CARBON CAPTURE AND STORAGE OPPORTUNITIES IN THE SOUTHEAST AND GULF COAST

A TECHNICAL REPORT

Authored by
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Great Plains Institute

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Carbon Solutions LLC is a low-carbon energy startup using cuttingedge research and development and software and services to address energy challenges, including carbon capture and storage, geothermal energy, wind energy, biofuels, energy storage, and the hydrogen economy. Carbon Solutions aims to accelerate low-carbon energy infrastructure development in the US. The Carbon Solutions business vision is focused on three integrated pillars: research and development that advances low-carbon energy science, software development that generates unique tools and data, and services that apply our research and development and software to address emerging energy challenges for our clients.

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Executive summary

The Southeast and Gulf Coast (SEGC) region, which includes Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Texas, supplies industrial goods and energy to regional, national, and global markets and has the highest concentration of industrial and power-sector emissions in the United States. Carbon capture and storage (CCS) is a crucial tool for reducing emissions from these sectors, where process-related and combustion emissions are often difficult to eliminate through other means. This report evaluates how carbon capture, carbon dioxide (CO_2) transport, and saline storage could expand across the Southeast and capture the regions emissions through two modeled scenarios: 1) a near-term scenario over the next 10 to 15 years and 2) a midcentury scenario in 2050, both leveraging the area's extensive geologic storage potential.

CAPTURE FACILITY SELECTION

To identify the most promising opportunities for deployment in each scenario, facilities were evaluated based on emissions scale, capture cost, and technological readiness. In the SEGC, 1,799 facilities that reported emissions to the EPA Greenhouse Gas Reporting Program (GHGRP) in 2024 are eligible for the federal 45Q tax credit, which provides the primary financial incentive for capturing and storing CO_2.[1] Using Carbon Solutions' CO_2NCORD model and sector-level cost estimates from the EFI Foundation, a subset of these facilities was selected for near-term and midcentury modeling.[2] Seventy-eight facilities were identified as candidates for early carbon capture deployment in the near-term scenario. These facilities are the most prepared to adopt capture technologies within the next 10 to 15 years and include industries that have reached Nth-of-a-Kind (NOAK) cost levels with at least 50,000 metric tons of capturable emissions and modeled capture costs below $100 per ton or have existing or announced projects demonstrating technical readiness. Midcentury scenario facility selection builds on the near-term facility selection to include sectors and facilities that could achieve commercial deployment by 2050. In total, 217 facilities are identified, including all capture streams from the 78 near-term facilities, as well as additional industrial plants emitting more than one million metric tons of capturable CO_2 per year. Power facilities meeting the same emissions threshold and built after 2010 are also included, as newer plants typically have longer lifespans and are more suitable to retrofit carbon capture. The modeled average capture cost across these facilities is $135 per metric ton of CO_2.

STORAGE SELECTION

To evaluate where captured CO_2 from these facilities could be permanently stored, Carbon Solutions' SCO_2TPRO model was used to identify and characterize 799 potential onshore and offshore storage locations across the Southeast and Gulf Coast. These locations, representing an estimated storage capacity of more than two billion metric tons of CO_2, were selected based on geologic characteristics—such as depth, porosity, permeability, and formation thickness—using data from various sources, including the National Carbon Sequestration Database.[3] The model also estimated storage costs for each potential site, incorporating both capital and operating expenses such as permitting, well development, monitoring, and closure.

TRANSPORT NETWORK DEVELOPMENT

To determine optimal storage sites for the selected facilities, CO_2 was modeled as being transported to nearby storage locations through cost-optimized pipeline networks, using Carbon Solutions' *CostMAP^{PRO}* to estimate routing costs and *SimCCS^{PRO}* to identify the least-cost network configuration.

1 Credit for carbon oxide sequestration; US Environmental Protection Agency Office of Atmospheric Protection, "Greenhouse Gas Reporting Program (GHGRP)."

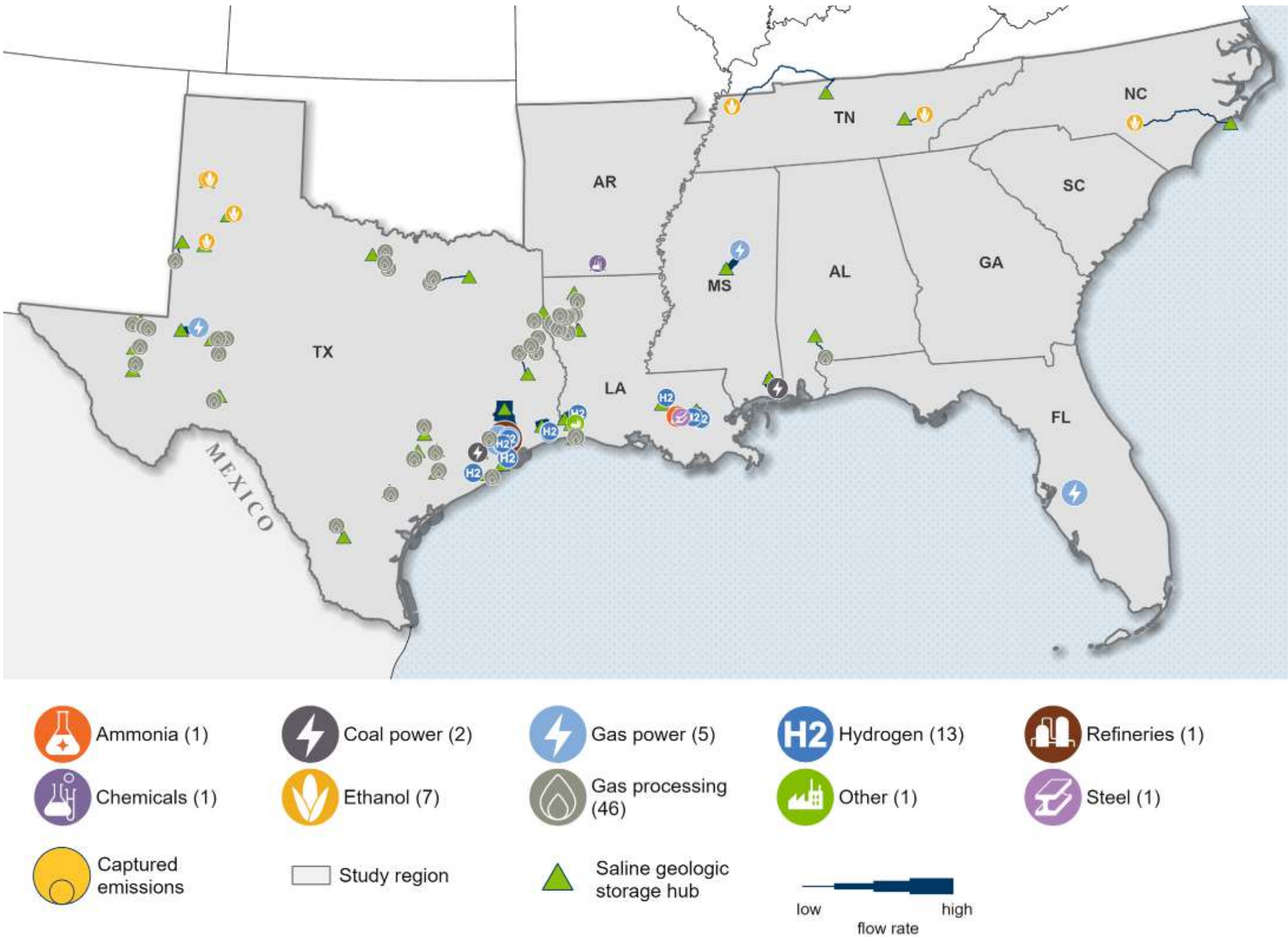
2 Sale et al., Finding New Opportunities for Carbon Capture with CO_2NCORD (2024); Moniz et al., Unlocking Private Capital for Carbon Capture and Storage Projects in Industry and Power.

3 Bauer et al., "NATCARB."

NEAR-TERM DEPLOYMENT SCENARIO

In the near-term scenario, 78 facilities capturing 48.2 million metric tons of CO_2 ($MMtCO_2$) annually connect to 38 storage hubs through 1,240 miles of new pipeline, at an average combined cost of $117 per metric ton of CO_2 captured, transported, and stored (figure 1).

