CCS projects being developed by ExxonMobil Corporation (NYSE:XOM) are still financed internally, without seeking debt and equity investors in the market. Further, panelists at this event stressed that the current financial viability of CCS projects depended directly on DOE funding and 45Q tax breaks. Moreover, as projects move ahead and provide substantial returns, more banks and investors will likely start financing them; however, as of March 2024, most were still being developed out of “balance sheets,” meaning CCS projects remained tied to existing oil and gas companies with substantial revenue and access to debt and equity markets for their overall operations.<sup>17</sup>

**Behind the aforementioned legislative changes, lobbying efforts promoting CCS have increased since 2015, a trend closely resembling the growing number of CCS-related bills introduced in the U.S. Senate. According to research conducted by Empower in 2023, from 2002 to April 2023, there were at least 4,695 lobbying reports related to CCS, totaling around 2.25 billion USD in lobbying expenses.**

17 The Global CCS Institute, “Financing Large Scale CCUS Projects (2023 DC Forum on Carbon Capture & Storage),” YouTube, 17 May 2023, [www.youtube.com/watch?v=cO76HxcnssE](http://www.youtube.com/watch?v=cO76HxcnssE).

**Graph 2 – CCS-related Senate bills and lobbying reports**



Source: Empower, using federal lobbying disclosure data and Congress.gov.

Since 2021, 45Q tax breaks have increased on a yearly basis and many states have applied for primacy over Class VI permits, including Texas and Louisiana, which was recently granted primacy in December 2023.<sup>18,19</sup> Given Texas’s current CCS landscape, Empower concludes that it is likely the next state in line to receive primacy for Class VI permits.

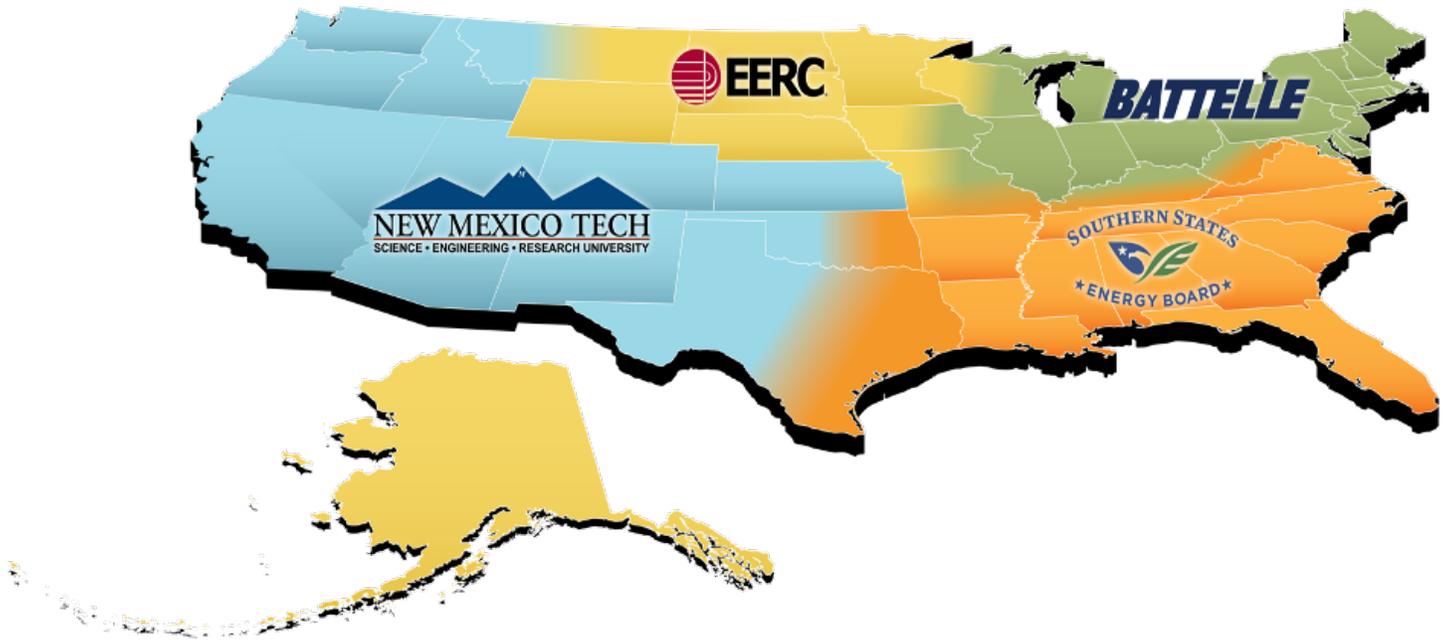
In addition to providing financial support to CCS projects, the U.S. Government has also supported corporate networks and consortia by creating regional initiatives throughout the country. The DOE’s CarbonSAFE program, which began in 2016, is a “Regional Carbon Sequestration Partnership” divided into four regional initiatives (see Map 2): Midwest Regional Carbon Initiative, Partnership of the Western United States, Southeast Regional Carbon

Utilization & Storage Partnership (SECARB-USA), and Plains Carbon Dioxide Reduction (PCOR).<sup>20,21</sup>

Texas is divided between two regional initiatives: the Partnership of the Western United States and SECARB-USA, in which major CCS players in Louisiana have created corporate consortia, such as the CCS Commercialization Consortium consisting of 50 companies, including Denbury, Inc., Mexican cement giant CEMEX, ExxonMobil, Chevron Corporation (NYSE:CVX), and others.<sup>22</sup> By either spending on lobbying or joining CCS consortia and “non-profit” initiatives, corporations have directly influenced CCS policy and the climate mitigation narrative to fit their needs.

18 RRC, “Geologic Storage of Carbon Dioxide (CO2),” <https://rrc.texas.gov/oil-and-gas/applications-and-permits/injection-storage-permits/co2-storage>.  
 19 Rachel Franzin, “EPA gives Louisiana authority to approve projects storing carbon dioxide underground,” The Hill, 2 January 2024, <https://thehill.com/policy/energy-environment/4385657-epa-gives-louisiana-authority-to-approve-projects-storing-carbon-dioxide-underground>.  
 20 Department of Energy (DOE), “CarbonSafe Initiative”, [netl.doe.gov/carbon-management/carbon-storage/carbon-safe](https://netl.doe.gov/carbon-management/carbon-storage/carbon-safe).  
 21 DOE, “Regional Initiative to Accelerate CCUS Deployment,” [netl.doe.gov/carbon-management/carbon-storage/RCSP](https://netl.doe.gov/carbon-management/carbon-storage/RCSP).  
 22 See supporting file: AR\_22\_final\_web.pdf.

## Map 2 – Map of regional DOE carbon capture initiatives



Source: U.S. DOE.<sup>23</sup>

More recently, the White House's CEQ created a CCS task force to "provide recommendations to the Federal government on how to ensure that CCS projects, including carbon dioxide pipelines, are permitted in an efficient manner, reflect the input and needs of a wide range of stakeholders, and deliver benefits rather than harms to local communities." The task force includes individuals from Occidental Petroleum, ExxonMobil, Talos Energy Inc. (NYSE:TALO), Carbonvert Inc., CapturePoint LLC, Air Products and Chemicals, Inc. (NYSE:APD), the Global CCS Institute, Elysian Carbon Management, and BP p.l.c (LSE:BP), as well as government and non-profit actors.<sup>24</sup>

<sup>23</sup> DOE, "Regional Initiative to Accelerate CCUS Deployment," [netl.doe.gov/carbon-management/carbon-storage/regional-initiative-to-accelerate-ccus-deployment](https://netl.doe.gov/carbon-management/carbon-storage/regional-initiative-to-accelerate-ccus-deployment).

<sup>24</sup> White House, "CEQ Announces Members of Task Forces to Inform Responsible Development and Deployment of Carbon Capture, Utilization, and Sequestration," 24 March 2023, [www.whitehouse.gov/ceq/news-updates/2023/03/24/ceq-announces-members-of-task-forces-to-inform-responsible-development-and-deployment-of-carbon-capture-utilization-and-sequestration](https://www.whitehouse.gov/ceq/news-updates/2023/03/24/ceq-announces-members-of-task-forces-to-inform-responsible-development-and-deployment-of-carbon-capture-utilization-and-sequestration).



**CCS FINANCING  
FOR TEXAS:  
CORPORATE  
EXPANSION AND  
FINANCE**

# CCS FINANCING FOR TEXAS: CORPORATE EXPANSION AND FINANCE

## 4.1 Texas CCS overview – new and old players

In 2015, the University of Texas's Bureau of Economic Geology characterized the state's Miocene sediment strata in the Gulf of Mexico, particularly in the upper coast, as a top location for large scale CCS deployment.<sup>25</sup> Adjacent to the upper coast, many CCS projects are being developed in the neighboring State of Louisiana, where a major CO<sub>2</sub> pipeline already connects Mississippi, Louisiana, and Texas. This pipeline, owned by ExxonMobil, will connect Louisiana's Baton Rouge area, where many CCS projects have applied for Class VI permits, with multiple emitting facilities and new Class VI developments along the Gulf Coast of Texas.

**For practical purposes, Texas can be divided into three main CCS regions: the Permian Basin, on the western side of the state bordering New Mexico; Northern Texas, bordering Oklahoma; and the Gulf Coast, which can be further divided into southern and northern coastal regions. During the course of Empower's research, two strong patterns emerged in each geographic region, based mainly on existing infrastructure and activities. In the Permian Basin, where the EOR industry has flourished since the 1980s, new CCS projects have focused on "capturing" CO<sub>2</sub> as a "tertiary injectant," an activity known as a EOR;<sup>26</sup> whereas, in the coastal region, most projects have applied for a Class VI permit to "permanently" store CO<sub>2</sub> without using it as a tertiary injectant. An important exception should be noted, although located in the coastal region: Petra Nova CCS is a major EOR project connected by an 81-mile pipeline.**

From 1982 to 2023, Texas registered 15,051 CO<sub>2</sub> injection wells, of which 79.2% were located in the Permian Basin. Occidental Petroleum is the largest operator of CO<sub>2</sub> injection wells in Texas, comprising 47.6% of all CO<sub>2</sub> wells, which are mainly located in the Permian Basin. Occidental operates CO<sub>2</sub> wells through three subsidiaries: Occidental Permian Ltd., Oxy USA Inc., and Oxy USA WTP LP. As of March 2024, Kinder Morgan operated 1,443 CO<sub>2</sub> injection wells, followed by Chevron with 1,283 wells. Similarly, Occidental (31.5%) is one of the largest owners of CO<sub>2</sub> pipelines after Kinder Morgan (34.4%). Both companies jointly own 1,286 out of 1,948.47 miles of CO<sub>2</sub> pipelines (Graph 4). As shown in Map 4, companies are divided among the three regions mentioned: Kinder Morgan and Occidental are located in the Permian Basin, Denbury in the coastal region, and CapturePoint, LLC in Northern Texas, bordering Oklahoma.<sup>27</sup>

In fact, Kinder Morgan states it transports 1.2 billion cubic feet per day from Southwest Colorado to New Mexico and West Texas, and extracts most of its daily oil from the SACROC Unit in the Permian Basin.<sup>28</sup> As of March 2024, no new CCS projects had been announced by Kinder Morgan; however, it may apply for 45Q tax credits provided existing fields meet IRS requirements, or may receive tax breaks through credit transfers as explained in Form 8933. On the other hand, Occidental Petroleum already announced it would be building a DAC facility in Kleberg County and geological storage sites in Chambers and Ector counties.

