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Challenges for People and Planet in the Carbon Capture Buildout

Climate Impacts, Community Harms, and the Gulf South Epicenter

REPORT SUMMARY

Carbon capture, utilization, and storage is expanding rapidly, driven by federal tax credits and public subsidies. Yet its climate benefits remain uncertain, while its risks fall heavily on communities already burdened by fossil fuel and petrochemical pollution. The Gulf South—especially Louisiana and Texas—has become the center of this buildout, with more than 60 percent of proposed fossil fuel-based CCUS projects located in the two states.

The report examines how CCUS may prolong fossil fuel dependence, increase local pollution, add hazardous pipelines and storage infrastructure, and direct potentially hundreds of billions of taxpayer dollars toward an unproven and weakly regulated climate strategy.

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ABOUT JUST SOLUTIONS

Just Solutions invests deeply in state-level coalitions and organizations to lead the way on climate solutions that support healthy, resilient communities and accountable democratic institutions. We provide innovative, responsive solutions to some of the most pressing problems of our time.

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Introduction

With support from recent developments in federal tax policy, carbon capture, utilization, and storage (CCUS) is poised for expansion like never before. Hundreds of CCUS projects—encompassing multiple sectors including petrochemicals, gas processing, industrial production, biofuels, and power generation—have been announced and many are under development. A significant number of large carbon dioxide (CO_2) storage well "hubs" are also proposed, to create common infrastructure and economies of scale for storing captured CO_2 from multiple sources.

With CCUS expansion on such a scale, the fundamental flaws of this technology and the approach to climate change it embodies and promotes could be quite consequential, not only in the fight against climate change, but also in the places where CCUS operations are unleashed. The risks and consequences for communities are considerable, including local pollution and infrastructure impacts that raise serious concerns about environmental justice. But the "climate case" and the "community case" against CCUS are deeply interconnected and share a common root in the fundamental problem of fossil fuel dependency and profitmaking in our economy. It is therefore important to first grasp the faulty climate logic behind CCUS.

The justification given for using CCUS is straightforward: instead of sharply reducing fossil fuel use and dependency in our economy, we can continue to use these fuels and limit the harmful climate change impacts of continuing oil and gas extraction and combustion (or chemical conversion) by technologically capturing the resulting CO_2 and then keeping it out of the atmosphere. This is done either by securely burying the CO_2 underground or putting it to use in producing other materials or goods that potentially have an effect of reducing net emissions as compared to a scenario without carbon capture. The underlying fallacy in such thinking is that we can limit greenhouse gas (GHG) emissions without reducing our dependency on fossil fuels and thereby without reducing or encumbering the profits and assets of fossil fuel corporations. In fact, because the tax credits that subsidize it are awarded on a per ton basis of stored CO_2, CCUS arguably invites efforts to *increase* the use of fossil fuels in pursuit of greater subsidies. This is in keeping with the fact that CCUS was first developed and deployed by the fossil fuel industry precisely for the purpose of increasing oil extraction in the form of enhanced oil recovery (EOR), where captured CO_2 is used as an injectant to recover hard-to-reach oil from depleted reservoirs.[1] Under current CCUS tax policy—specifically, Section 45Q of the Internal Revenue Code—securely storing CO_2 underground or using it for EOR are credited at the same rate.[2]

In this report, we aim to do three basic things. The first is to profile and assess the current crossroads and momentum for CCUS development at the project level and then to excavate the policy story behind this major shift. The second is to lay out in some detail both the "climate case" and the "community case" against CCUS, with the troubling implication of taxpayers footing the bill for causing more harm than good in both cases. The third is to put a spotlight on the CCUS buildout in the Gulf South region, clearly a targeted area for carbon capture development in connection with the fossil fuel and petrochemical industries; specific striking cases illustrate how a misguided climate solution is also putting the communities in its path at further risk.

Of 177 fossil fuel-based CCUS projects currently proposed or under construction, 64, or 36 percent, are sited in Louisiana, and Louisiana and Texas are home to a combined 112 CCUS projects or roughly 63 percent of the total, 53 of which are already permitted or have permits pending. More than half of these projects are CO_2 sequestration sites or hubs, and the two states' combined storage buildout by number of projects, in turn, comprises more than 60 percent of the total storage buildout nationally—a trend clearly reflecting the relative scale of carbon capture and storage potential in the region. In addition,

1 Decades later, as of 2022, 87 percent of captured CO_2 reported in the Greenhouse Gas Reporting Program was being used for EOR. See Bains, P. (2023). Flaws in EPA's Monitoring and Verification of Carbon Capture Projects. Environmental Integrity Project. Table 2.