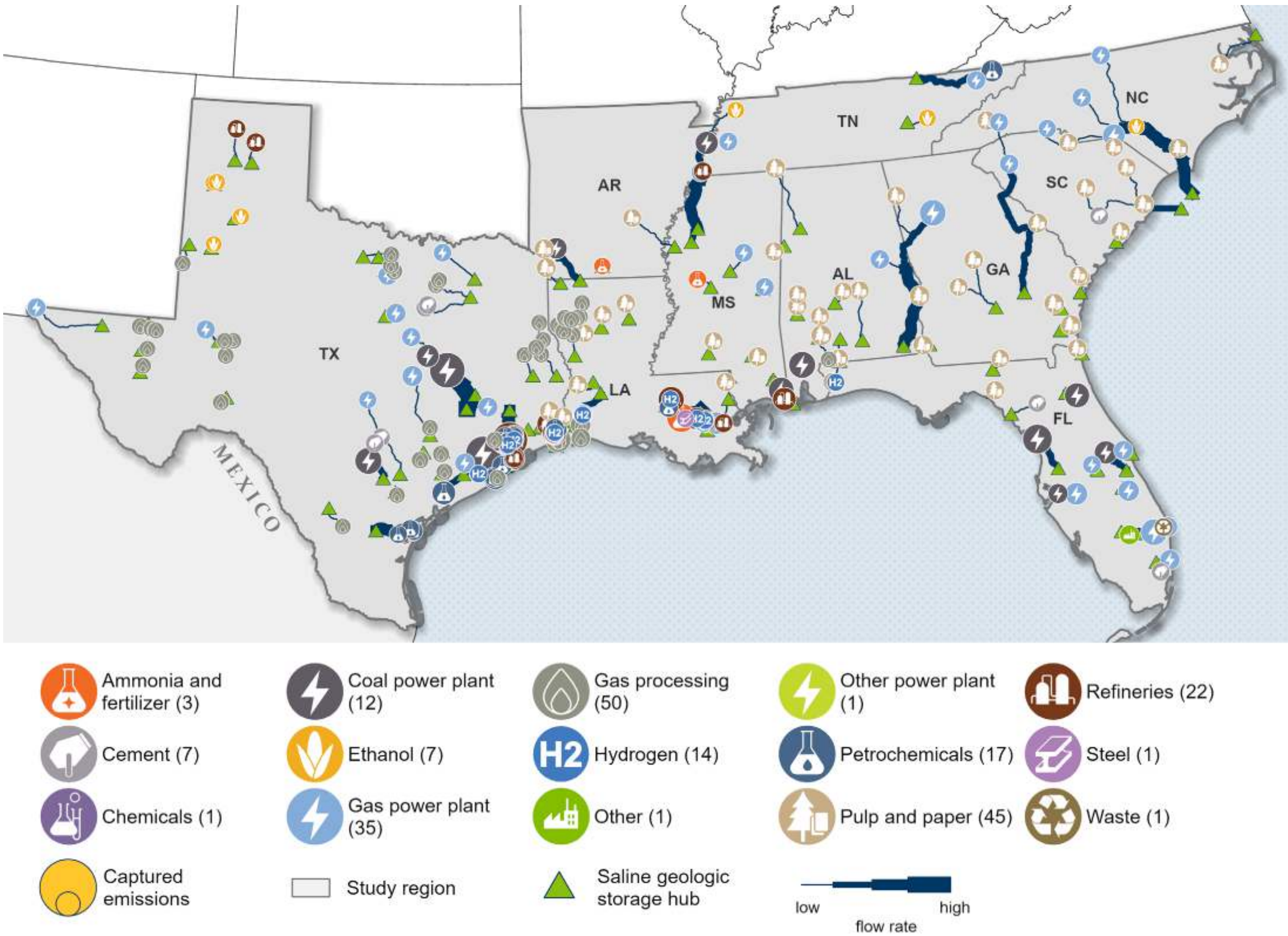
Figure 1. Near-term scenario deployment modeling results for the Southeast and Gulf Coast



MIDCENTURY DEPLOYMENT SCENARIO

By midcentury, 217 facilities capturing approximately 392.8 $MMtCO_2$ per year connect to 42 storage hubs through 5,543 miles of pipeline, at an average combined cost of \$148 per metric ton of CO_2 captured, transported, and stored (figure 2).

Figure 2. Midcentury scenario deployment modeling results for the Southeast and Gulf Coast



TAKEAWAYS

These scenarios illustrate how the build-out of carbon capture, transport, and storage infrastructure in the SEGC can begin with concentrated corridors that connect early projects to nearby storage sites and expand into a broader regional network that supports large-scale deployment. The SEGC has the potential to lead in CCS development by using its extensive storage capacity to achieve scalable, cost-effective emissions reductions. While the deployment scenarios explore opportunities with the highest modeled potential, they are limited by model inputs and may not reflect actual project siting. They demonstrate how coordinated planning and supportive policy can turn these opportunities into real-world projects and investments.

Emissions reductions and regional context

Achieving net-zero global carbon dioxide (CO_2) emissions by midcentury is essential to limiting the impact of global temperature rise.[4] For the United States, achieving this goal will require the widespread deployment of technologies that decarbonize industrial production and power generation, including in the SEGC. While a wide range of strategies for emissions reduction will be required across the US economy, carbon capture and storage (CCS) offers one of the most direct pathways to reduce emissions from existing high-emitting facilities.

CCS involves separating CO_2 from emissions streams and transporting it for permanent storage in deep geologic formations. Carbon capture has been used for decades in natural gas processing and enhanced oil recovery and is now being applied to ethanol, ammonia, hydrogen, and power generation facilities.[5] As capture costs decline and supportive policy frameworks mature, CCS can enable substantial emissions reductions across industrial sectors.

Federal incentives, most notably the Section 45Q tax credit, have been instrumental in advancing early projects. The credit currently provides up to $85 per metric ton for CO_2 stored in saline formations or used in enhanced oil recovery or industrial applications. Analyses suggest that many CCS projects may require higher values, between $109 and $153 per ton, to achieve commercial viability.[6] Continued cost reductions and targeted state and federal policies will be critical to realizing large-scale deployment.

This report evaluates how CCS can contribute to achieving these reductions in the SEGC through two modeled deployment scenarios; 1) near-term (10–15 years), which includes early commercial deployment focused on low-cost, high-purity capture opportunities and announced projects, and 2) midcentury, which includes large-scale buildout that reflects economies of scale and sustained policy support. This analysis identifies where capture projects, pipeline networks, and storage hubs could develop most efficiently. The results highlight the scale of the region's opportunity and the infrastructure coordination needed to realize it.

SOUTHEAST AND GULF COAST EMISSIONS AND CONSIDERATIONS

The Southeast and Gulf Coast (SEGC), defined here as Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Texas, has substantial potential for development in capture, transport, and storage. The region has a dense concentration of energy and manufacturing industries, substantial CO_2 emissions, and world-class onshore and offshore geologic storage potential.

The region's emissions from facilities are concentrated in two major sources: electric power generation and industrial production. Nearly 2,300 facilities in the SEGC reported CO_2 emissions to the US Environmental Protection Agency (EPA) Greenhouse Gas Reporting Program (GHGRP) in 2023. These facilities produce 964 $MMtCO_2$/yr and can be divided into two groups: electricity generation and industrial facilities.[7]

Electricity generation emissions

Electricity generators contribute the most to the region's total CO_2 emissions in this region, with 360 facilities and a combined 538 $MMtCO_2$ per year from coal-, gas-, and other-fired power plants (figure 3).

Figure 3. Total emissions from gas-, coal-, and other-power plants in the Southeast and Gulf Coast

Source: US EPA, Greenhouse Gas Reporting Program (2024).

4 United Nations Environment Programme, Emissions Gap Report 2025: Off Target - Continued Collective Inaction Puts Global Temperature Goal at Risk; "Summary for Policymakers."

5 Global CCS Institute, Global Status of CCS 2025.

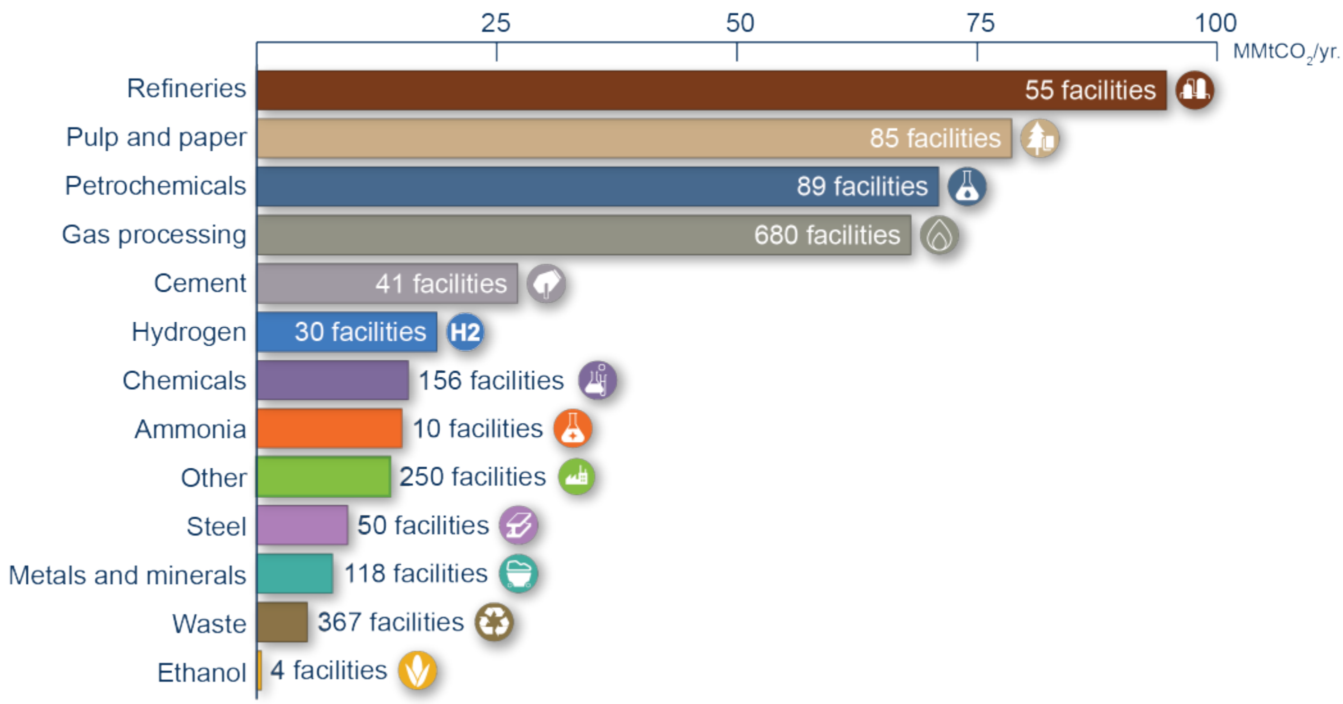
6 Carbon Capture Coalition and Brown Brothers Energy and Environment, 45Q Research Brief: Ensuring the Continued Success of the American Car Bon Management Industry.