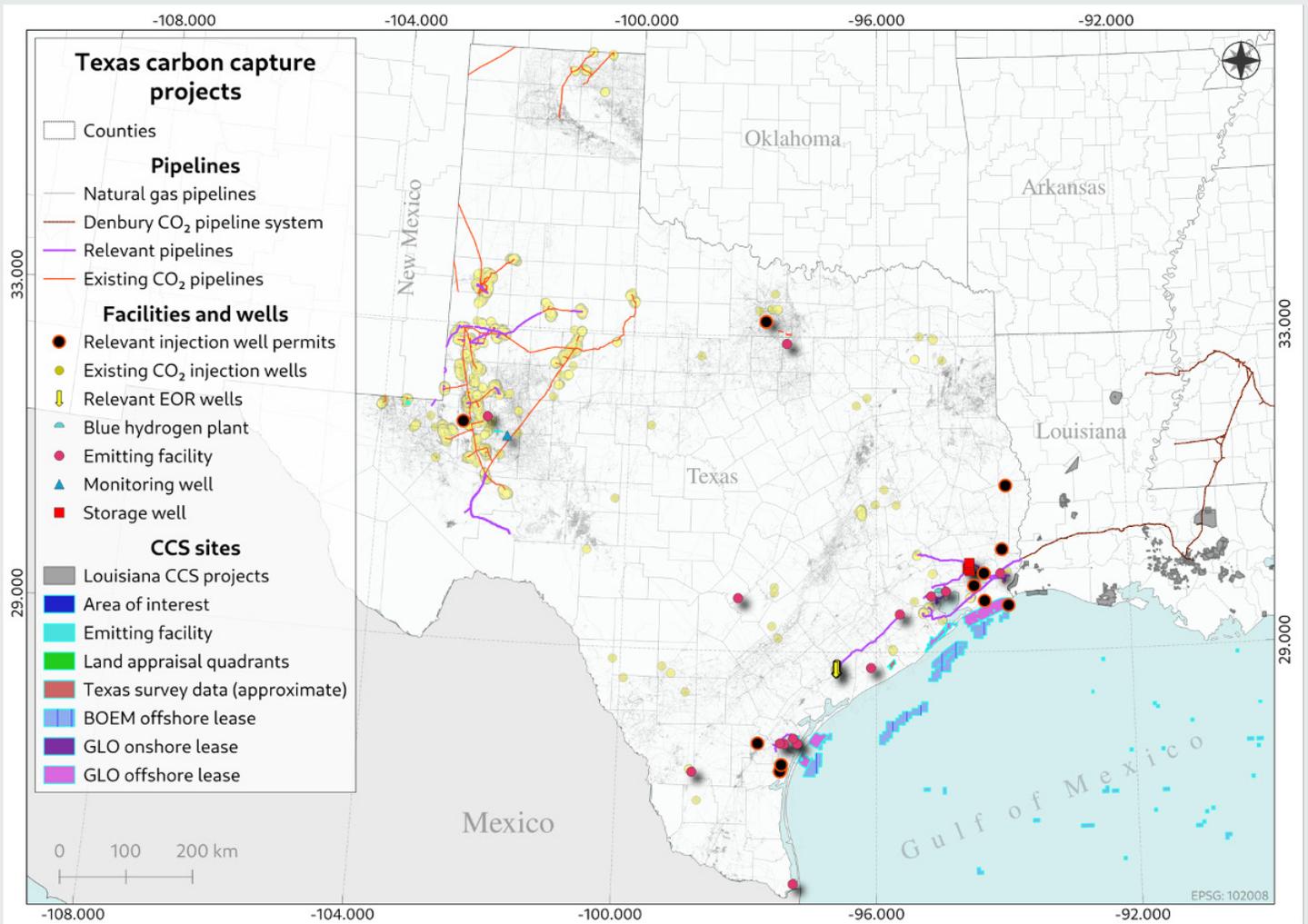
25 Meckel, T., Treviño, R., "Gulf of Mexico Miocene CO<sub>2</sub> Site Characterization Mega Transect," 2014, Bureau of Economic Geology, University of Texas at Austin, <https://repositories.lib.utexas.edu/items/2577fc57-ad62-4c95-926f-e30cbad90dc6>. See also: <https://gccc.beg.utexas.edu/research/miocene>.

26 A general note should be added. *Fracking*, also known as hydraulic fracturing occurs when underground rock formations are fractured to increase oil and gas output, whereas EOR does not fracture underground rock formations, but pushes oil and gas up by using a "tertiary injectant".

27 Analysis by Empower using RRC data.

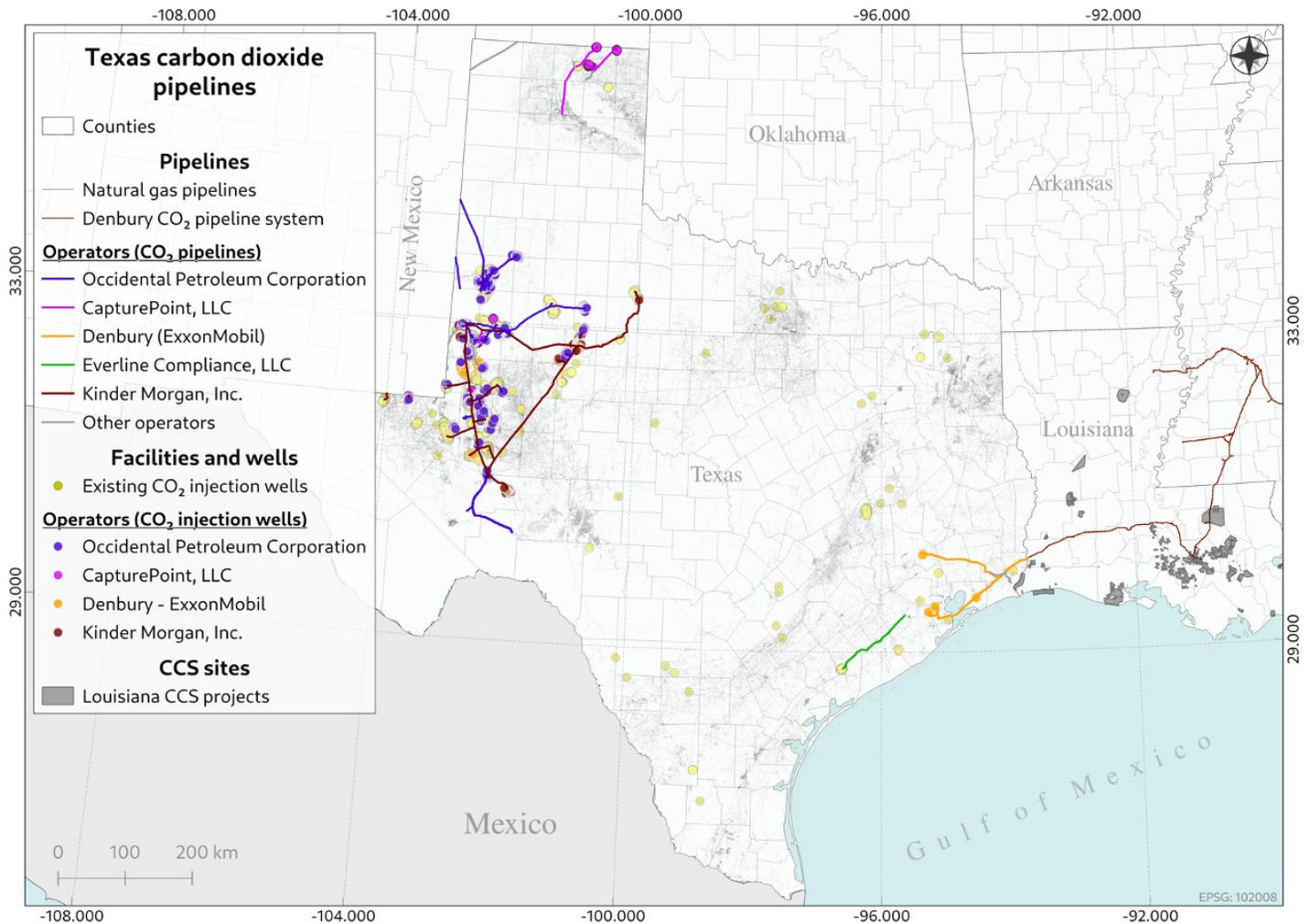
28 See: [www.kindermorgan.com/Operations/CO2/Index](http://www.kindermorgan.com/Operations/CO2/Index).

### Map 3 – Texas carbon capture projects (March 2024)



Source: Empower, using data from multiple sources.

**Map 4 – Texas CO2 infrastructure (Top 5 companies – 2024)**



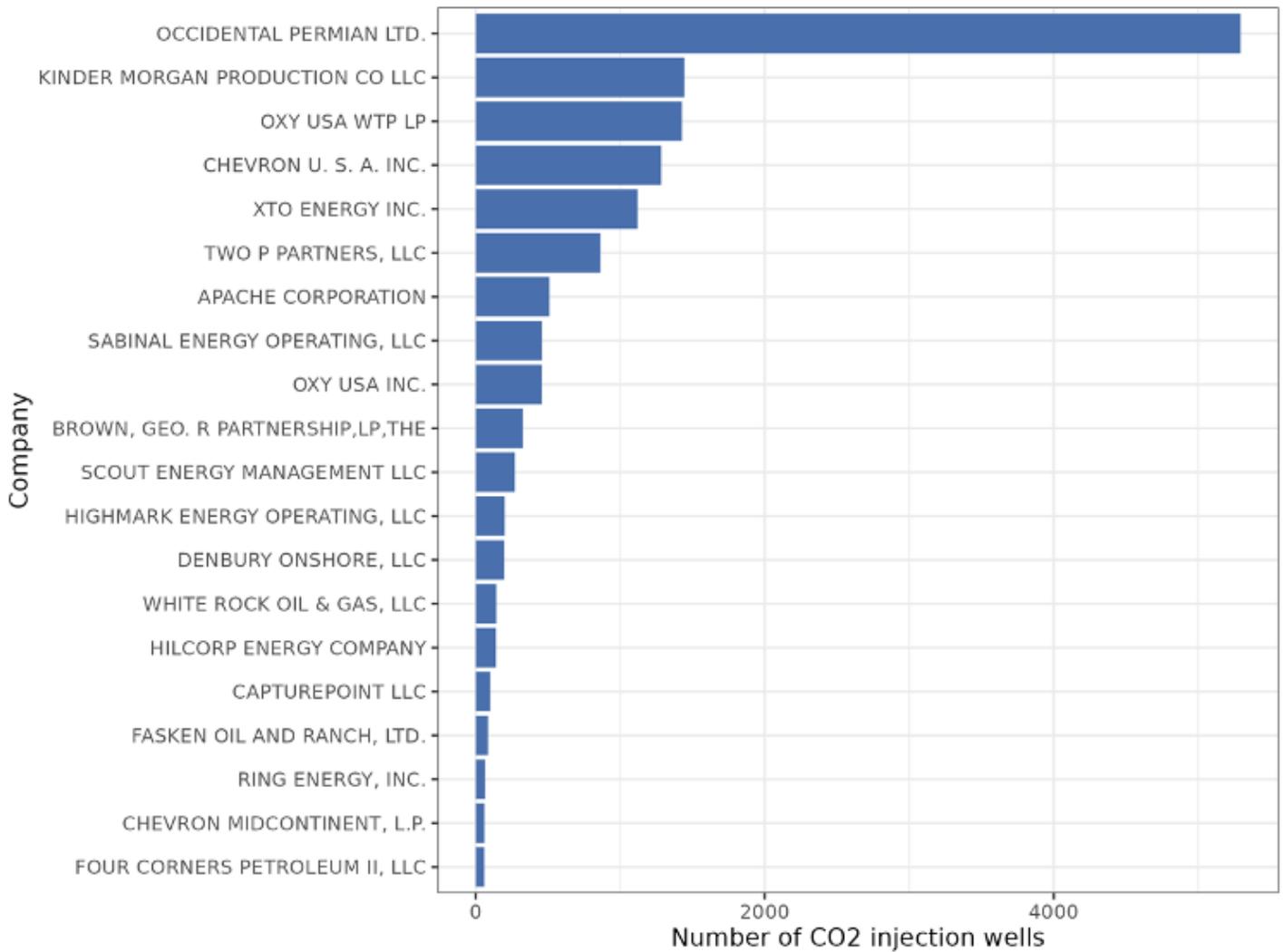
Source: Empower, using data from multiple sources.