2 Credit parity for "CCUS-EOR" was codified in the One Big Beautiful Bill Act of 2025, overturning the 45Q program's longstanding principle of assigning a higher value to secure sequestration. It is clear that corporate lobbying helped to secure this major shift: out of nearly $1 billion spent on CCUS-related lobbying activities between 2004 and 2025, 89 percent was spent by fossil fuel corporations, directly associated businesses, and fossil-fuel dependent industries. See Gulden, L. E., & Harvey, C. (2025). Tracing sources of funds used to lobby the US government about carbon capture, use, and storage. *Environmental Science & Policy*, *171*, 104171. Another carbon capture technology, direct air capture (DAC), aims to remove already emitted CO_2 from the atmosphere and thus could have clear positive climate benefits; however, this approach is prohibitively costly to implement and energy intensive in itself, and thus its potential benefits are in fact highly uncertain. On DAC opportunity costs compared to renewable energy investments, see Kashtan, Y., Pendleton, J., Sousa, B., Willis, M. D., Michanowicz, D. R., Shonkoff, S. B., & Buonocore, J. J. (2026). Direct air capture has substantial health and climate opportunity costs. *Communications Sustainability*, *1*(1), 67. It should also be noted that CCUS is potentially more positive for narrow applications in hard-to-abate industries such as cement production, but given comparatively higher costs of heavy industrial CCUS, widespread adoption does not seem likely under current policy or market conditions.

the two states are home to 14 new or expanded CO_2 pipeline projects.[3] On this emerging scale—as of 2023, only 14 CCUS projects were operational in the US[4]—the Gulf South CCUS buildout threatens to compound and deepen environmental injustices that have taken root over decades of fossil fuel and petrochemical development and production in the region.[5] Now, carbon capture is adding yet another layer of development and further adverse impacts to this ongoing legacy of environmental injustice and ecological harm.

Twenty-one projects, or roughly 12 percent of the total emerging CCUS buildout, are clustered in just four parishes across the Southeast Louisiana industrial corridor known as "Cancer Alley." This 85-mile stretch between Baton Rouge and New Orleans (the "SE industrial corridor") is home to some 200 chemical, fossil fuel, and industrial production facilities that have impacted predominantly Black and lower-income populations with extreme pollution exposure and endemic health risks and effects over decades, including disproportionately high cancer rates.[6] As seen in Figure 1, petrochemical and industrial facilities in this region are clustered in areas with higher densities of Black residents, and most of the new CCUS-involved facilities are sited in the same areas. Southeast Texas is also targeted for dozens of new fossil fuel and related chemical facilities or projects, including 15 incorporating CCUS in non-white majority Harris and Jefferson counties, with all of this being built on top of existing toxic facility clus-

3 Oil & Gas Watch. Carbon Capture Use and Storage (CCUS) summary. Retrieved June 28, 2026. The OGW database includes CCUS projects at oil and gas processing facilities and refineries and petrochemical production facilities, as well as CO_2 storage and pipeline projects. Except as otherwise cited, CCUS project data in this report are drawn from the OGW database. Another, more expansive CCUS database, maintained by the Clean Air Task Force, also includes projects in the biofuels sector as well as cement and steel production, and a number of power plant projects. In both databases, projects are either proposed, in development, or under construction. The OGW database is interactive and more comprehensive as a research tool, including links to project permit applications and final permits (where applicable), project emissions profiles (drawn primarily from facility permits and EPA facility reports), as well community profiles (drawn primarily from EPA EJ Screen reports). Other significant clusters of CCUS projects in development are in the Upper Plains States, the Midwest, and California.