7 US Environmental Protection Agency Office of Atmospheric Protection, "Greenhouse Gas Reporting Program (GHGRP)."

Industrial sector emissions

Industrial sectors in the SEGC contribute 426 $MMtCO_2$/yr. to the region's emissions profile from 1,935 facilities (figure 4). Roughly half of industrial emissions are related to on-site stationary combustion, with the remaining industrial emissions attributed to various processes within each sector. The petroleum refinery, petrochemicals, pulp and paper, and gas processing sectors are the highest contributors to the SEGC industrial emissions profile, with each sector contributing greater than 65 $MMtCO_2$ annually. The remaining sectors present in the region, including ammonia, cement, chemicals, ethanol, hydrogen, metals and minerals, steel, and waste, contribute roughly 25 percent to the region's total industrial CO_2 emissions.

Figure 4. Reported CO_2 emissions in the Southeast and Gulf Coast by industrial sector



Source: US EPA, Greenhouse Gas Reporting Program (2024).

Evaluating facility suitability for near-term and midcentury carbon capture deployment

Facility selection for near- and midcentury carbon capture deployment is determined by technical and economic feasibility, specifically, how cost-effective and practical it is to separate and compress CO_2 from a facility's flue gas under market conditions that support deployment. Facilities that have demonstrated commercial maturity, have higher amounts of capturable emissions, and lower capture costs are prioritized for deployment.

CAPTURE MODELING FRAMEWORK AND DATA SOURCES

Section 45Q Tax Credit Eligibility

Facilities considered for near-term and midcentury deployment were selected from the 1,799 sources in the region that are eligible under the federal Section 45Q tax credit, based on the minimum CO_2 capture thresholds of 18,750 tCO_2/ yr. for electricity generating facilities and 12,500 tCO_2/ yr. for industrial facilities. Emissions from eligible facilities in the region account for 99.9 percent of total emissions from industrial and power facilities in the region. Each facility was then evaluated to determine how technically feasible and cost-effective it would be to add carbon capture.

Identifying point sources suitable for capture

Although the near-term and midcentury deployment scenarios are described at the facility level, most facilities include multiple emissions sources, often with distinct characteristics. Identifying which of these point sources are technically suitable for capture is a key first step in determining facility-level potential. Capture feasibility depends on the technical ability to remove CO_2, and capturable CO_2 emissions varies widely depending on the process, fuel type, and CO_2 concentration.

This analysis used Carbon Solutions' CO_2NCORD tool to evaluate emission sources within the 1,799 facilities eligible for the federal Section 45Q tax credit to identify specific point sources across the SEGC most viable for carbon capture.[8] CO_2NCORD uses emissions data to identify the point sources at facilities suitable for capture. For this analysis emissions data were taken from:

- EPA's Greenhouse Gas Reporting Program (GHGRP), EPA's Emissions and Generation Resource Integrated Database (eGRID)
- EIA's Fuel Ethanol Plant Production Capacity report
- Renewable Fuels Association's Biorefinery Locations Table

When identifiable, emissions from sources unlikely to be suitable for capture, such as flares, were excluded to improve accuracy.[9]

Determining capturable emissions

After identifying point sources suitable for capture, the analysis estimated the quantity of CO_2 that could be captured at each facility. These capturable emissions were adjusted to account for process-level variations and technological limitations, producing a "capturable fraction" of CO_2 for each facility type. These estimates form the basis for assessing capture potential across the power and industrial sectors. Further details on estimating capturable emissions with CO_2NCORD can be found on Carbon Solutions' webpage.

CAPTURE COST ESTIMATES

The cost to capture CO_2 from point sources most viable from capture varies widely depending on factors such as the concentration of CO_2, the total volume of emissions, and the presence of other pollutants. In general, large flue gas streams with high CO_2 concentrations and low pollutant content are less expensive to capture than smaller, more dilute streams.

Cost estimates for this analysis were derived primarily from the NETL Constant Model methodology from the Carbon Capture Retrofit Database, which provides standardized retrofit cost relationships for a range

8 Sale et al., Finding New Opportunities for Carbon Capture with CO_2NCORD (2024).

9 Sale et al., Finding New Opportunities for Carbon Capture with CO_2NCORD (2024); Bennett et al., "Identifying Opportunities and Cost for CO_2 Capture at Power and Industrial Facilities in the United States."

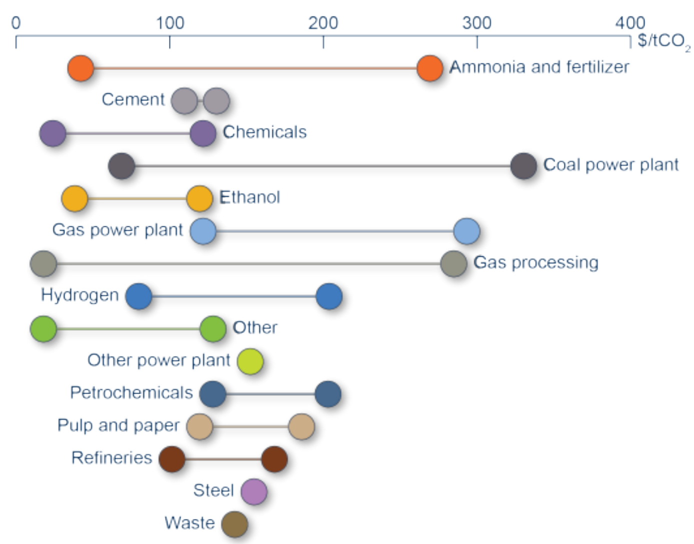
of fuel and process types. These estimates were supplemented with sector-level cost data from the EFI Foundation, which provides estimated costs for First-of-a-Kind (FOAK) and Nth-of-a-Kind (NOAK) capture projects within a sector.[10]

Total capture costs include capital expenses, energy penalties, and compression to pipeline pressure, annualized using a 10 percent discount rate and 12-year capital recovery period (in 2022 dollars).

Assumptions follow NETL cost modeling conventions, with equipment costs scaled to the size of the CO_2 stream and energy prices based on state-level data from the Energy Information Administration.[11] The analysis also adjusts for site-specific factors such as available waste heat and cooling needs. Capture costs were capped at $500 per metric ton, reflecting the approximate upper limit of feasible capture and comparable to direct air capture costs.

Capture costs vary by sector and flue gas composition. High-volume, high-concentration CO_2 streams with low pollutant content are typically below $100 per metric ton. The range of capture costs used in the near-term and midcentury scenarios is shown in figure 5.

Figure 5. Modeled capture costs by sector



Note: The bar between circles indicates additional facilities used a capture cost between the two circle values.

NEAR-TERM SELECTION

This analysis identified a subset of emitting facilities within the SEGC that fell within two categories: 1) facilities in sectors that have reached NOAK costs, or 2) facilities in sectors that have not yet reached NOAK costs but have announced carbon capture projects. The near-term and midcentury scenarios only include retrofit opportunities at existing power and industrial facilities.

Facilities in sectors that have reached Nth-of-a-Kind costs

These facilities generally have flue gas streams with a high volume of concentrated, high-purity CO_2, which reduces the cost of capture on a per-ton basis. The near-term scenario includes facilities in these sectors that have at least 50,000 metric tons of capturable CO_2, as larger facilities may be more economical to retrofit as the cost to capture CO_2 decreases with increasing capturable quantities of CO_2.

Given current inflationary and supply-chain pressures, and recent cost analyses showing that many NOAK projects may require 45Q values above $100 per ton to reach breakeven levels, this analysis focuses on the subset of NOAK opportunities with modeled capture costs below $100 per ton, representing the most cost-effective options for early deployment.

Facilities in sectors that have not yet reached NOAK costs but have announced carbon capture projects

These facilities were included to highlight the potential for near-term carbon capture deployment in sectors where technical or economic feasibility is still developing. Their inclusion does not verify continued project development or financial viability but instead reflects opportunities for future investment as costs decline and policy support continues to strengthen. The near-term scenario uses a subset of announced projects from the Global CCS Institute's Global Status of CCS 2024 and Clean Air Task Force's US Carbon Capture Project Table.[12]