In a 2024 financial report, Occidental Petroleum stated that “the Permian Basin... [was] one of the largest and most active oil Basins in the United States, accounting for more than 45% of total United States oil production in 2023.” That year, Occidental Petroleum extracted 584 million barrels per day from the Permian Basin and spent 2.8 billion USD in capital expenses on the Basin alone. In that same report, Occidental claimed it was of paramount importance to have access to CO<sub>2</sub> sources and that disruptions would critically affect oil production and infrastructure operation costs.<sup>29</sup>

**Occidental has spent over 47 million USD in lobbying expenses from 2008 to 2023, promoting CCS technology at the federal level, and is part of multiple CCS corporate consortia. As of March 2024, Occidental was developing two major CCS sites in Louisiana: Magnolia Sequestration Hub in Allen Parish and Pelican Sequestration Project in Livingston Parish.**

<sup>29</sup> Occidental Petroleum Corporation, “Form 10-K,” Securities and Exchange Commission (SEC), 14 February 2024, [www.sec.gov/Archives/edgar/data/797468/000079746824000034/oxy-20231231.htm](http://www.sec.gov/Archives/edgar/data/797468/000079746824000034/oxy-20231231.htm).

**Graph 3 – Number of CO2 injection wells per company (1980-2023)**



Source: Empower, using RRC data

In November 2023, ExxonMobil acquired Denbury, Inc., placing Exxon as one of the largest holders of CO2 pipelines in the U.S., adding Denbury’s Green and NEJD pipelines to its assets. The Denbury pipeline system in Louisiana reaches the eastern coast of Texas and traverses Mississippi; many CCS projects detected by Empower in Texas and Louisiana are positioned close to this system.<sup>30</sup> The transaction, valued at 4.9 billion USD, comprised “15 strategically located onshore CO2 storage sites” and fields with a combined approximate capacity of 46,000 oil barrels per day.<sup>31</sup>

Denbury’s Green pipeline enters the State of Texas through the bordering counties of Orange, Texas, and Calcasieu parish in Louisiana. It splits two ways in Jefferson County, diving into Conroe Lateral, which ends in Montgomery County, and the Green pipeline, which reaches Chambers and Galveston counties. Denbury’s existing CO2 pipeline extension in Texas accounts for approximately 221.2 miles there, 316.6 miles in Louisiana, and 483.9 in Mississippi.<sup>32</sup>

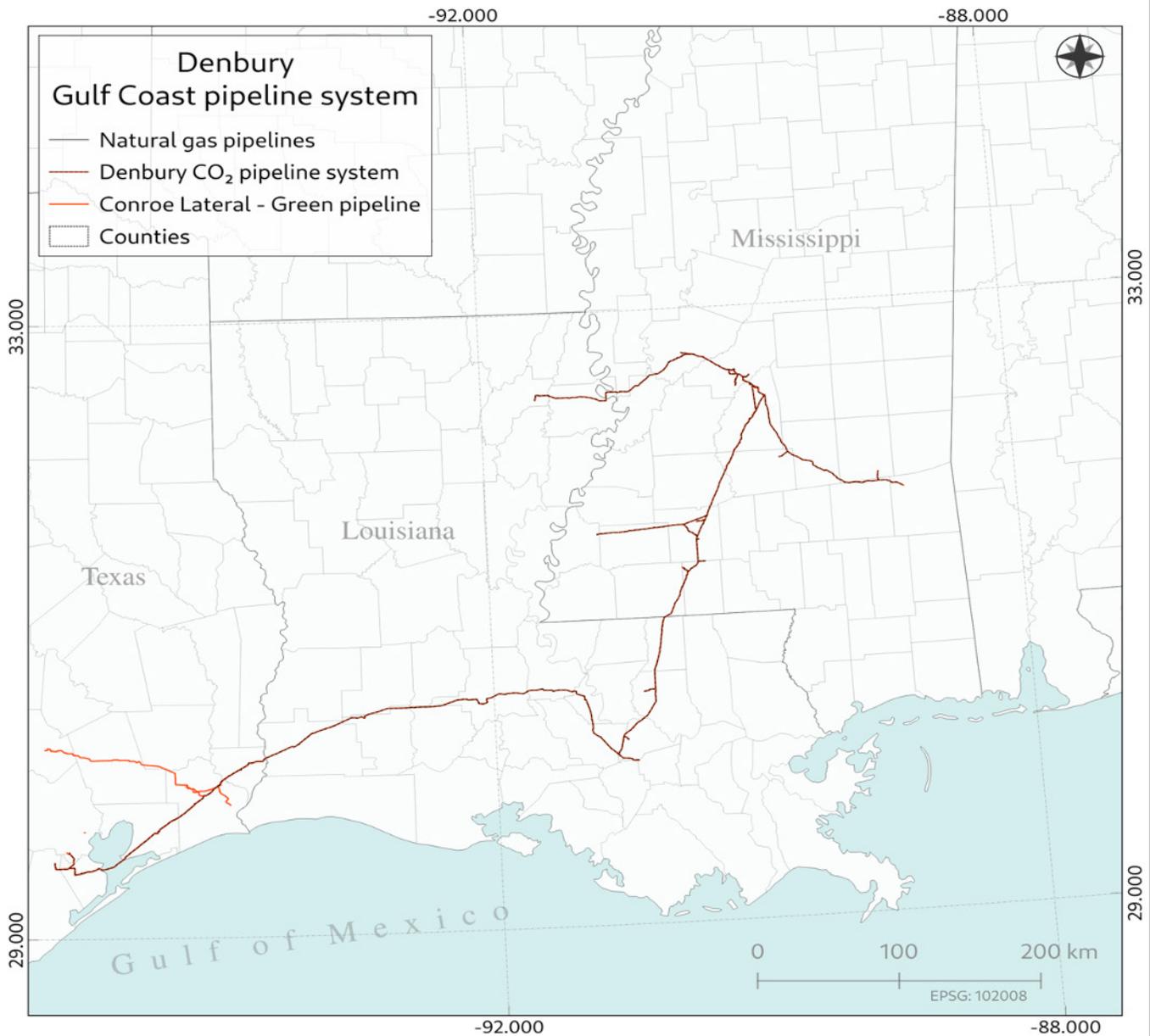
30 ExxonMobil, “ExxonMobil completes acquisition of Denbury,” ExxonMobil, 2 November 2023, [https://corporate.exxonmobil.com/news/news-releases/2023/1102\\_exxonmobil-completes-acquisition-of-denbury](https://corporate.exxonmobil.com/news/news-releases/2023/1102_exxonmobil-completes-acquisition-of-denbury).

31 ExxonMobil, “ExxonMobil Completes Acquisition of Denbury,” SEC, 2 November 2023, [www.sec.gov/Archives/edgar/data/34088/000119312523268938/d566751dex991.htm](http://www.sec.gov/Archives/edgar/data/34088/000119312523268938/d566751dex991.htm).

32 Calculations performed by Empower using GIS data.

**Map 5 – Denbury Gulf Coast pipeline system (2023)**

Source:



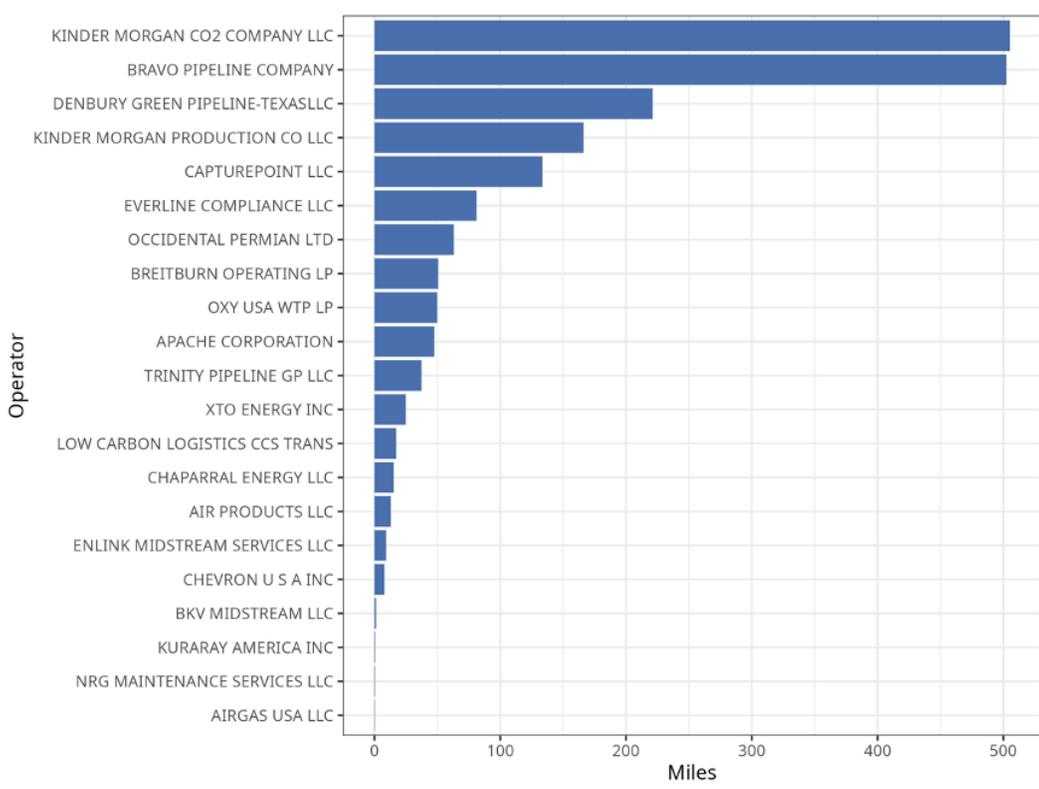
Empower, using data from Denbury's now extinct website and RRC.

ExxonMobil's acquisition of Denbury will connect multiple projects across three states, including some CCS projects developed by Exxon in Louisiana: Pecan Island CCS, Project Libra, and the Denbury CCS projects Draco, Virgo, Gemini, Aries and Pegasus. In Mississippi, Denbury, now ExxonMobil, owns a naturally occurring CO<sub>2</sub> reserve called the Jackson Dome, which connects to the company's Gulf Coast pipeline system.<sup>33</sup> In short, companies that have had an important

presence in Texas remain key CCS actors in the region. In particular, ExxonMobil and Occidental are developing new carbon capture projects in both Texas and Louisiana.

<sup>33</sup> Texas Supreme Court, "Texas Rice Land Partners, Ltd. v. Denbury Green Pipeline-Texas, LLC," 2 March 2012, <https://casetext.com/case/texas-rice-land-partners-ltd-v-denbury-green-pipeline-texas-1>.

**Graph 4 – Extension of CO2 pipelines per company (1980-2023)**



Source: Empower, using data from RRC.

## 4.2 CCS corporate ownership

Empower conducted research on 14 Class VI projects, five EOR-related projects, and eight “blue” ammonia and hydrogen projects. As mentioned, CCS projects are still in their early stages in Texas and financial data is often unavailable. For example, bank lending represents a minuscule portion of CCS financing, as most projects appear to depend on internal cash reserves for construction and lean on tax breaks and DOE programs for future cash flows.