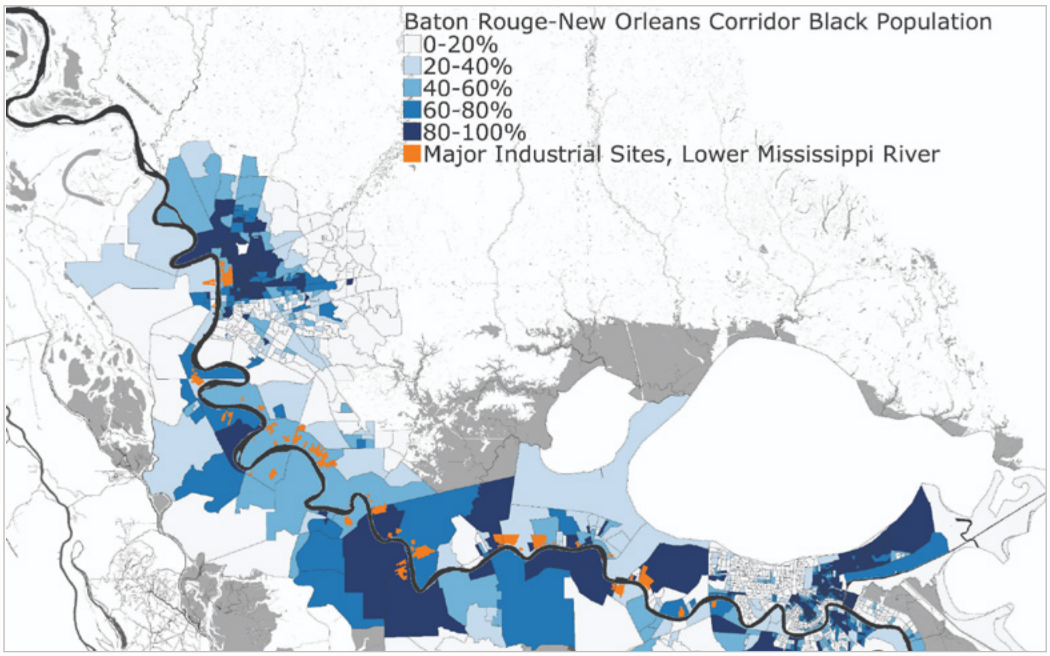
4 Global CCS Institute. (2023). *Global Status of CCS 2023*.

5 Donaghy, T. Q., Healy, N., Jiang, C. Y., & Battle, C. P. (2023). Fossil Fuel Racism in the United States: How Phasing out Coal, Oil, and Gas Can Protect Communities. *Energy Research & Social Science*, *100*, 103104; Juhasz, A. (2024, January 25). "*We're Dying Here": The Fight for Life in a Louisiana Fossil Fuel Sacrifice Zone*. Human Rights Watch.

6 Terrell, K. A., & St Julien, G. (2022). Air pollution is linked to higher cancer rates among black or impoverished communities in Louisiana. *Environmental Research Letters*, *17*(1), 014033. US Environmental Protection Agency estimates in its Air Toxics Screening Assessment, based largely on self-reported facility data, point to higher-than-average hazardous pollution concentrations and cancer risk in the region, but recent research employing mobile monitors to capture hyper-local pollutant concentrations in 15 census tracts with polluting facilities suggests far higher hazardous pollutant concentrations and cancer risk in these places, including primarily from ethylene oxide along with smaller contributions from chloroprene and formaldehyde. See Robinson, E. S., Yassine, A., Agarwal, S., Tehrani, M. W., Lupolt, S. N., Chiger, A. A., ... & DeCarlo, P. F. (2025). Total cancer risk estimates from measured concentrations of volatile organic compounds in industrialized southeastern Louisiana. *Proceedings of the National Academy of Sciences*, *122*(41), e2504770122.

ters and correlated poor air quality and negative health impacts in surrounding areas.[7] It should be underscored that nearly all of these CCUS-involved facilities are *new*, and thus the subsidies that come with CCUS must be understood as helping to finance yet more pollution and additional community burdens on top of the already profound cumulative burdens that mark the region.

Figure 1. Race and Industry in Cancer Alley, Louisiana, 2013.



Source: Stepniak, M. (2015). Industry & Infrastructure: Cancer Alley, LA and Detroit, MI. Parsons School of Design, The New School.

Specifically, CCUS in the Gulf South threatens further harm in three main ways: 1) increasing and further "locking in" the production, processing, transport, combustion, and associated greenhouse gas emissions of fossil fuels in the region; 2) causing more local pollution in places already overburdened by toxic air pollutants among a host of other health stressors, all of which disproportionately affect low-income households and communities of color; and 3) adding more scarring infrastructure of pipelines and wells—for CO_2 transport and storage—to already fragile local ecosystems, along with more public safety risks in the communities where such infrastructure will be sited.