10 Moniz et al., Unlocking Private Capital for Carbon Capture and Storage Projects in Industry and Power.

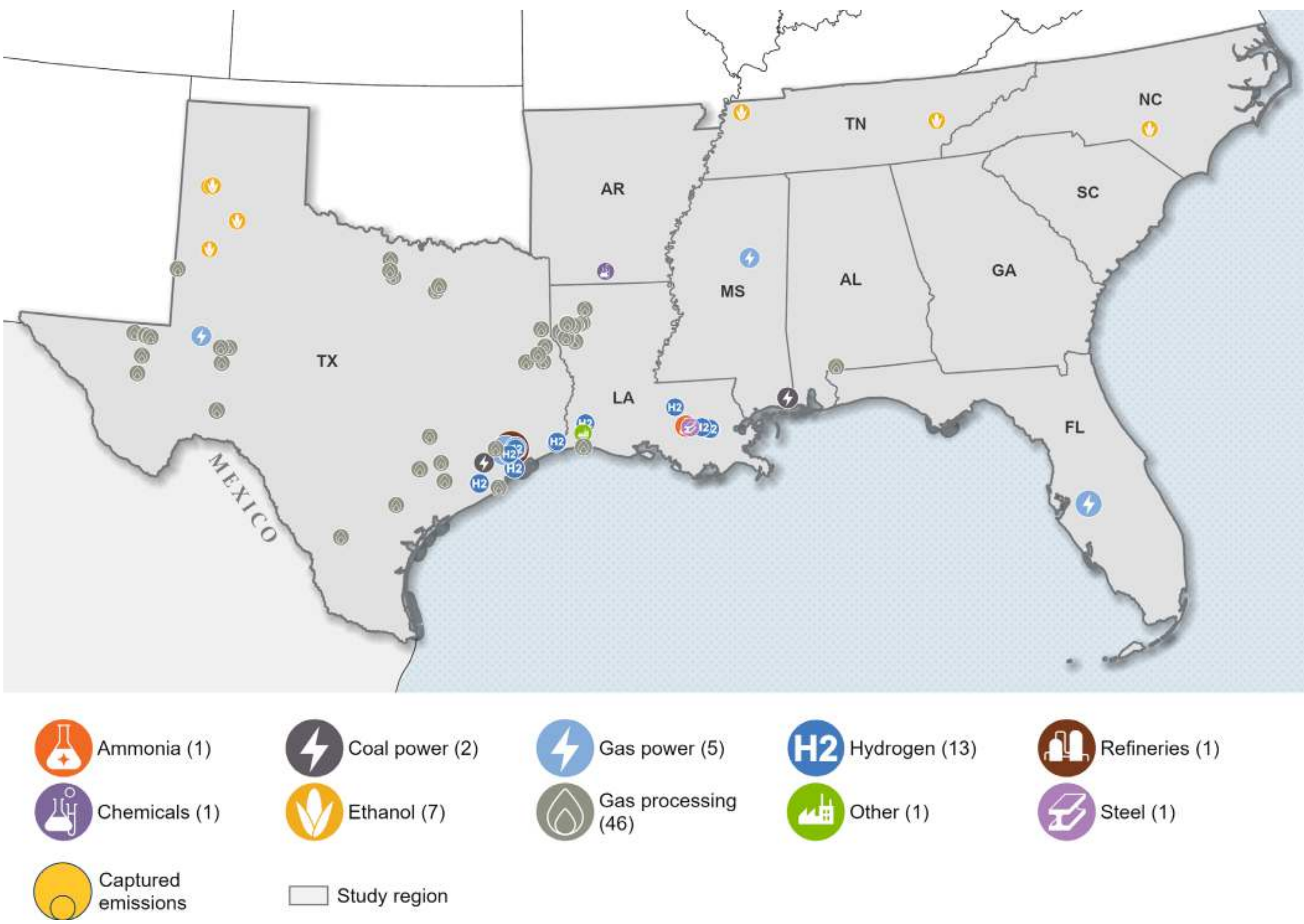
11 Hackett and Kuehn, Natural Gas Combined Cycle CO_2 Capture Retrofit Database; Hackett and Kuehn, Pulverized Coal CO_2 Capture Retrofit Database; Hughes et al., "Industrial CO_2 Capture Retrofit Database (IND CCRD)"; US Energy Information Administration, "State Energy Profile Data."

12 Global CCS Institute, Global Status of CCS 2024; Clean Air Task Force, "US Carbon Capture Activity and Project Table."

Near-term facilities

In total, 78 facilities were identified as near-term candidates for carbon-capture deployment across the SEGC, representing approximately 48.15 $MMtCO_2$ per year (figure 6). These facilities span sectors with demonstrated capture experience or favorable flue-gas characteristics, including pulp and paper, hydrogen production, ethanol, refineries, petrochemicals, natural-gas processing, and power generation. Together they form the foundation for early carbon-capture deployment in the region and establish the basis for expansion under the midcentury scenario.

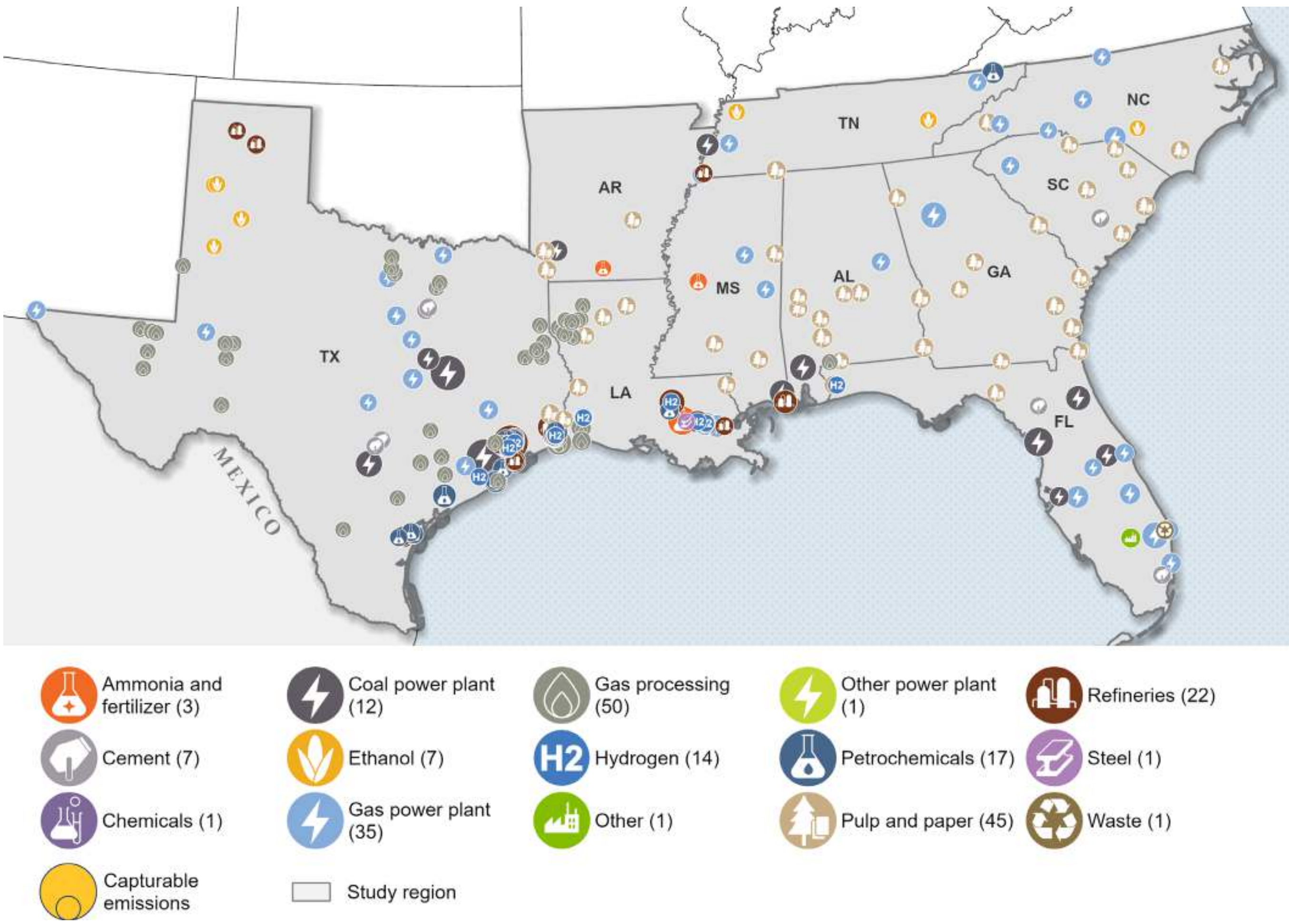
Figure 6. Facilities selected for capture for the near-term scenario



MIDCENTURY SELECTION

The midcentury scenario builds on the near-term scenario by expanding the capturable emissions at the near-term facilities to include all identifiable capture streams. In addition, it includes all industrial facilities across the region with more than one million metric tons of capturable CO_2 per year, reflecting the greater economies of scale available to large emitters. Power facilities are similarly limited to those with at least one million metric tons of capturable emissions per year and that began operation after 2010, as newer plants are more likely to include advanced technologies and have longer expected lifespans. The selection of facilities for this scenario includes 217 facilities capturing approximately 392.8 $MMtCO_2$ per year (figure 7).

Figure 7. Facilities selected for capture for the midcentury scenario



Storage opportunity and site selection

The SEGC has extensive opportunities for CO_2 storage in both onshore and offshore saline geologic formations. Saline formations are porous rock layers located deep underground and are the most abundant and secure option for large-scale CO_2 storage. Although depleted oil and gas reservoirs in the region have and could continue to utilize CO_2-enhanced oil recovery, this analysis focuses exclusively on saline formations because they provide the greatest potential for permanent storage at the scale required for regional carbon management deployment

STORAGE SELECTION

The near-term and midcentury scenarios use the same overall modeling approach to estimate how much CO_2 could be safely stored across the SEGC and what it might cost to develop those sites. Using Carbon Solutions' *SCO_2T^{PRO}* model, the analysis combines detailed regional geologic information, such as formation depth, porosity, and permeability, with cost data adapted from EPA and NETL studies.[13] The same framework was applied to both onshore and offshore formations, with cost and engineering assumptions adjusted to reflect their different operating environments.

This approach helps identify where storage capacity is concentrated, how site characteristics influence costs, and how both inland and coastal formations could support large-scale carbon management in the region.

RESERVOIR CHARACTERIZATION AND GEOLOGIC DATA

Reservoir storage capacity depends on a combination of geologic factors and site-specific characteristics. Generally, reservoirs with the greatest potential for CO_2 storage will be relatively thick formations with high porosity and permeability, resulting in higher overall storage capacities and densities. These reservoirs will support higher injection rates and require fewer wells, resulting in reduced storage costs. They must have temperatures and pressures sufficient for storing CO_2 as a supercritical fluid and must have an overlying caprock with low permeability capable of preventing vertical CO_2 migration.

To assess CO_2 storage potential, this analysis used reservoir data to develop a geologic dataset that captures subsurface variability across multiple formations and states. The data were compiled from several sources, including state geologic surveys, published papers, United States Geological Survey (USGS) reports, and the National Carbon Sequestration Database (NATCARB).[14]

These sources were standardized and merged into a unified geologic characteristics database, containing formation names, thickness, porosity, permeability, temperature gradient, depth, and geographic extent. Each factor was mapped on a 10 km × 10 km grid, with constant geologic properties assumed within each cell. If information was missing, this analysis used representative averages based on neighboring or analogous formations.

The 10 km grids were then aggregated into 50 km by 50 km zones, grouped by formation to manage computational complexity while preserving geologic variability. This approach creates larger zones suitable for siting multiple wells, with each grid cell represented in the model by a single point. The resulting dataset served as the foundation for estimating CO_2 injectivity, plume behavior, and total storage capacity across the Southeast.