In a 2023 report, Deloitte stated that CCS technology was still expensive and could account for up to 50% of an emitter’s costs; moreover, in order to make CCS economically feasible, subsidies and grants were still needed. However, as of November 2023, when that report was published, tax credits were still considered insufficient for some emitters, which, according to Deloitte, “limits the bankability of certain projects.”<sup>34</sup> As of March 2024, CCS was still considered a nascent industry and projects’ corporate

structures revealed how companies were isolating liability and risk through layers of subsidiaries, which simultaneously provided a legal conduit for transferring “balance sheet” resources to companies deploying CCS projects without having to rely directly on external financing.

A 2021 study classified CCS projects into four types of ownership. The first is called capture and store, when a project’s sponsor owns both the capture and storage elements. Although considered the most profitable option, as costs and revenue are internalized, it also requires more permitting and larger operation costs. In this case, the project’s sponsor usually legally segregates the capture component from the storage element to isolate financial risk and insurance. The second type consists of an emitting facility capturing CO2 and contracting a third party to sequester it for a fee; the emitting facility may be eligible for a 45Q tax break, which may be partially or entirely transferred to the sequestration party. Emitting facilities may also decide to keep 45Q tax credits and pay a fee to the sequestering party.<sup>35</sup>

<sup>34</sup> “Carbon Capture and Storage: Seeking a bankable business model,” Deloitte, November 2023, [www2.deloitte.com/content/dam/Deloitte/nl/Documents/finance/deloitte-nl-fa-ccs-seeking-bankable-business-model-final-19112023.pdf](http://www2.deloitte.com/content/dam/Deloitte/nl/Documents/finance/deloitte-nl-fa-ccs-seeking-bankable-business-model-final-19112023.pdf).

<sup>35</sup> Sam Kamyans, John Marciano, Sam Guthrie, “Financing Carbon Capture Projects,” Allen & Overy, 6 May 2021, [www.allenoverly.com/global/-/media/allenoverly/2\\_documents/news\\_and\\_insights/publications/2021/05/financing\\_us\\_carbon\\_capture\\_projects.pdf](http://www.allenoverly.com/global/-/media/allenoverly/2_documents/news_and_insights/publications/2021/05/financing_us_carbon_capture_projects.pdf).

The study stressed that the second type of ownership, also known as capture and toss, is more likely to develop in a carbon market where emitting companies may purchase storage and transportation services from a third party. Similarly, an EOR “sequestering” party, which will use CO<sub>2</sub> as a tertiary injectant and store it in a gas or oil cavern as it replaces these substances via EOR, could purchase CO<sub>2</sub> from an emitting facility that owns a CO<sub>2</sub> capture unit.

The third kind of ownership, called *strip and capture*, separates the CCS component from the emitting facility so that tax breaks accrue directly to the capture and sequestration projects. Some companies may license the CCS component back to the facility and send tax breaks from the emitting facility to the CCS project, or from the CCS project to the emitting facility.<sup>36</sup>

The fourth and final type of ownership, referred to as sale leaseback, consists of the sponsor selling off the CCS project to a stakeholder and having it leased back in order to retain tax credits and quickly capitalize following expenditures during design, engineering, and construction.<sup>37</sup> Tax credit transferability confers an additional incentive for developing a carbon market and may result in further development of new projects, especially along the Gulf Coast.

Empower analyzed ownership of 39 projects and identified two kinds of ownership: a single parent company owning (or co-owning) multiple CCS projects, and a parent company owning (or co-owning) a single CCS project. As of March 2024, Occidental Petroleum was developing six CCS projects; ExxonMobil five; and TotalEnergies SE (ENXTPA:TTE) three. However, for the remaining projects, Empower found that ownership was heterogeneous, as no single company owned more than two facilities.

### 4.3 Private equity and publicly-traded companies as project sponsors

CCS project sponsors in Texas were divided into two categories: publicly-traded companies and private equity sponsors. Empower was able to trace ownership back to 22 publicly-traded companies and 22 private equity sponsors. As mentioned, companies usually create subsidiaries to isolate liability and risk, rendering ownership information inaccessible at first blush.

**Whereas publicly-traded companies are required to report to the Securities and Exchange Commission (SEC) and thus disclose a greater amount of financial information regarding their operations, private companies are not subject to the same regulations. Therefore, their financial data is more difficult to retrieve than publicly available data. In fact, for most cases analyzed in this report, Empower was able to find the names of organizations investing in a certain private equity fund but not financial details about how much was invested over time. Empower has studied a troubling trend in which large infrastructure projects are increasingly financed through private equity. Moreover, private equity investors include limited partners such as public employees and teacher pension funds, which, in turn, indirectly invest in CCS or other fossil fuel-related activities through private equity.**

For example, a private equity sponsor reviewed for this report was Milestone Carbon Midland CCS Hub, which is jointly-owned by SK Capital Partners and IC ADS Holdings, LLC. Research conducted by Empower revealed that SK Capital's limited partners included pension funds and other insurance companies, as follows: 3M Pension Plan, Arkansas Teacher Retirement System, Illinois Municipal Retirement Fund, Fresno County Employees' Retirement Association, Michigan Department of Treasury, New York Life Insurance Company, etc.<sup>38</sup>

In Texas, some CCS projects were owned by multiple layers of private equity funds, in which a fund was owned by another fund, which in turn is ultimately owned by a private company, such as the case of Orchard Storage that is directly owned by Elysian Carbon Management I, LLC. In 2023, Elysian was purchased by private company Buckeye Partners, which manages and operates multiple privately-owned funds. In turn, Buckeye receives investment from the IFM Global Infrastructure Fund, which is owned by IFM Investors Pty, Ltd. In 2022, Empower conducted research on this company, particularly its subsidiary Aleatica, S.A.B. de C.V., formerly known as OHL Mexico, a highway infrastructure giant responsible for displacing multiple communities in Mexico and corruption scandals involving

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<sup>36</sup> *Ibid.*

<sup>37</sup> *Ibid.*

<sup>38</sup> Information related to investors may be reviewed in the supporting documents; all folders containing the sub-folder “Preqin” include relevant information on investors and funds researched by Empower.

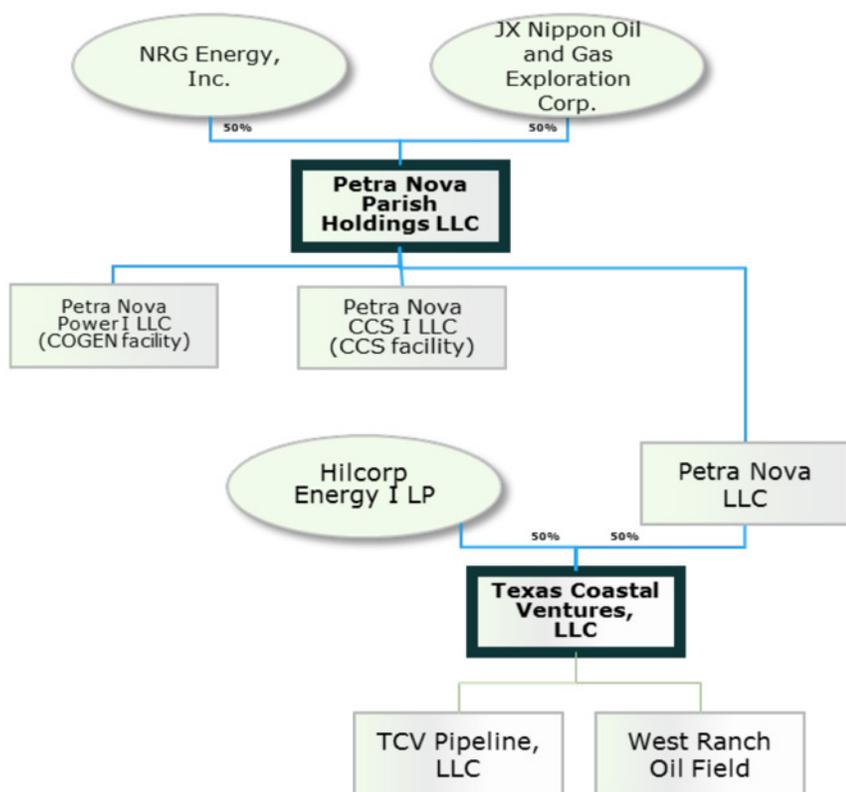
high-level politicians.<sup>39</sup> Some of IFM's investors include AA Pension Scheme, Alaska Retirement Management Board, American Electric Power System Retirement Plan, Arizona State Retirement System, Arkansas Teacher Retirement System, Avon Pension Fund, etc.

As of March 2024, half of the ultimate parent companies reviewed for this report were private equity sponsors, which will hinder local communities' access to relevant financial information. Only in a handful of cases was Empower able to obtain financial information via a FOIA response, which, for example, revealed that Pineywoods CCS, developed by Tenaska Energy, Inc., would require approximately 638 million USD in investment for construction. For other projects, financial data was unavailable or heavily redacted in the EPA's FOIA response, such as information related to Jasper County Storage Facility and Orchard Storage.

Given CCS projects' early stages of development, most relevant financial information is not yet available even for publicly-traded sponsors. Moreover, even though publicly-traded companies are required to report financial information to the SEC, their reports seldom include subsidiaries' balance sheet operations, and consolidated financial statements required by the SEC do not provide details on whether a certain amount of money was transferred to a particular subsidiary, for instance for a company developing and operating a CCS facility or storage site.

Some CCS projects have a combination of private and publicly-traded sponsors, such as Petra Nova CCS. The capture facility is owned by ENEOS Holdings, Inc (TSE:5020), which is connected to an EOR field by an 81-mile pipeline jointly owned by NRG Energy Inc. (NYSE:NRG) and Hilcorp Energy Company. The latter owns 133 EOR wells in the West Ranch Oil Field.

**Graph 5 – Petra Nova CCS corporate structure (2020)**



Source: EPA MRV plan.

39 Empower, "El rol de dos empresas concesionarias de autopistas en la detención de Kenia Inés Hernández Montalván: Los casos de ALEATICA (exOHL) y COCONAL," October 2022, unpublished – for private use only.

In addition, although some project sponsors are publicly traded, such as BlackRock, Inc. (NYSE:BLK), their participation is mainly through the private equity market. However, as publicly-traded companies, they are subject to SEC reporting requirements. But, until CCS projects become bankable, financing will remain relatively obscure and beneath layers of subsidiary companies.