The threat of significant environmental justice and racial equity impacts of CCUS expansion in the Gulf South significantly raises the stakes for efforts to curtail or eliminate the 45Q tax credit. As we will see in Part II, 45Q was significantly expanded in both the Inflation Reduction Act of 2022 (IRA) and

7 Bullard, R. D., Powers, L. T., Yoder, N., King, D., & Johnson, G. S. (2025). Green Light to Pollute in Texas: Proposed Buildout of Petrochemical Facilities Targets Most Vulnerable Communities, Again. Bullard Center for Environmental & Climate Justice.

the One Big Beautiful Bill Act of 2025 (OBBBA); it is a major focal point for opponents of CCUS because, in the absence of any regulatory limits on CO_2 emissions at the federal level and in most states (including Louisiana and Texas), 45Q is arguably the only reason for adopting CCUS. However, at $85 per ton, the current 45Q rate is not in itself generally sufficient relative to the costs of CCUS—most conspicuously so in the gas power sector and heavy industry. Indeed, without further enhancement of the 45Q program, CCUS expansion as a commercially viable pathway for reducing greenhouse gas (GHG) emissions—or at least claiming to do so—could be quite limited.[8] Yet based on today's rapidly expanding pool of CCUS projects proposed or in development, cumulative taxpayer costs for CCUS could potentially grow to as much as $835 billion in total under current policy, according to the Institute for Energy Economics and Financial Analysis (IEEFA). In fact, the total federal subsidy could grow to more than $2 trillion if the 45Q program is further enhanced with higher credit rates and longer eligibility timelines.[9]

A surge of new corporate research, advocacy, and publicity for CCUS, spurred by increasing federal support, has sparked a dramatic increase in related policy development, especially at the state level.[10] At the same time, CCUS is starting to face strong headwinds at the grassroots level, driven by mounting fiscal, environmental justice, and local safety and quality-of-life concerns. As noted in the Executive Summary, already one major Gulf South CCUS project, Air Products' massive Louisiana Clean Energy Complex (LCEC) for producing "blue ammonia,"[11] has been cancelled.[12] With a 496-acre facility footprint in the Darrow-Burnside-Sorrento area of Ascension Parish, toward the north end of the SE industrial corridor, the proposed facility would have been built along with two other new blue ammonia plants being developed nearby, in what is already, according to the Environmental Protection Agency's Toxics Release

8 The Carbon Capture Coalition is pushing for $130 per ton. See Carbon Capture Coalition. (2025). *45Q Research Brief: Ensuring the continued success of the American carbon management industry*.

9 Institute for Energy Economics and Financial Analysis. (2025). *Tax Credits for Carbon Capture, Utilization, and Storage (CCUS)*. [Fact Sheet].

10 Grey, S., Shenkman, E. G., & Pickerill, S. (2024, July 18). *State Action on CCS Continues in Alaska, Colorado, Illinois, Alabama, and Pennsylvania*. Environmental Edge, Arnold & Porter.

11 The modifier "blue" generally refers to limiting CO_2 emissions by adapting conventional natural gas-based production with carbon capture technology. Ammonia is thermochemically derived from hydrogen, and "blue ammonia" refers to ammonia produced with low-carbon hydrogen, where carbon capture technology is used to reduce CO_2 emissions in the process of reforming hydrogen from natural gas.

12 Air Products announced the project's cancellation on June 30, 2026. See Air Products. (2026, June 30). *Air Products Will Not Proceed with Louisiana Clean Energy (LCEC) Project; Company Will Record Pre-Tax Charge in Fiscal Third Quarter; Finalizing Agreement with Yara for Renewable Ammonia from NEOM Green Hydrogen Project in Saudi Arabia*. [Press Release]. The company also disclosed expected charges of as much $2.9 billion to write down project development costs.

Inventory, among the most polluted counties in the country.[13] Although Air Products cited economic reasons for cancelling the new plant,[14] grassroots resistance was also clearly a factor, including local residents' opposition to the project's proposed transport and storage system.[15] Louisiana Governor Jeff Landry was seeking to quell the rising tide of community discontent when, on October 15, 2025, he took the unprecedented step of issuing an executive order that imposed an indefinite moratorium on new CO_2 storage permits and imposed specific new guidelines and standards for processing existing applications.[16] Nevertheless, across the SE industrial corridor, three out of four proposed ammonia plants involving CCUS are expected to be operational by 2030, and two have already received final air permits from the Louisiana Department of Environmental Quality (LDEQ). Two of the three new plants are in Ascension Parish—Clean Hydrogen Works' Ascension Clean Energy Project, in Donaldsonville, and CF Industries' Blue Energy Complex in nearby Modeste—and the third, the St. Rose Blue Ammonia facility, fills out the region's chemical sector CCUS buildout at the south end of the SE industrial corridor, in St. Charles Parish, directly west of New Orleans. Specific aspects of the now-withdrawn Air Products LCEC project are also important to understand, and we give some attention to the LCEC in this report, as background for assessing ongoing development of related projects in the region.