GEOLOGIC STORAGE MODELING

This analysis used the dataset to identify potential storage locations using *SCO_2T^{PRO}*, a screening tool that quantifies CO_2 storage potential and annual costs for saline formations. The model uses the standardized reservoir data to estimate the technical performance and economic feasibility of injection zones.

SCO_2T^{PRO} utilizes models trained on detailed reservoir simulations to estimate injectivity (the rate at which CO_2 can be injected), plume size (the extent to which CO_2 disperses in the subsurface), and storage capacity (the total amount of CO_2 a formation can

13 Mark-Moser et al., "FECM/NETL Offshore CO_2 Saline Storage Cost Model"; Ogland-Hand et al., How to Net-Zero America: Nationwide Cost and Capacity Estimates for Geologic CO_2 Storage; US Environmental Protection Agency, Geologic CO_2 Sequestration Technology and Cost Analysis.

14 Carbon Solutions, "SCO_2T^{Pro}"; Bauer et al., "NATCARB."

safely contain). A formation's geology—including permeability, porosity, thickness, depth, and temperature gradient—will affect these factors. Each 50 km by 50 km zone is a potential injection area within the model. The model assumes a maximum injection rate of 1 $MMtCO_2$ per year per well, which is consistent with previous US EPA and US Department of Energy (DOE) analyses.

To more accurately capture site-specific conditions, the model also incorporated existing Class VI permit applications along the Texas-Louisiana border. Because multiple permitted wells occur within some of the 50 km by 50 km modeling zones, this analysis represented those areas using the underlying 10 km by 10 km grid data. Each Class VI permit area was assigned the cost and storage potential of its corresponding 10 km cell to increase precision, particularly where projects are under regulatory review.

The economic parameters used in this analysis mirror those used in the EPA's geologic sequestration cost methodology, including a 10 percent interest rate, a 12-year capital recovery period, a 30-year injection period, and a 50-year post-injection monitoring period.

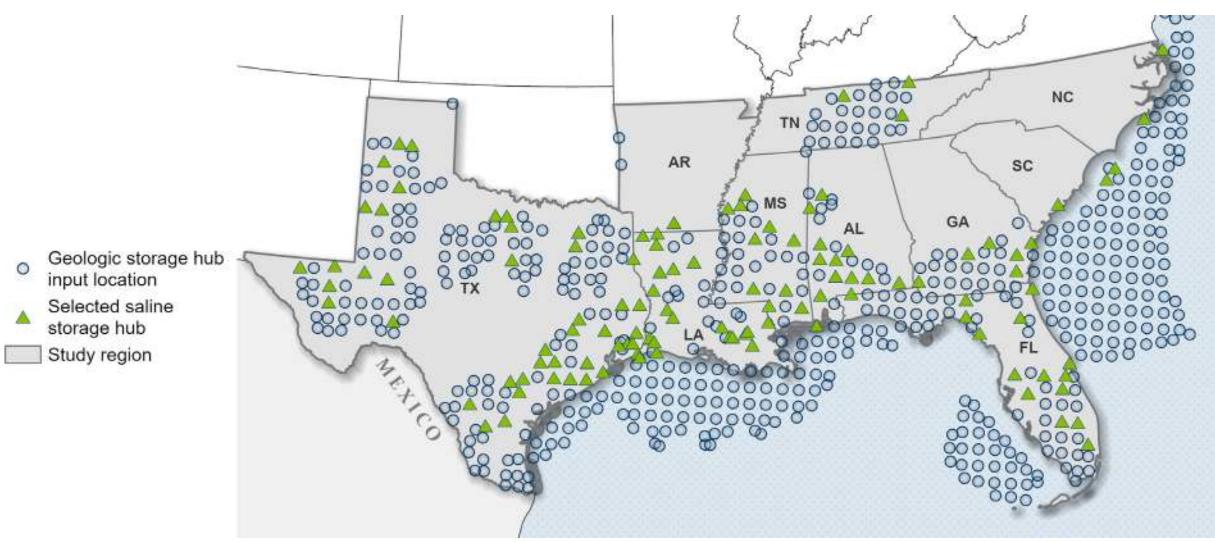
STORAGE COST

In addition to the overall capacity for storing injected CO_2, ideal locations for CO_2 storage must consider the cost of a Class VI well for the permanent storage of CO_2 in a saline reservoir. As with storage capacity estimates, the cost of a well varies based on the geologic characteristics and geographic conditions of a specific well location.

There are also additional considerations for offshore storage. These sites have substantial capacity; however, they tend to be more expensive due to logistical challenges, specialized marine equipment, and higher labor costs. Collectively, these factors can increase installation costs by as much as ten times compared to onshore projects. Storage cost estimates for the modeled sites were developed using a combination of existing federal and regional cost models. These included the EPA's onshore CO_2 storage cost model, the FECM/NETL offshore model for the Gulf Coast, and a Carbon Solutions model for the Atlantic Coast.[15] Together, these models capture the full range of costs associated with developing storage sites, covering capital expenses—such as site preparation, permitting, drilling, surface facilities, monitoring wells, and contingency—as well as operating costs for maintenance, monitoring, and closure.

The same set of potential storage sites was available to both the near-term and midcentury scenarios modeled in SimCCSPRO. In total, the analysis identified 799 storage locations (figure 8), including 33 onshore Class VI wells (at 10 km resolution) with a combined capacity of roughly 8 gigatons of CO_2, and 315 federal offshore sites with approximately 1.19 gigatons of capacity.

Figure 8. Storage hub input locations used for near-term and midcentury scenarios



15 Ogland-Hand et al., How to Net-Zero America: Nationwide Cost and Capacity Estimates for Geologic CO_2 Storage; Mark-Moser et al., "FECM/NETL Offshore CO_2 Saline Storage Cost Model"; US Environmental Protection Agency, Geologic CO_2 Sequestration Technology and Cost Analysis.

Transport and scenario buildout

The analysis models CO_2 transportation for near-term and midcentury deployment scenarios exclusively through pipelines, which are the most cost-effective and safest option for large-scale carbon transport.

MODELING APPROACH

Pipeline modeling was completed using Carbon Solutions' *CostMAP*[PRO] software, which estimates installation costs and routing options across a defined region. This tool uses geospatial data to 1) assess the economic and practical feasibility of building CO_2 pipelines, and 2) identify the least-cost, realistic routes between the identified capture sites and storage locations.

GEOSPATIAL DATA INPUTS

CostMAP[PRO] integrates multiple spatial datasets, including land cover, federal land designations, population density, slope, and environmentally protected areas, to create two separate layers: a cost surface that represents the relative expense of pipeline construction across different terrains, and a routing surface that represents physical and environmental suitability. These two layers ensure that pipeline routes are not only cost-effective but also feasible to construct and operate in sensitive or restricted areas. *CostMAP*[PRO] also considers linear features, including roads, railways, rivers, and existing rights-of-way and treats them as either barriers or corridors depending on whether they hinder or facilitate pipeline construction.

PIPELINE COST COMPONENTS

Pipeline costs include capital expenditures, which include materials, labor, rights-of-way, and safety infrastructure, and operating expenditures, such as pump maintenance and energy usage. A cost escalation factor of 0.7 is applied for offshore pipelines to account for the higher costs of installation and maintenance.[16]

COST CALCULATION

After the routing and cost layers are combined, the model calculates the annual transportation cost (in millions of [2022] dollars per year). This value is divided by the total yearly volume of CO_2 transported and stored across the entire CCS network to yield a final unit transportation cost ($/t$CO_2$).

SCENARIO OPTIMIZATION

The near-term and midcentury deployment scenarios were constructed by linking the capture, storage, and transport data in Carbon Solutions' *SimCCS*[PRO] model, an optimization tool designed to identify cost-effective strategies for CCS.[17] *SimCCS*[PRO] then optimized the routing and sizing of pipelines and the assignment of CO_2 volumes to available storage locations to connect those preselected sources to the lowest-cost storage options.

16 Vidas et al., "Analysis of the Costs and Benefits of CO_2 Sequestration on the US Outer Continental Shelf"; Smith et al., "The Cost of CO_2 Transport and Storage in Global Integrated Assessment Modeling"; Metz et al., "IPCC Special Report on Carbon Dioxide Capture and Storage."

17 Middleton et al., "SimCCS: An Open-Source Tool for Optimizing CO_2 Capture, Transport, and Storage Infrastructure"; Middleton et al., "Generating Candidate Networks for Optimization: The CO_2 Capture and Storage Optimization Problem."