**Table 1 – List of CCS sponsors (March 2024)**

| Project  | County           | Company                                     | Publicly traded or Private equity |
|--|------------------|---|-----------------------------------|
| Petra Nova CCS Pipeline                                | Fort Bend        | ENEOS Holdings, Inc (TSE:5020)              | PT                                |
| Next Decade Rio Grande LNG                             | Cameron          | NextDecade Corporation (NASDAQCM:NEXT)      | PT                                |
| Coastal Bend CCS                                       | Nueces           | TotalEnergies SE (ENXTPA:TTE)               | PT                                |
| Next Decade Rio Grande LNG                             | Cameron          | BlackRock, Inc. (NYSE:BLK)                  | PT                                |
| Bluebonnet Sequestration Hub                           | Chambers         | Occidental Petroleum Corporation (NYSE:OXY) | PT                                |
| Jasper County Storage Facility                         | Jasper           | BP p.l.c. (LSE:BP)                          | PT                                |
| Baytown Blue Hydrogen Complex                          | Harris           | Exxon Mobil Corporation (NYSE:XOM)          | PT                                |
| Freeport LNG CCS                                       | Brazoria         | Osaka Gas Co., Ltd. (TSE:9532)              | PT                                |
| Bayou Bend CCS   | Jefferson        | Chevron Corporation (NYSE:CVX)              | PT                                |
| Bayou Bend CCS   | Jefferson        | Equinor ASA (OB:EQNR)                       | PT                                |
| Corpus Christi Offshore Sequestration Hub              | Nueces           | Repsol, S.A. (BME:REP)                      | PT                                |
| Corpus Christi Offshore Sequestration Hub              | Nueces           | Mitsui & Co., Ltd. (TSE:8031)               | PT                                |
| Corpus Christi Offshore Sequestration Hub              | Nueces           | POSCO Holdings Inc. (KOSE:A005490)          | PT                                |
| Petra Nova CCS Pipeline                                | Fort Bend        | NRG Energy Inc (NYSE:NRG)                   | PT                                |
| Balcones Cement Plant                                  | Comal            | CEMEX, S.A.B. de C.V. (NYSE:CX)             | PT                                |
| Port of Corpus Christi Blue and Green Ammonia Facility | Nueces           | Mitsubishi Corporation (TSE:8058)           | PT                                |
| Port of Corpus Christi Blue and Green Ammonia Facility | Nueces           | Lotte Chemical Corporation (KOSE:A011170)   | PT                                |
| Port of Corpus Christi Blue and Green Ammonia Facility | Nueces           | RWC, Inc. (OTCEM:RWCI)                      | PT                                |
| BKV Barnett Zero                                       | Wise             | Banpu Public Company Limited (SET:BANPU)    | PT                                |
| Voestalpine  | San Patricio     | ArcelorMittal S.A. (ENXTAM:MT)              | PT                                |
| Voestalpine  | San Patricio     | Voestalpine AG (WBAG:VOE)                   | PT                                |
| Next Decade Rio Grande LNG                             | Cameron          | GIC Private Limited                         | PE                                |
| Next Decade Rio Grande LNG                             | Cameron          | Mubadala Investment Co. PJSC                | PE                                |
| King Ranch Reach                                       | Kleberg          | King Ranch, Inc.                            | PE                                |
| Ozona CCS - Loving facility                            | Ozona CCS, LLC   | Ozona CCS, LLC                              | PE                                |
| Baytown Carbon Capture Project                         | Chambers         | Energy Capital Partners Management, LP      | PE                                |
| Pineywoods CCS   | Liberty, Harding | Tenaska Energy, Inc.                        | PE                                |
| Milestone Carbon Midland CCS Hub                       | Upton            | IC ADS Holdings, LLC                        | PE                                |
| Milestone Carbon Midland CCS Hub                       | Upton            | SK Capital Partners                         | PE                                |

## 4.4 Project finance trends and financial landscape

As mentioned, as of March 2024, CCS projects were still being financed internally and bankability remained limited.<sup>40</sup> CCS project financing directly depends on DOE funding and 45Q tax breaks, and companies developing and deploying CCS technology are either large publicly-traded companies or backed by significant private equity funds. Moreover, as of March 2024, most projects had not yet reached a final investment decision (FID); only a handful of projects provided total investment estimates, subsidies, and financial information.

Both ExxonMobil and BKV Corporation have stated that 45Q tax breaks and DOE funding programs are essential to developing CCS projects in the U.S.<sup>41</sup> In fact, BKV's CEO, Chris Kalnin, claimed that companies "...who can innovate, play along the whole value chain, and have the balance sheet to do it will see carbon capture as a tremendous business."<sup>42</sup> In December 2023, BKV's Barnett Zero project was set to receive an 18 million USD check from the IRS in order to compensate it in the amount of 85 USD for every ton of captured and injected CO<sub>2</sub>.<sup>43</sup>

**Lacking bankability, CCS projects are viable only through large companies with sufficient financial resources to carry out construction and operation of a CCS facility and storage unit. Thus, 45Q tax credits and DOE funding are the main sources of cash flow for such projects and large companies will benefit the most from them.**

Although, as stated above, the CCS market is still comprised of several companies, as the industry consolidates and financial instruments adapt to 45Q-based revenue streams, fewer companies will remain in the industry. Larger companies will be able to withstand risk associated with a CCS facility, including bankruptcy and insurance costs. In order to understand the market's potential size, Empower computed the amount of tax credits for CCS projects using publicly-announced tons of CO<sub>2</sub> captured by companies.

Empower was able to retrieve CO<sub>2</sub> data for 34 projects, including Class VI, EOR and a direct air capture (DAC) unit. Combined, these projects could receive at least 3.2 billion USD in annual 45Q-related tax credits and, if projects meet the highest IRS requirements, the amount could skyrocket to 33 billion USD per year. Tax breaks range from 12 to 180 USD per ton of CO<sub>2</sub>, depending on the storage type and CCS apprenticeship programs instituted at a given facility. As of March 2024, DAC was eligible for the largest tax credits available, whereas EOR received a lower sum but also benefited from using CO<sub>2</sub> as a tertiary injectant to extract oil or gas.<sup>44</sup>

Graph 6 shows the amount of tax credits each of the 34 projects could obtain from 45Q tax breaks; EOR projects received small sums compared to larger Class VI projects, such as Coastal Bend CCS, King Ranch Reach, Freeport LNG CCS, etc. As of March 2024, some projects were still pending clarification regarding the type of capture and storage to be used; however, due to the projects' sizes, confirmed Class VI projects in Texas accounted for the largest amount of eligible tax credits compared to other CCS technologies such as DAC, and EOR (see Graph 7).

45Q tax credits may provide an important source of revenue for companies developing CCS components in addition to their existing fossil fuel infrastructure. For large companies able to finance initial construction and operation of a CCS facility, 45Q tax credits may cover investment-related expenditures during a short period of time. For instance, Pineywoods CCS is eligible for 45Q tax breaks ranging from 60 million USD to 673.5 million USD annually; total construction costs are estimated at 638 million USD. If Pineywoods CCS is eligible for the largest sum, it would nearly cover construction costs within a year's time.

40 "Carbon Capture and Storage: Seeking a bankable business model," Deloitte, November 2023, [www2.deloitte.com/content/dam/Deloitte/nl/Documents/finance/deloitte-nl-fa-ccs-seeking-bankable-business-model-final-19112023.pdf](http://www2.deloitte.com/content/dam/Deloitte/nl/Documents/finance/deloitte-nl-fa-ccs-seeking-bankable-business-model-final-19112023.pdf).

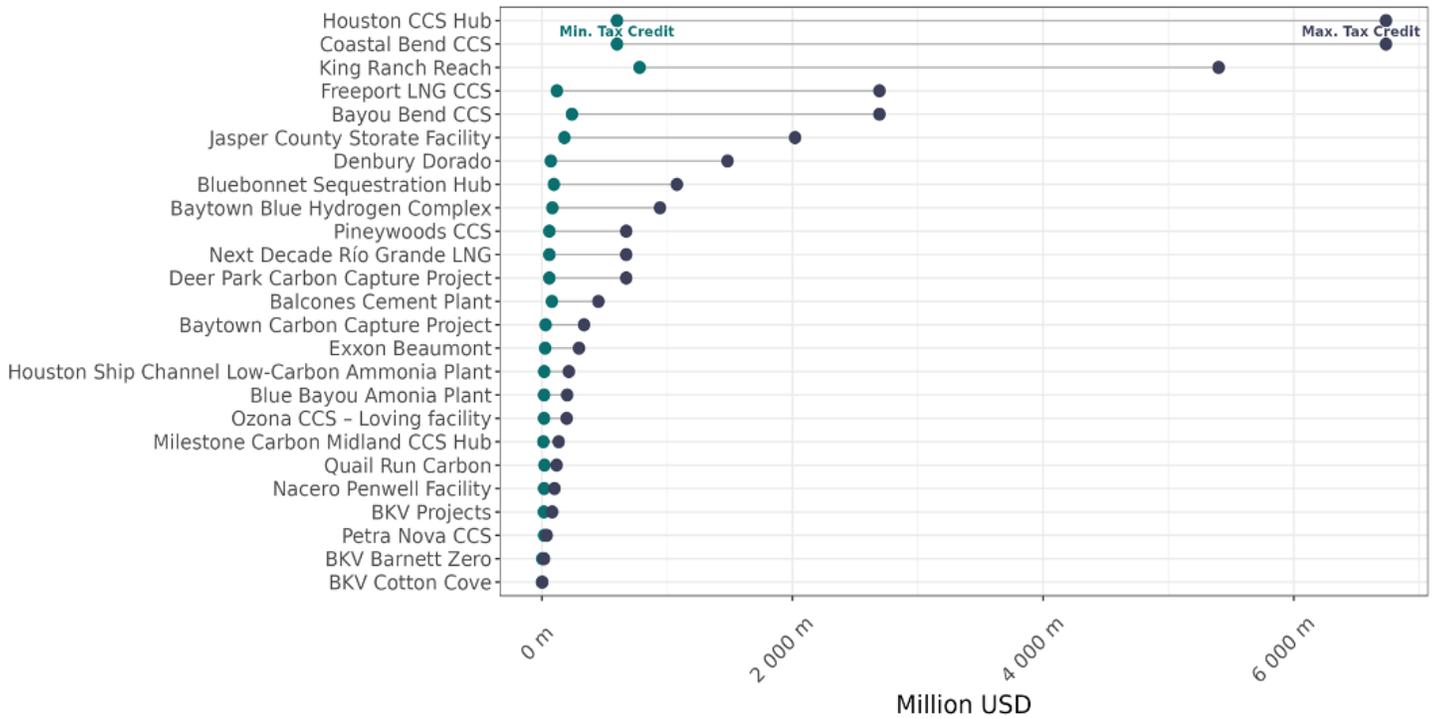
41 The Global CCS Institute, "Financing Large Scale CCUS Projects (2023 DC Forum on Carbon Capture & Storage)," YouTube, 17 May 2023, [www.youtube.com/watch?v=cO76HxcnssE](http://www.youtube.com/watch?v=cO76HxcnssE).

42 Trent Jacobs, "BKV CEO: If You Have the Skills To Pay the Bills, CCS Is a 'Tremendous Business,'" *Journal of Petroleum Technology*, 1 February 2024, <https://jpt.spe.org/bkv-ceo-if-you-have-the-skills-to-pay-the-bills-ccs-is-a-tremendous-business>.

43 Austin Jackson, "Barnett Zero project takes aim at climate change," *Wise County Messenger*, 14 December 2023, <https://read.bkv.com/pdfs/Wise-County-Messenger-121423.pdf>.

44 IRS, "About Form 8933, Carbon Oxide Sequestration Credit," 15 September 2023, [www.irs.gov/forms-pubs/about-form-8933](http://www.irs.gov/forms-pubs/about-form-8933).

**Graph 6 – CO2 tax credits per CCS project (Texas, 2024)**



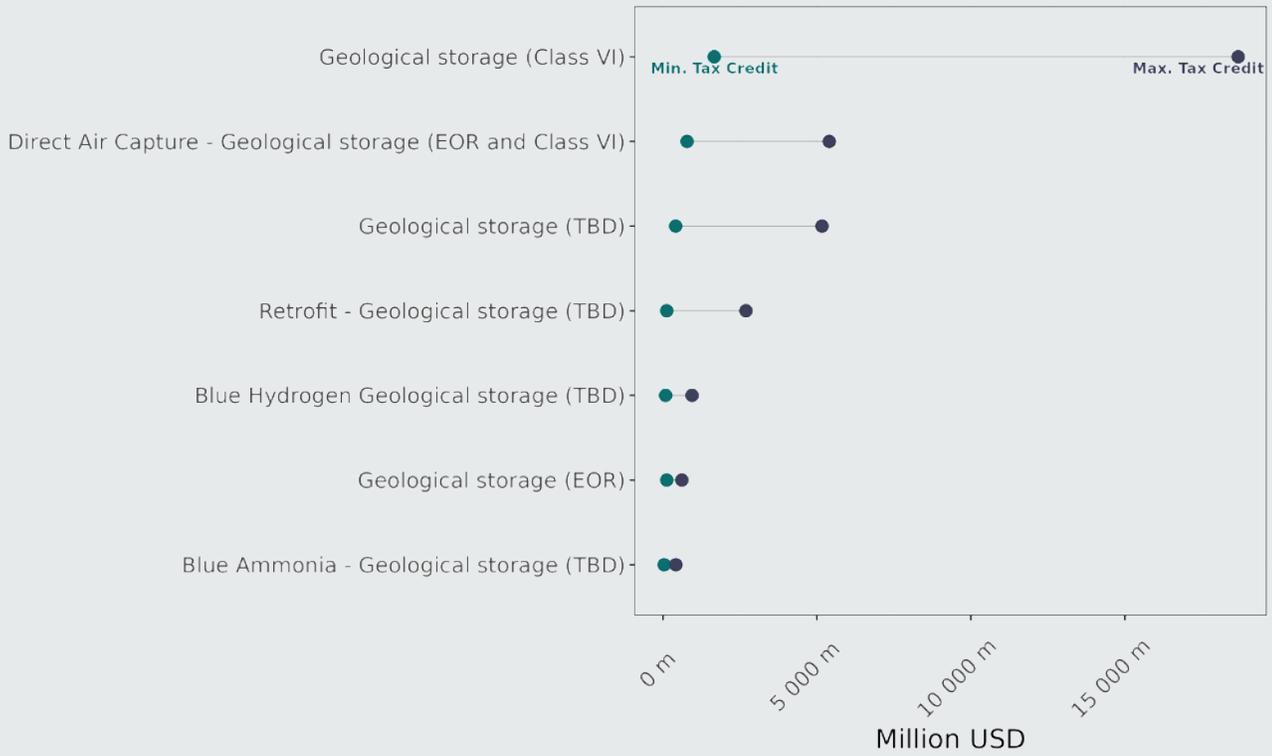
Source: Empower, based on research conducted for this report.

As of March 2024, companies could opt to cash out 45Q tax breaks as opposed to getting discounts on federal taxes. Therefore, 45Q tax credits have a direct impact on balance sheet operations, as they directly affect revenue streams, as companies gain access to financial resources instead of waiting for deductions to be applied to annual tax payments. Also, companies may choose to transfer 45Q tax breaks to third parties storing CO2 in an offsite facility, in which tax breaks act as a source of payment for transportation and storage activities. In the case of Pineywoods CCS, third-party capturing sites may opt to transport CO2 and store it in the company's storage site by paying Pineywoods CCS a fee or by transferring 45Q tax breaks to it.

As mentioned, Empower also analyzed DOE subsidies to CCS projects. From 2011 to 2023, Congress provided nearly 5 billion USD to DOE's CCS budget. DOE's CCS-related expenditures appeared to decrease after 2020; however, this was due to a cutback in subsidies to power-generating companies investing in CCS. In fact, CCS funding used specifically in development of capture and storage technology has increased since 2022 (Graph 9).<sup>45</sup> Additionally, the IIJA provided 8 billion USD for DOE's CCS-related programs (Table 2).

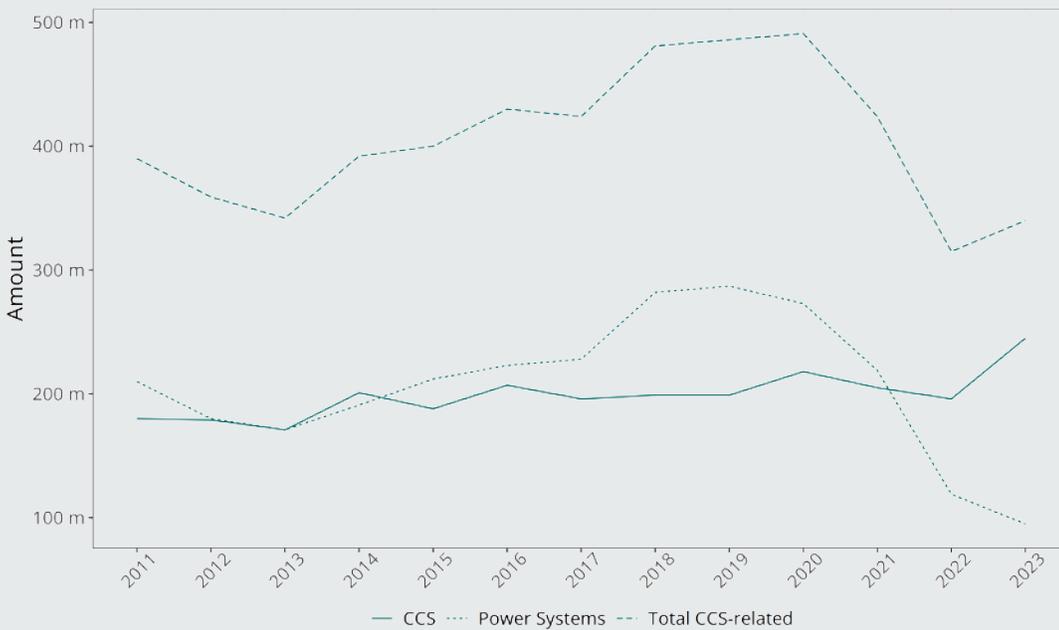
45 Congressional Budget Office, "Carbon Capture and Storage in the United States," December 2023, [www.cbo.gov/system/files/2023-12/59345-carbon-capture-storage.pdf](https://www.cbo.gov/system/files/2023-12/59345-carbon-capture-storage.pdf), pg. 14.

**Graph 7 – CO2 tax credits per storage type (Texas, 2024)**



Source: Empower, based on research conducted for this report.

**Graph 8 – Annual DOE funding for CCS and related programs (2011-23)**



Source: Empower, using Congressional Budget Office data.<sup>46</sup>

<sup>46</sup> This chart does not include additional funding from IJJA.

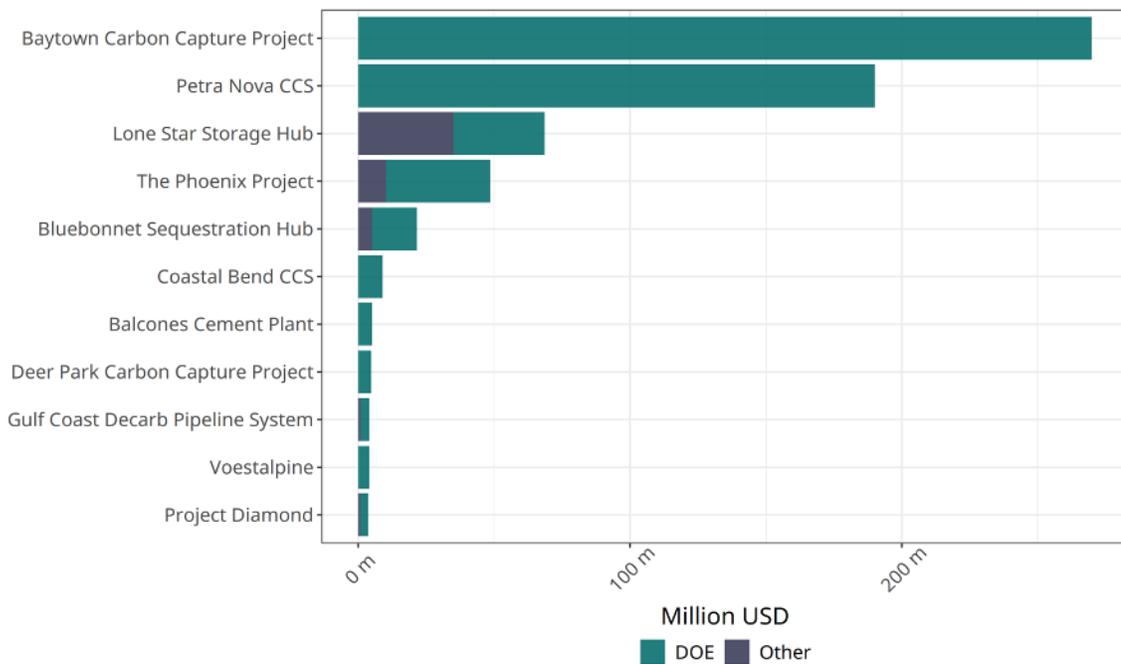
**Table 2 – Infrastructure Investment and Jobs Act annual funding for CCS programs (2022-26)**

|  | 2022         | 2023         | 2024         | 2025         | 2026       | Total        |
|--|--------------|--------------|--------------|--------------|------------|--------------|
| Large-scale pilot projects                 | 387          | 200          | 200          | 150          | 0          | 937          |
| Demonstration projects                     | 937          | 500          | 500          | 600          | 0          | 2,537        |
| Front-end engineering and design (FEED)    | 20           | 20           | 20           | 20           | 20         | 100          |
| CIFIA program                              | 3            | 2,097        | 0            | 0            | 0          | 2,100        |
| Large-scale storage validation and testing | 500          | 500          | 500          | 500          | 500        | 2,500        |
| <b>TOTAL</b>                               | <b>1,847</b> | <b>3,317</b> | <b>1,220</b> | <b>1,270</b> | <b>520</b> | <b>8,174</b> |

Source: Congressional Budget Office, Carbon Capture and Storage in the United States.

According to Empower's research, the largest subsidy awarded in Texas was for Energy Capital Partners Management's Baytown Carbon Capture Project, followed by NRG Energy's Petra Nova, and then BP's Lone Star Storage Hub. Other projects also received DOE funding for their Front-End Engineering and Design (FEED) studies, which come before projects reach FID. In short, CCS projects are mainly funded through a mix of public funding mechanisms and internal balance sheet operations, which include 45Q tax breaks, DOE funding, and companies' access to equity and debt markets for their overall operations.

**Graph 9 – DOE funding by project (2016-23)**



Source: Empower, using data from DOE and company information.<sup>47</sup>

<sup>47</sup> "Other" may include funds owned by the project's sponsor.

## 4.5 Permitting requirements

Empower analyzed the permits required for Class VI wells in Texas. As of the publishing of this report, Texas had not been granted primacy over Class VI permits and companies submitting such permits had to go through the Texas RRC and the EPA. Class VI wells may require additional permits such as those related to water, construction, geological feasibility (also known as stratigraphic tests), coastal permits, deep water exploration permits, pre-construction reports, etc. For instance, BP's Jasper County Storage Facility required 13 federal permits, in addition to 22 at the state and local levels.

Authorities at the federal level included the U.S. Army Corps of Engineers, CEQ, the Federal Aviation Administration, U.S. Fish and Wildlife Services, and the EPA. At the state level, some projects may require a Coastal Management Program, State Land Use Lease, Stormwater Construction General Permit, as well as water and air-related permits. Most permits are required prior to construction and projects will likely submit permits in the coming months as construction plans move forward.

In addition to permits, projects are also required to report testing and monitoring data related to Class VI wells. Reporting is divided into monitoring, per-occurrence, pre-plugging, and post-injection. Post-injection requirements include monitoring groundwater and plume pressure, and analyzing seismic activity continuously. Per-occurrence may include a variety of malfunctions and failures that need to be reported when the event happens, especially if affecting groundwater, exceeding allowed operating parameters (such as pressure), damaging infrastructure, power failures, and releasing CO<sub>2</sub> into the atmosphere.

According to a 2023 EPA FOIA response, some projects may be required to report on a semi-annual basis the following information: wellhead pressure, change to the sources of CO<sub>2</sub>, changes to physical or chemical characteristics of the CO<sub>2</sub> stream being injected, injection pressure, flow rate, temperature, and volume.