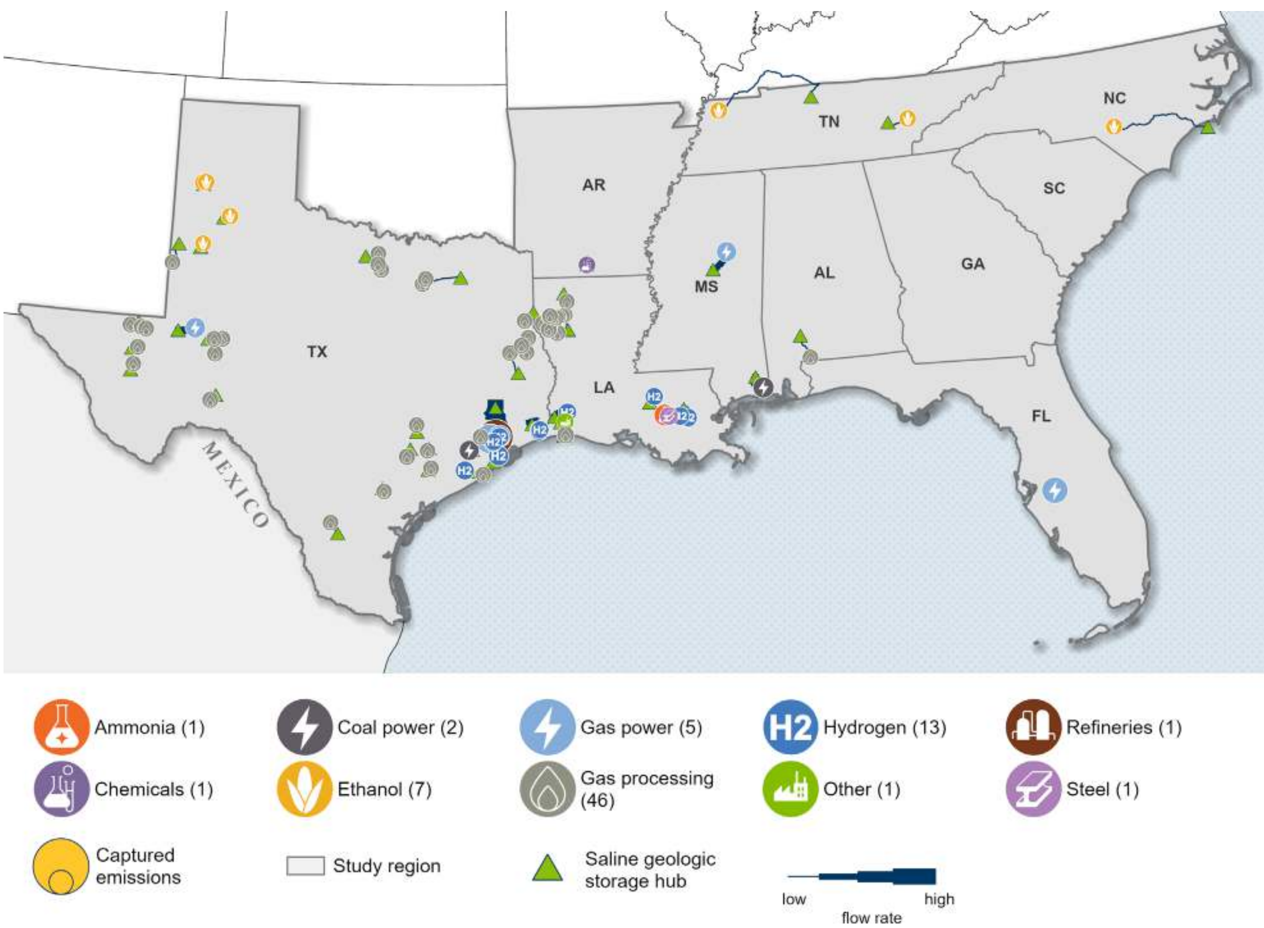
Southeast deployment scenario results

Two regional deployment scenarios were modeled to evaluate how carbon capture, transport, and storage infrastructure could develop across the SEGC. The scenarios differ in timeframe and facility selection, illustrating how deployment could expand from early, low-cost opportunities to include larger and more complex sources over time. The near-term scenario simulates a CCS network that could emerge within the next 10 to 15 years, using facilities with lower-cost, high-purity or high-volume CO_2 streams and commercially available capture technologies, as well as a select number of facilities with announced projects. The midcentury scenario expands this network to include additional industrial plants emitting more than one million metric tons of capturable CO_2 per year, as well as power facilities built after 2010 of similar scale. This broader set of facilities increases the total volume of CO_2 captured and extends the modeled pipeline network to connect more dispersed sources to onshore and offshore saline storage hubs. Together, these scenarios illustrate how the region's carbon capture and storage system could evolve from a collection of early projects into a more interconnected network by midcentury. In both scenarios, CO_2 is transported exclusively by pipeline and permanently stored in onshore and offshore saline formations. The number and location of storage hubs are optimized to store all captured CO_2 from the selected facilities while minimizing total system cost.

NEAR-TERM SCENARIO

The near-term scenario connects 78 capture facilities to 42 saline geologic storage sinks through roughly 2,200 kilometers (1,370 miles) of pipeline, capturing and storing 48.2 $MMtCO_2$ per year (figure 9). The average cost of capture, transport, and storage is \$118 per metric ton, with capture representing over 85 percent of the total cost.

Figure 9. Near-term scenario deployment modeling results for the Southeast and Gulf Coast

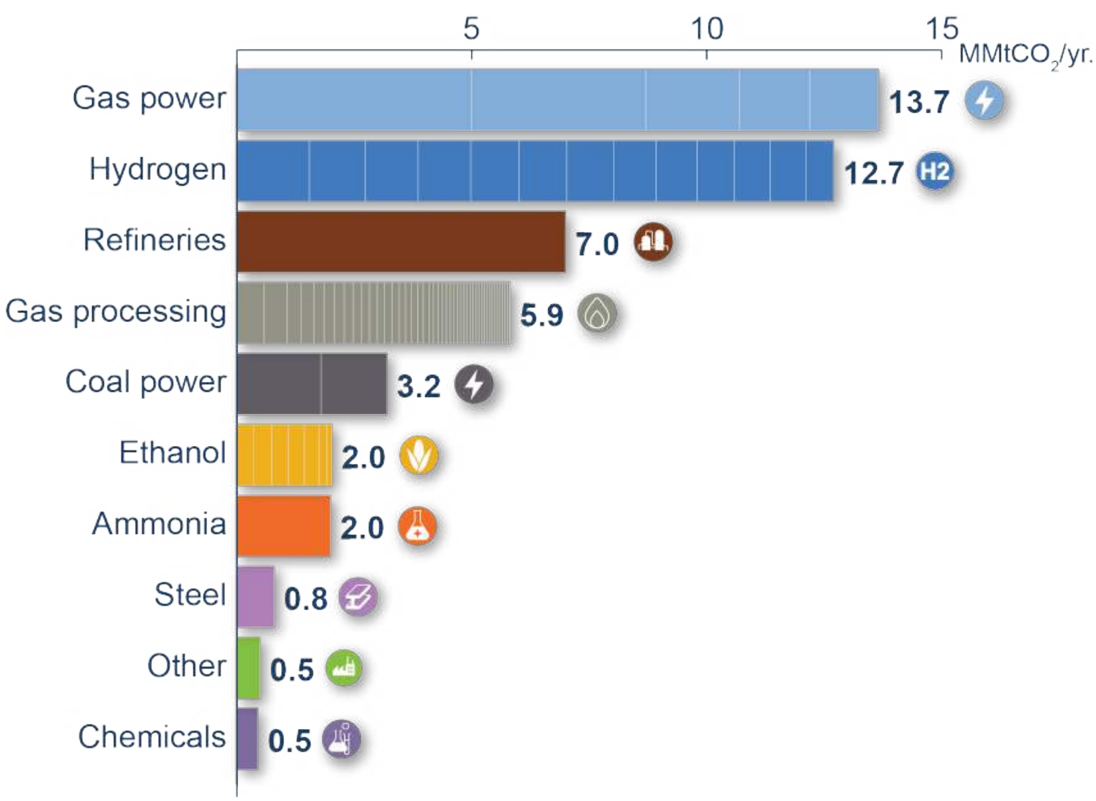


The modeled near-term network forms a series of compact regional systems rather than a single continuous pipeline network. Most facilities are concentrated along the Texas and Louisiana Gulf Coast, with smaller clusters in Mississippi, Alabama, Tennessee, Florida, and North Carolina. Pipelines are routed primarily along existing infrastructure corridors such as highways, railways, and rights-of-way to minimize new land disturbance and cost. The system consists mainly of short pipelines, ranging from tens to a few hundred miles, that converge on nearby storage hubs.

Onshore storage is concentrated within the Gulf Coast sedimentary basins and the Mississippi Embayment, while offshore pipelines extend into state and federal waters in the Gulf of Mexico/Gulf of America and Atlantic Ocean. Offshore formations near the Texas-Louisiana border and along the South Carolina coast provide high-injectivity sites that can accommodate multiple wells, each capable of storing up to one million metric tons of CO_2 annually. This network appears as clusters of capture facilities connected to storage hubs by short, coastal transport corridors, forming a pattern of dense industrial clusters linked to nearby geologic reservoirs.

Captured emissions in this scenario come from gas-fired power (13.7 $MMtCO_2$/yr) and hydrogen (12.7 $MMtCO_2$/yr) facilities. Additional near-term opportunities exist in coal-fired power and across industrial sources, including ammonia, chemicals, ethanol, natural gas processing, and refining, collectively capturing approximately 22 million metric tons of CO_2 per year (figure 10).