As mentioned, Class II permits used for EOR are being used to deploy CCS projects and are also eligible for 45Q tax breaks. Texas has primacy over Class II permits, which enables companies to go through Texas administrative procedures without having to submit an additional Class II application with the EPA. In 2022, Texas GLO issued a set of recommendations to the RRC, in which it stated that Class II permits were inadequate for managing CCS. Once the chemical composition of CO<sub>2</sub> is confirmed, a typical Class II permit in Texas takes around 30 days for approval. Furthermore, GLO criticized the lack of an adequate program for transforming Class II wells into Class VI, which are more rigorous and strict.<sup>48</sup> As of March 2024, CCS projects using Class II for developing their projects could earn 13.47 USD and up to 67.35 USD per ton of CO<sub>2</sub> captured.<sup>49</sup>

### 4.5.1 The General Land Office leases

The Texas Clean Air Act of 2009 enables Texas GLO to lease Permanent School Fund (PSF) land and offshore tracts for CCS-related activities.<sup>50, 51</sup> Suitable locations for CCS are determined by the Bureau of Economic Geology through studies commissioned by GLO. Based on the study's findings, GLO may recommend likely places to the Texas School Land Board, which, in turn, decides locations to be leased for CCS. Once possible locations have been established, the Texas School Land Board may publish Request for Proposals in which companies seeking to develop CCS projects submit bids to GLO.

As of March 2024, GLO had offered two offshore locations to develop CCS projects. The first, announced in 2021, awarded 40,000 acres to Bayou Bend, LLC.<sup>52</sup> The second, held in 2023, awarded 140,000 acres to Repsol. For this report, Empower identified four Requests for Proposals (Table 3).

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48 Texas General Land Office, "Texas General Land Office Comments on Amend re: HB 1284 (2021), RRC's sole jurisdiction over carbon sequestration wells," 16 May 2022, <https://rrc.texas.gov/media/rubbftom/comments-ch5-hb1284-glo.pdf>.

49 IRS, "About Form 8933, Carbon Oxide Sequestration Credit," 15 September 2023, [www.irs.gov/forms-pubs/about-form-8933](https://www.irs.gov/forms-pubs/about-form-8933).

50 Health and Safety Code, Chapter 382, <https://statutes.capitol.texas.gov/Docs/HS/htm/HS.382.htm>.

51 These are State-owned lands managed by the School Land Board, a board established in 1939 within the GLO. See: The Texas General Land Office, School Land Board, [www.glo.texas.gov/the-glo/boards-commissions/school-land-board/index.html](https://www.glo.texas.gov/the-glo/boards-commissions/school-land-board/index.html).

52 Texas General Land Office, "Industry Leaders Usher in New Era of Carbon Sequestration Near Jefferson County. Two energy companies awarded bid to store CO<sub>2</sub> in ocean bed," [www.glo.texas.gov/the-glo/news/press-releases/2021/september/cmr-george-p-bush-announces-new-coastal-partnership-for-carbon-sequestration1.html](https://www.glo.texas.gov/the-glo/news/press-releases/2021/september/cmr-george-p-bush-announces-new-coastal-partnership-for-carbon-sequestration1.html).

**Table 3 – GLO requests for proposals**

| Number      | Release date           | Tracts   | Counties   |
|-------------|------------------------|--|--|
| 21-SLB-1-ST | April 7, 2021          | AUS53663   | Jefferson  |
| 23-SLB-1-LP | March 9, 2023          | Corpus Christi East, Port Aransas South, Corpus Christi North, Mustang Island, Port Aransas North, Corpus Christi West, Padre Island | Nueces, Aransas, Kleberg   |
| 23-SLB-2-LP | March 9, 2023          | Seabrook, Galveston East, Bolivar South, Bolivar North, Galveston West, Anahuac, High Island, Jefferson West                         | Galveston, Chambers, Brazoria  |
| 24-SLB-1-LP | February or March 2024 | To be defined  | Cameron, Matagorda, Brazoria (Brownsville, Matagorda and Freeport areas) |

Source: Empower, with data from GLO.

PSF leases provide funding for Texas public schools. Historically, funding was derived from oil and gas production; however, as part of an investment strategy instituted by GLO, CCS is also being included in PSF bids through offshore storage leases. In fact, GLO expects to earn billions of dollars in PSF revenue by 2050, suggesting 45Q tax breaks will benefit local governments through agreements with companies developing CCS projects.<sup>53</sup>

#### 4.5.2 Offshore projects: BOEM leases

The IIJA also amended the Outer Continental Shelf Lands Act by authorizing the Department of the Interior (DOI) the right to grant leases, rights-of-ways over the outer continental shelf for offshore CCS projects. It also required BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) to publish offshore regulations related to CCS by November 2022; however, the deadline was missed and, as of March 2024, the agencies had not yet published the regulations.<sup>54</sup>

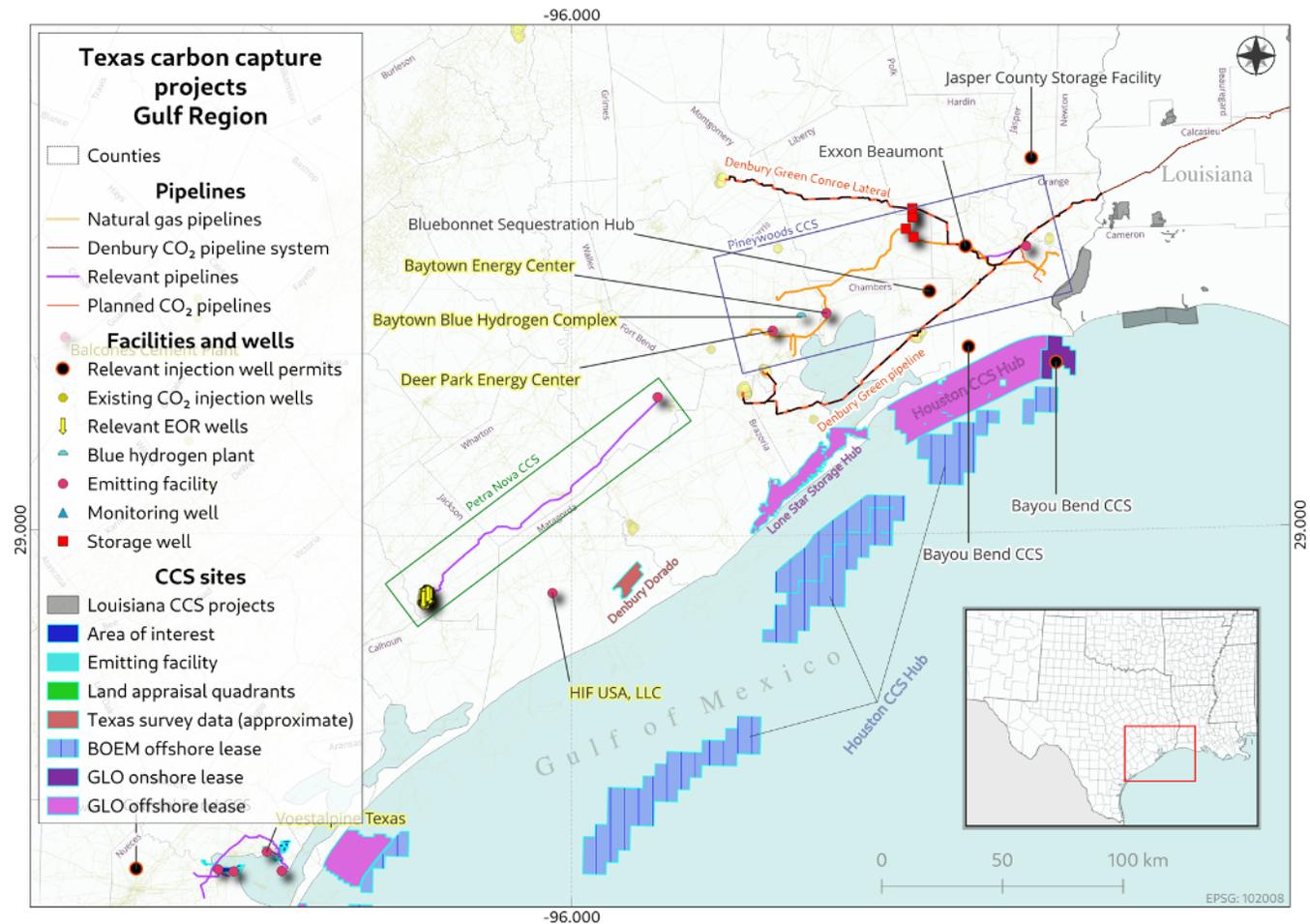
Additionally, the IIJA also instructed BOEM to publish Proposed Notices of Sale for oil and gas exploration in the Gulf of Mexico. Empower conducted research on leases 257, 259, and 261, which were directly related to CCS projects.<sup>55</sup> Through leases 257 and 259, ExxonMobil acquired offshore blocks in close proximity to a GLO offshore lease awarded to Repsol's CCS project, the Corpus Christi Offshore Sequestration Hub. Although Empower was unable to confirm if such leases would be later used for CCS, a 2022 BOEM report labeled multiple leases off the Gulf Coast of Texas as "Carbon Capture Lease Blocks," particularly in an area in close proximity to block 247, awarded to ExxonMobil.

<sup>53</sup> Texas General Land Office, "Texas General Land Office Comments on Amend re: HB 1284 (2021), RRC's sole jurisdiction over carbon sequestration wells," 16 May 2022, <https://rrc.texas.gov/media/rubbftom/comments-ch5-hb1284-glo.pdf>.

<sup>54</sup> "Carbon Sequestration", Bureau Of Safety and Environmental Enforcement, [www.bsee.gov/carbon-sequestration](http://www.bsee.gov/carbon-sequestration).

<sup>55</sup> BOEM, Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 259, [www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/Sale-259-%20FNOS\\_1.pdf](http://www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/Sale-259-%20FNOS_1.pdf).

## Map 6 – Texas carbon capture projects in the lower Gulf Coast region



Source: Empower, using data from multiple sources.

In 2022, the Port of Corpus Christi Authority published its 2026 Strategic Plan, which included CCS as part of its climate change mitigation commitments.<sup>56</sup> In February 2023, the Port of Corpus Christi Authority signed an agreement with Howard Energy Partners and Talos Energy Inc. (NYSE:TALO) to develop Coastal Bend CCS, which, as of early 2024, was set to receive one of the largest tax breaks from the IRS. In March 2024, TotalEnergies acquired Talos's CCS unit, Talos Low Carbon Solutions, effectively taking control of 50% of Coastal Bend CCS, 65% of Harvest Bend (in Louisiana), and 25% of Bayou Bend CCS.<sup>57</sup>

In September 2023, a joint venture comprised by Repsol (BME:REP), Carbonvert,<sup>58</sup> Mitsui (TSE:8031), and POSCO International (KOSE:A005490) was awarded 140,000 acres in the Corpus Christi port area through a GLO lease to store CO<sub>2</sub>.<sup>59</sup> Given that a local authority is also involved in promoting and developing CCS projects, the Corpus Christi area has become significant for CCS nationally.

<sup>56</sup> Port of Corpus Christi, "Strategic Plan 2026," September 2022, [https://portofcc.com/images/Strategic\\_Plan\\_2026.pdf](https://portofcc.com/images/Strategic_Plan_2026.pdf).

<sup>57</sup> TotalEnergies, "TotalEnergies acquires Talos Low Carbon Solutions, a pioneer in the growing American Carbon Storage industry," 18 March 2024, <https://corporate.totalenergies.us/news/totalenergies-acquires-talos-low-carbon-solutions-pioneer-growing-american-carbon-storage>.

<sup>58</sup> Former owner and developer of Coastal Bend CCS.

<sup>59</sup> "Corpus Christi Carbon Storage Hub Awarded to World-Class Team Led by Repsol," 5 September 2023, [www.businesswire.com/news/home/20230905545977/en/Corpus-Christi-Carbon-Storage-Hub-Awarded-to-World-Class-Team-Led-by-Repsol](http://www.businesswire.com/news/home/20230905545977/en/Corpus-Christi-Carbon-Storage-Hub-Awarded-to-World-Class-Team-Led-by-Repsol).