Figure 10. Captured emissions by sector for the near-term scenario



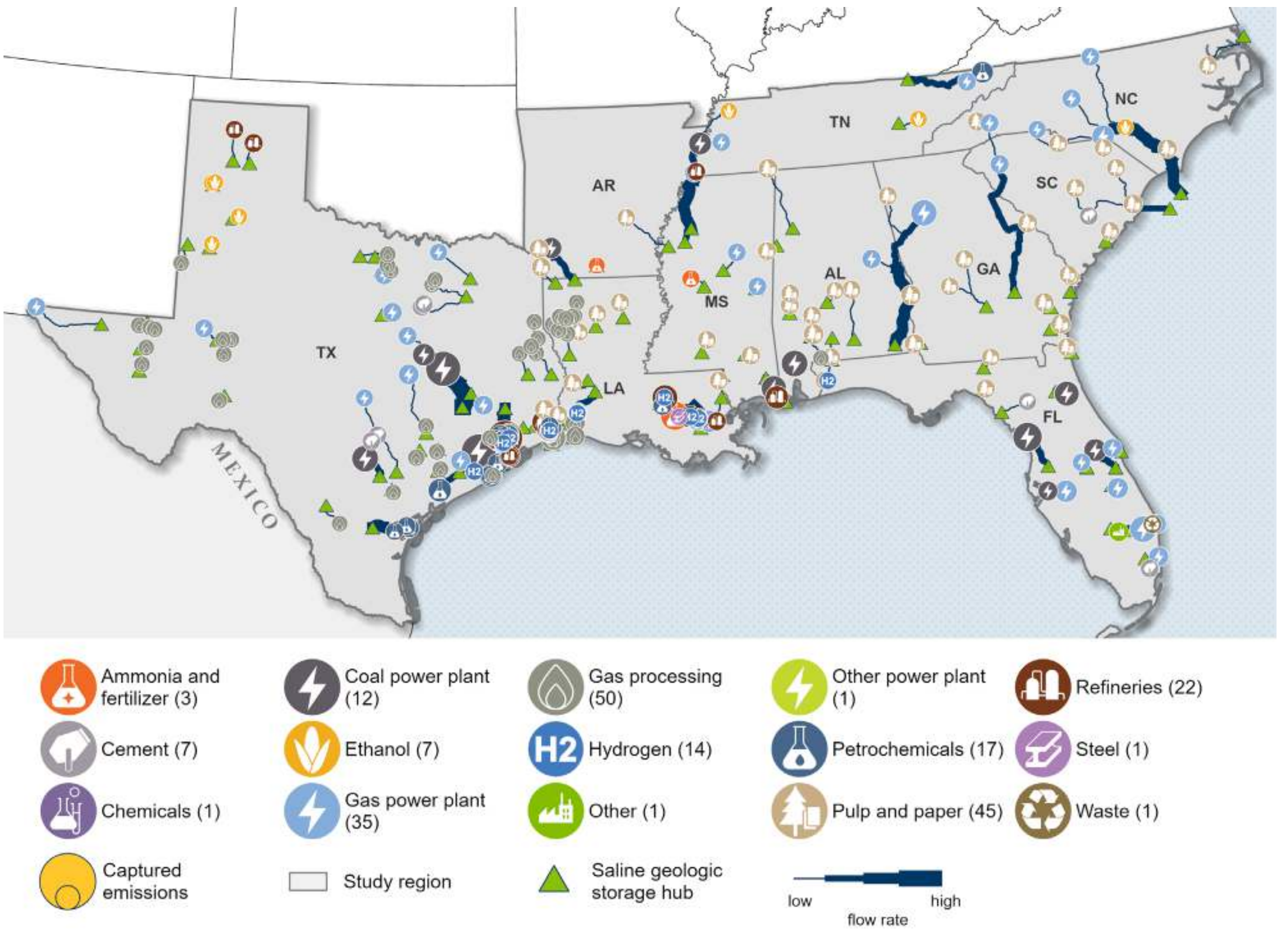
MIDCENTURY SCENARIO

The midcentury scenario represents a broader phase of carbon capture, transport, and storage deployment across the SEGC. The scenario connects 217 capture facilities to 109 saline geologic storage sinks through roughly 9,000 kilometers (5,590 miles) of pipeline, capturing and storing 392.8 $MMtCO_2$ per year (figure 11). The average cost of capture, transport, and storage is $148 per metric ton, with capture costs again accounting for more than 85 percent of total system cost.

The modeled network shifts from compact coastal clusters into a region-wide infrastructure system. Major corridors remain along the Texas and Louisiana coasts, with trunk pipelines extending north through Mississippi and Alabama and east toward Georgia and the Carolinas. These connections integrate previously separate clusters into a continuous, cost-optimized transport network.

Onshore saline formations in the Gulf Coast sedimentary basins and the Mississippi Embayment remain the backbone of storage. Offshore Gulf federal waters sites supplement capacity and account for roughly six percent of total midcentury injection.

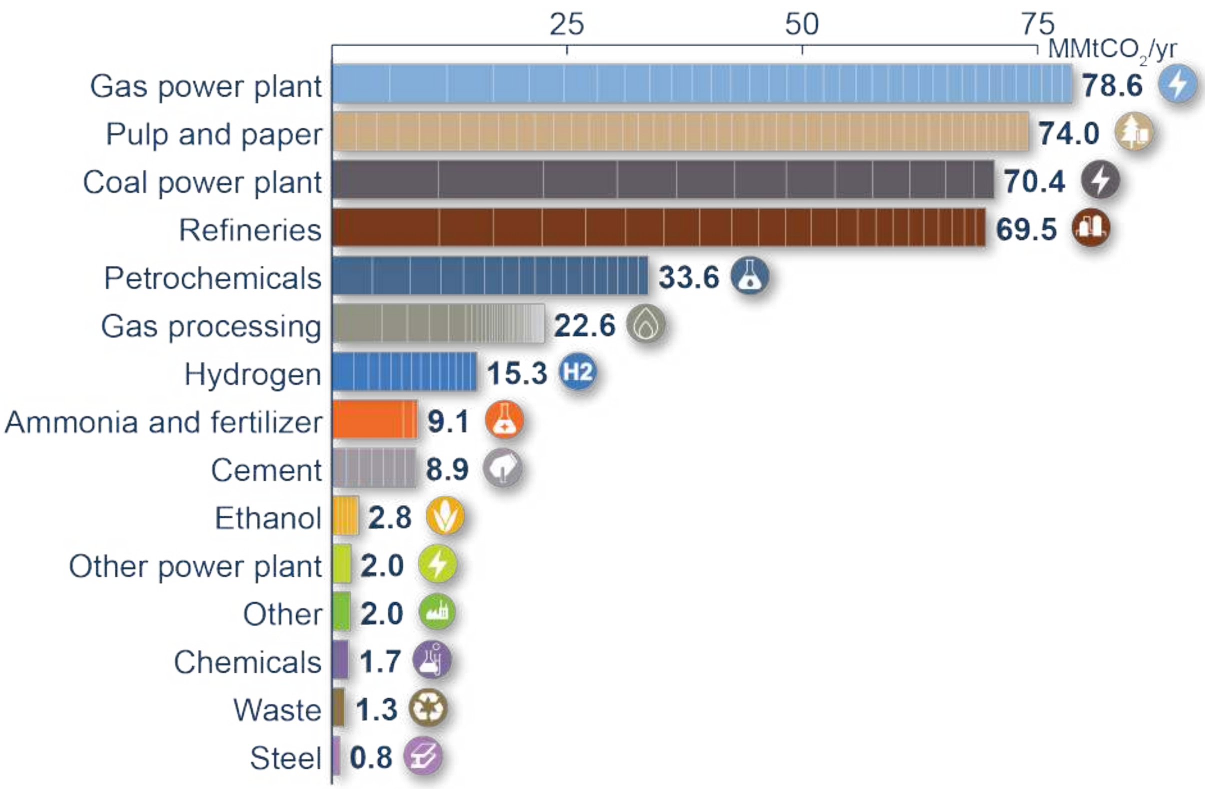
Figure 11. Midcentury scenario deployment modeling results for the Southeast and Gulf Coast



Capture volumes in the midcentury scenario vary widely across facility types. Power generation and hydrogen production together account for about 165 $MMtCO_2$ per year, while cement, refining, petrochemicals, and pulp and paper collectively add more than 195 $MMtCO_2$, making up over half of total captured CO_2 in the region. These combined contributions illustrate how large-scale deployment relies not only on major energy producers but also on the widespread participation of diverse industrial sectors.

The expanded facility set adds significant volumes from pulp and paper plants that generally have higher capture costs, incorporates LNG pretreatment and liquefaction facilities along the Gulf Coast, and includes additional cement, refinery, and petrochemical sources alongside expanded gas and coal power with carbon capture. Capture unit costs in this scenario generally range from \$120 to \$180 per metric ton, with smaller or lower-concentration sources extending above \$200 per metric ton.

Figure 12. Captured emissions by sector for the midcentury scenario



Discussion

The deployment scenarios presented in this analysis illustrate potential pathways for regional carbon capture, transport, and storage build-out across the SEGC. While they provide a detailed technical view of what a future CCS network may look like, they also represent idealized, cost-optimized systems based on current data, not forecasts of actual project development. Translating these modeled scenarios into real-world deployment will depend on a range of technical, economic, policy, and social factors that extend beyond what can be captured in a model.

CAPTURE

Capture facility selection considers facility-level emissions and technology costs to estimate the most likely near-term and midcentury deployment opportunities. These costs help estimate capture feasibility across various facility types; however, they do not account for site-specific variations in design or operational constraints that may impact project feasibility at individual facilities, such as flue gas composition, available space, and access to heat or power. All of these factors can substantially affect capture efficiency and cost.

Financing for projects included in this analysis assumed a 12-year capital recovery period and uniform financing terms across sectors, consistent with the current 45Q tax credit structure. In practice, project economics will vary based on access to low-cost capital, fuel prices, and the long-term certainty of federal and state incentives. Facilities with limited financing options or higher operational risks may have higher capture costs than modeled.

Current 45Q values are sufficient for high-purity CO_2 streams, such as those present in ethanol, hydrogen, and natural gas processing, but are generally insufficient for lower-purity industrial sources. However, model results indicate that credit values in the range of $120 to $140 per ton may be needed to spur deployment in sectors such as cement, refining, and petrochemicals. Ensuring long-term policy stability would further support the viability of future projects and help enable cost reductions.

The scenarios also only assess retrofit installations and do not consider new facilities. While retrofit modeling offers a realistic near-term snapshot, future capture systems could achieve lower costs and higher efficiencies if integrated into new plants designed with capture in mind. Greenfield carbon capture is already under consideration for proposed hydrogen, LNG, and petrochemical facilities along the Gulf Coast.[18]

Electricity-generating facilities meeting certain emissions thresholds and operational lifetimes were considered in the scenarios; however, actual project decisions will depend on additional considerations, including capacity factors, market demand, and evolving dispatch conditions. Renewable generation, industrial electrification, and emerging demand for firm low-carbon power, such as from data centers, will all influence which power plants are viable candidates for CCS.

Finally, the modeling does not account for competing decarbonization pathways such as fuel switching, electrification, or process substitution. These options may reduce emissions at some facilities, altering the relative attractiveness of CCS. A more integrated analysis that includes these alternatives would refine expectations for total capturable emissions and infrastructure needs.

TRANSPORT

CO_2 pipelines are the only transport mode modeled in the near-term and midcentury scenarios, optimized for cost and routing efficiency. In practice, other potential transport options, such as truck, rail, or barge, may offer practical and cost-effective solutions for transporting smaller or short-distance volumes and could help connect dispersed emitters, especially those near ports or offshore storage sites.

The CO_2 pipeline modeling considers environmental and physical constraints, including land cover and slope, population density, and existing rights-of-way. However, it does not consider additional factors, such as local opposition and permitting complexity, that may impact the feasibility of pipeline siting in certain areas. Actual pipeline development will likely depend

18 Clean Air Task Force, "US Carbon Capture Activity and Project Table"; Global CCS Institute, Global Status of CCS 2025.

on transparent safety standards, consistent permitting processes, and opportunities for meaningful public participation.

Although the modeled network excludes existing CO_2 pipelines, several already operate in Texas, Louisiana, and Mississippi. Incorporating existing infrastructure into regional optimization models could potentially reduce the total system length and cost in specific corridors, or lower costs while minimizing new land disturbance. Alternatively, it could reduce options for build-out in those areas.

STORAGE

While this analysis factored in estimates of capacity, injectivity, and cost to help select onshore and offshore saline formations, it does not substitute for site-specific geologic characterization, which requires seismic and geochemical data to confirm storage viability. Actual injection rates, well spacing, and pressure interference among nearby sites can significantly affect the total usable capacity in a basin.

The SEGC have substantial storage potential, both onshore and offshore. Offshore formations are modeled to store approximately six percent of total injected CO_2 in the midcentury scenario, but this share could grow as operators pursue offshore Class VI permits to avoid land use conflicts. Several state and federal offshore lease applications in Texas and Louisiana indicate a growing interest from the private sector in these opportunities.

Although the modeling evaluates the suitability and cost of injecting into geologic formations, it does not account for mineral rights, pore space ownership, or permitting complexity. These factors can substantially influence project timelines, costs, and site selection. Securing access to pore space, clarifying long-term liability, and expanding state Class VI primacy are key policy priorities that enable the timely deployment of projects. Additionally, the scenarios consider only saline formations; future storage portfolios could include enhanced oil recovery or utilization pathways, particularly given the parity in 45Q tax credit values for enhanced oil recovery and dedicated storage projects following the passage of the One Big Beautiful Bill Act.[19]

Conclusion

The near-term and midcentury CCS deployment scenarios demonstrate that large-scale capture and storage could feasibly develop across the SEGC over the next several decades. However, realizing these modeled systems will require overcoming barriers related to cost, permitting, public perception, and financing. Continued policy support, particularly for financial incentives for capture and storage, as well as Class VI permitting, will be critical to converting modeled potential into deployment. States across the Southeast can build upon these findings to develop coordinated strategies that align economic, environmental, and social objectives as they build toward a regional carbon management system.

19 H.R. 1 - One Big Beautiful Bill Act, H.R. 1; Carbon Capture Coalition, "The One Big Beautiful Bill Act of 2025."

Bibliography

Bauer, J, C Rowan, A Barkhurst, et al. “NATCARB.” United States, September 26, 2018. https://doi.org/10.18141/1474110.

Bennett, Jeffrey A., Kat Sale, Daniel Rodriguez, et al. “Identifying Opportunities and Cost for CO_2 Capture at Power and Industrial Facilities in the United States.” In Carbon Capture, Utilization, and Storage Conference and Exhibition, 11?13 March 2024, 0 vol. SEG Global Meeting Abstracts. Carbon Capture, Utilization, and Storage (CCUS) Conference and Exhibition, 2024. https://doi.org/10.15530/ccus-2024-4014460.

Carbon Capture Coalition. “The One Big Beautiful Bill Act of 2025.” July 2025. https://carboncapturecoalition.org/wp-content/uploads/2025/07/OBBB-fact-sheet.pdf.

Carbon Capture Coalition, and LLC Brown Brothers Energy and Environment. 45Q Research Brief: Ensuring the Continued Success of the American Car Bon Management Industry. May 9, 2025. https://carboncapturecoalition.org/wp-content/uploads/2025/05/45Q-anal ysis_v3-1.pdf.

Carbon Solutions. “SCO_2T^{Pro}.” Carbon Solutions, n.d. Accessed November 20, 2025. https://www.carbonsolutionsllc.com/software/sco2tpro/.

Clean Air Task Force. “US Carbon Capture Activity and Project Table.” November 30, 2024. https://www.catf.us/ccstableus/.

Credit for Carbon Oxide Sequestration.

Global CCS Institute. Global Status of CCS 2024. 2024. https://www.globalccsinstitute.com/wp-content/uploads/2024/11/Global-S tatus-Report-6-November.pdf.

Global CCS Institute. Global Status of CCS 2025. 2025. https://www.globalccsinstitute.com/wp-content/uploads/2025/10/Global-Status-of-CCS-2025-report-9-October.pdf.

Hackett, Gregory, and Norma Kuehn. Natural Gas Combined Cycle CO_2 Capture Retrofit Database. NETL, 2023. https://www.netl.doe.gov/energy-analysis/details?id=428b6b31-5a0b-4581-a7b0-12da7a301878.

Hackett, Gregory, and Norma Kuehn. Pulverized Coal CO_2 Capture Retrofit Database. National Energy Technology Laboratory (NETL), Pittsburgh, PA, Morgantown, WV, and Albany, OR (United States), 2023. https://doi.org/10.2172/1968297.

H.R. 1 - One Big Beautiful Bill Act, H.R. 1 (2025). https://www.congress.gov/bill/119th-congress/house-bill/1/text.

Hughes, Sydney, Alex Zoelle, Mark Woods, et al. “Industrial CO_2 Capture Retrofit Database (IND CCRD).” September 2022. https://www.osti.gov/biblio/1887588.

Intergovernmental Panel on Climate Change (IPCC), ed. “Summary for Policymakers.” In Global Warming of 1.5°C: IPCC Special Report on Impacts of Global Warming of 1.5°C above Pre-Industrial Levels in Context of Strengthening Response to Climate Change, Sustainable Development, and Efforts to Eradicate Poverty. Cambridge University Press, 2022. Cambridge Core. https://doi.org/10.1017/9781009157940.001.

Mark-Moser, MacKenzie, Michael Marquis, Alana Sheriff, et al. “FECM/NETL Offshore CO_2 Saline Storage Cost Model.” Version 1. March 4, 2025. https://doi.org/10.18141/2526258.

Metz, Bert, Ogunlade Davidson, Heleen Coninck, Manuela Loos, and Leo Meyer. “IPCC Special Report on Carbon Dioxide Capture and Storage.” Policy Stud., January 1, 2005.

Middleton, Richard S., Michael J. Kuby, and Jeffrey M. Bielicki. “Generating Candidate Networks for Optimization:

The CO_2 Capture and Storage Optimization Problem." Computers, Environment and Urban Systems 36, no. 1 (2012): 18–29. https://doi.org/10.1016/j.compenvurbsys.2011.08.002.

Middleton, Richard, Sean Yaw, Brendan Hoover, and Kevin Ellett. "SimCCS: An Open-Source Tool for Optimizing CO_2 Capture, Transport, and Storage Infrastructure." Environmental Modelling & Software 124 (October 2019): 104560. https://doi.org/10.1016/j.envsoft.2019.104560.

Moniz, Ernest, Joseph Hezir, Michael Downey, et al. Unlocking Private Capital for Carbon Capture and Storage Projects in Industry and Power. 2025. https://efifoundation.org/wp-content/uploads/sites/3/2025/04/Unlocking -Private-Capital-for-CCS-Projects-in-Industry-and-Power.pdf.

Ogland-Hand, Jonathan, Kyle Cox, Benjamin Adams, et al. How to Net-Zero America: Nationwide Cost and Capacity Estimates for Geologic CO_2 Storage. 2023.

Sale, Kat, Jeffrey Bennett, Jessi Eidbo, et al. Finding New Opportunities for Carbon Capture with CO_2NCORD. 2024. https://doi.org/10.31224/3642.

Sale, Kat, Jeffrey Bennett, Jessi Eidbo, et al. Finding New Opportunities for Carbon Capture with CO_2NCORD. 2024.

Smith, Erin, Jennifer Morris, Haroon Kheshgi, Gary Teletzke, Howard Herzog, and Sergey Paltsev. "The Cost of CO_2 Transport and Storage in Global Integrated Assessment Modeling." International Journal of Greenhouse Gas Control 109 (July 2021): 103367. https://doi.org/10.1016/j.ijggc.2021.103367.

United Nations Environment Programme. Emissions Gap Report 2025: Off Target - Continued Collective Inaction Puts Global Temperature Goal at Risk. Nairobi, 2025. https://www.unep.org/resources/emissions-gap-report-2025.

US Energy Information Administration. "State Energy Profile Data." June 2025. https://www.eia.gov/state/data.php#Prices.

US Environmental Protection Agency. Geologic CO_2 Sequestration Technology and Cost Analysis. 2008. https://www.epa.gov/sites/default/files/2015-07/documents/support_uic_ co2_technologyandcostanalysis.pdf.

US Environmental Protection Agency Office of Atmospheric Protection. "Greenhouse Gas Reporting Program (GHGRP)." October 15, 2024. www.epa.gov/ghgreporting.

Vidas, Harry, Bob Hugman, Ananth Chikkatur, and Boddu Venkatesh. "Analysis of the Costs and Benefits of CO_2 Sequestration on the US Outer Continental Shelf." OCS Study BOEM 100 (2012).