## 4.6 Wetlands and water bodies: a preliminary approach

Empower conducted a preliminary analysis of CCS projects' impacts on water bodies by analyzing the presence of wetlands and other water bodies within a 30-kilometer radius of an injection well, an onshore or offshore lease, or an area of interest. Such analysis lacks a direct link of causality and no probability models were used to measure impact of an accidental release of CO<sub>2</sub> into the water bodies analyzed. For this preliminary approach, Empower only analyzed the water bodies contained within the aforementioned area.

Projects located along the Gulf Coast will be surrounded by multiple water bodies and wetlands, which are at higher risk of being affected by human activity. Further away from the Coast, water bodies in the Permian Basin are smaller but still present, meaning underground water is also present in the area. More research is needed in order to shed light on the possible impacts of an accidental release of CO<sub>2</sub> into water bodies, including research on acidification and impacts on reefs, biodiversity, and ecosystem resilience.

Although offshore leases are located in the ocean, the U.S. Fish and Wildlife Services only considers continental water bodies and those within 4 miles of the coast. As such, the extent of water bodies affected does not include ocean waters in offshore leases. A more in-depth analysis is needed to integrate marine ecosystems into a proximity analysis like the one conducted by Empower for this report.

According to Empower's preliminary analysis, 19 projects overlap with approximately 24 million acres of water bodies. However, this may be underestimated given that many offshore leases overlap with only a small portion of the coastal region included in the U.S. Fish and Wildlife Services database, but are still located over marine ecosystems which are susceptible to environmental damage. Empower detected five types of water bodies within the explored area, which are listed below in Table 4.

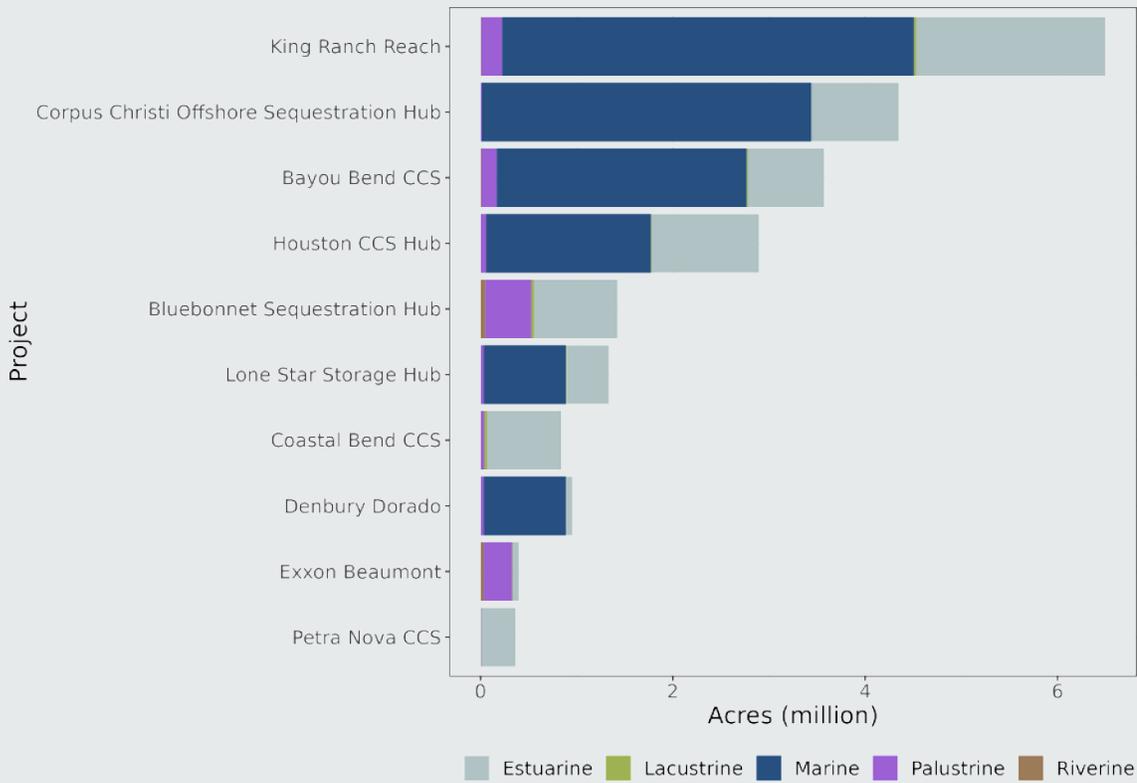
**Table 4 – Water body classification**

| Affected water body | Description  |
|---------------------|--|
| <b>Estuarine</b>    | The Estuarine System consists of deep-water tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted.                            |
| <b>Lacustrine</b>   | The Lacustrine System includes wetlands and deep-water habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, and emergent mosses or lichens.                              |
| <b>Marine</b>       | The Marine System consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides.          |
| <b>Palustrine</b>   | The Palustrine System includes all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5‰.   |
| <b>Riverine</b>     | The Riverine System includes all wetlands and deep-water habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5‰. |

Source: U.S. Fish and Wildlife Services.

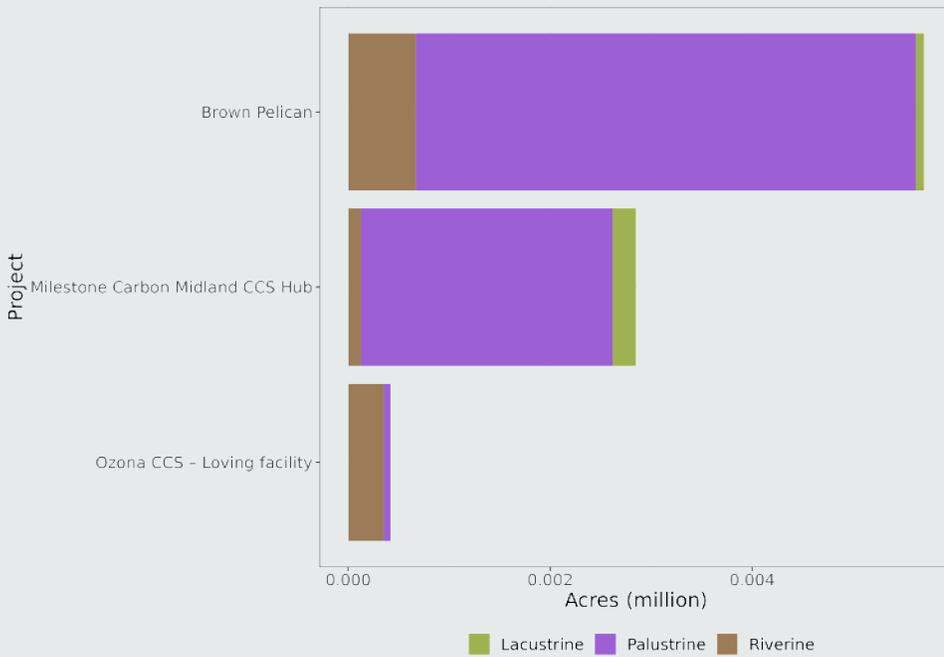
In the Permian Basin, 8,973 acres are within the areas analyzed in Empower's initial approach; the coastal region, as expected, amassed a larger acreage than the Permian Basin, with an area of approximately 22,658,525 acres within the study area. All remaining projects outside the Gulf and Permian regions accounted for 2,112,103 acres. Naturally, as several projects are located in the coastal area, the marine ecosystem held the largest acreage within the study area, with around 14,582,438 acres; estuaries located near marine ecosystems followed with 7,872,367 acres; Palustrine systems with 1,778,292; Lacustrine with 369,143; and, finally, Riverine systems with 177,359 acres.

**Graph 10 – Acres of water bodies within study area (Gulf Coast of Texas)**



Source: Empower, using U.S. Fish and Wildlife Services data.

**Graph 11 – Acres of water bodies within study area (Permian Basin)**



Source: Empower, using U.S. Fish and Wildlife Services data.

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# **CONCLUSIONS**

## CONCLUSIONS

As subsidies and tax breaks increase and legal procedures become more expedient, more companies will see CCS as a profitable endeavor. As of March 2024, CCS projects were only profitable due to tax breaks and subsidies, and are dependent on government programs continuing to finance CCS. Moreover, because CCS projects still struggle to obtain loans, only large companies with access to equity and credit markets are able to invest using their own financial resources.

Although CCS is promoted as a sound climate change mitigation plan, data regarding financing, tax breaks, insurance, and permitting remains relatively obscure. As noted by the White House Environmental Justice Advisory Council, EPA regulatory decisions and permitting observations regarding a CCS permit are not public.<sup>60</sup> Furthermore, location data that was publicly available on the RRC website as of April 2024 was not readily accessible, and multiple data transformations were needed. Users unfamiliar with data engineering would effectively be denied their right to scrutinize the government's activity. Regarding FOIA responses, in some cases data was completely redacted, including information about environmental uncertainties, which are crucial for independent third-party environmental research. The environmental impacts of CCS, especially long-run effects of mass-scaling CCS in the Gulf of Mexico, remain understudied.

Ultimate ownership of CCS projects in Texas remains split between publicly-traded companies and private equity funds. Companies create layers of subsidiaries to isolate CCS-related risk from other corporate units and provide only required resources from their balance sheets to the subsidiary developing and operating a CCS project. Private equity is subject to less stringent disclosure laws and its financial data will become harder to obtain as more projects are financed or sponsored by private equity. However, publicly-traded companies also do not disclose how funds are internally transferred between the ultimate parent company and subsidiaries.

The lack of transparency makes access to vital information more difficult for organizations and potentially affected groups. CBI rules in Louisiana and Texas allow companies to choose which information will be made public, preemptively denying access to information that may not be confidential nor business-related. Organizations should seek to challenge local CBI rules through FOIA appeals and other legal procedures available in order to gain access to insurance, financial, and environmental information.

While it was only during the Biden administration that CCS projects achieved some degree of financial viability, with passage of the Bipartisan Infrastructure Law and Inflation Reduction Act, CCS public policy has existed for nearly two decades, suggesting future administrations may choose to keep 45Q tax breaks and DOE funding available despite friction between political parties. Some troubling trends are the potential "conversion" of Class II wells into permanent storage sites, and subsidizing a highly polluting activity such as EOR. As mentioned, even local authorities have raised concerns about using EOR wells for permanent CO<sub>2</sub> sequestration.

CCS technology is pushed by large energy companies, which seek to benefit from tax breaks and subsidies in addition to their large energy-related revenues. Most companies have formed consortia through government-sponsored activities. Non-profit organizations, companies, and universities have joined these groups and new actors will continue to appear. It is important to continually monitor activity in these circles as new actors may signal a renewed boost for CCS.

Furthermore, lobbying plays an important role in promoting CCS as a feasible and even necessary activity for mitigating the effects of climate change. Some corporate consortia are directly led by industry groups that have invested millions of dollars in lobbying to promote CCS. Understanding these political and economic actors also provides insight as to how money moves and where political discourse favoring CCS is created and disseminated.

The Gulf Coast area will continue to see new CCS projects, as it is deemed as one of the best sites to deploy carbon sequestration in Texas; even local governments have begun enacting plans to incorporate CCS technology as public policy and are already signing agreements with large companies to build and operate CCS projects. As described above, even local schools will have access to CCS-related financial resources via GLO leases. The latter will make local governments and schools dependent on financial resources from the fossil fuel industry and less prone to press for substantial changes to the energy sector.

Social and environmental impacts should be better and more deeply explored before scaling CCS commercially and widely along the Gulf Coast and in the Gulf of Mexico. In addition, financial information, particularly debt and insurance details, should be disclosed for public scrutiny, as they are rarely available.

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60 White House Environmental Justice Advisory Council, "Recommendations: Carbon Management Workgroup," November 2023, [www.epa.gov/system/files/documents/2023-11/final-carbon-management-recommendations-report\\_11.17.2023\\_508.pdf](https://www.epa.gov/system/files/documents/2023-11/final-carbon-management-recommendations-report_11.17.2023_508.pdf).



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