Yet, even as these large-scale projects and many others are moving forward, potentially difficult economic and policy challenges for CCUS cannot be ignored. In addition to the problem of being dependent on federal subsidies, other economic and policy factors, such as uncertain off-take markets and prices for

13 In 2024, Ascension Parish ranked first among US counties for point source toxic air emissions from all industrial facilities reporting to the Toxics Release Inventory, and third among counties for combined toxic releases (air, water, and land) from chemical production facilities, with more than 23 million lb reported. See US Environmental Protection Agency. (2026). Toxics Release Inventory Program (TRI): TRI Explorer (2024 National Analysis Dataset released November 2025), Geography US County Report. Reporting year 2024. The world's largest ammonia production complex, owned by Ohio-based CF Industries, operates just a few miles away from the new blue ammonia plants under development and is ranked first nationally among more than 14,000 facilities for point source air emissions of toxic chemicals as of 2024.

14 Sahay, V. (2026, June 30). *Air Products to Exit Louisiana Clean Energy Project; Flags $2.9 billion hit*. Reuters.

15 The project's proposed transport and storage system included a sprawling complex of 18 CO_2 injection and monitoring wells to be built under Lake Maurepas, a 90-square-mile estuarine tidal lake system beloved for sport fishing and recreation in the southeast corner of white-majority (86 percent) and deep Red (+69 for Trump in 2024) Livingston Parish, and connected to Air Products' factory complex along the Mississippi River via a roughly 38-mile CO_2 pipeline. See Muller, W. (2023, December 3). *Lake Maurepas carbon capture project draws increasing opposition: Residents don't want project in lake*. Louisiana Illuminator. See also: Cartwright, C. (2024, October. 5). 'I am begging you, do not approve this': Air Products Plant Faces Opposition at LDEQ Hearing.*The Advocate*.

16 See State of Louisiana, Office of the Governor. (2025, October 15). Executive Order JML 25-119.

CCUS-adapted "clean" products, and regulatory uncertainty that can weaken investor confidence, are also critically important. The latter includes excessive risk of project liability introduced by, among other things, Trump Administration actions such as its proposed repeal of the Greenhouse Gas Reporting Program, which includes the core regulatory framework for "monitoring, reporting, and verification" (MRV) of CO_2 storage, as the basis for 45Q credit claims.[17] Further, if the Environmental Protection Agency (EPA) succeeds in the courts with its revocation of the Agency's 2009 "endangerment finding" on GHG emissions, which undergirds federal authority to regulate CO_2 and other heat-trapping gasses under the Clean Air Act, CCUS expansion will no longer potentially be tethered to any program of regulatory compliance with GHG emissions standards—in contrast with the Biden Administration's clean power rules (now also facing repeal) for new natural gas plants and existing coal plants, which designated CCUS as the default control technology for reducing power plant CO_2 emissions.[18] The case for publicly subsidizing CCUS, already vulnerable to climate and environmental justice critiques, is arguably only further weakened by lack of any regulatory "sticks" that could validate its role under a standard-setting policy or market-based program of mandatory emissions reductions.

While the complex commercial challenges facing CCUS development warrant closer examination in future research, the following report aims to take stock of CCUS expansion as currently proposed or under development, assuming that progress on a significant scale is possible with continuing policy support. It is also safe to assume that CCUS is likely to get traction more rapidly in the Gulf South region because of built-in political and infrastructural advantages for industry (and disadvantages for communities) that are unique to the region. In fact, the first major project of the new CCUS buildout, a carbon capture retrofit of CF Industries' massive, 60-year old ammonia and nitrogen products complex in Donaldsonville, LA, commenced operations in July 2025,[19] and the new CF Industries Blue Point Complex in Modeste, noted above, reached a Final Investment Decision with two Japanese partners (JERA and Mitsui) in April 2025. The combined CO_2 capture capacity of the two plants is approximately 4.3 million tons per year (tpy), which could generate cumulative 45Q credits worth more

17 This is Subpart RR of the Greenhouse Gas Reporting Program, which follows from requirements of the Underground Injection Control Program as authorized under the Safe Drinking Water Act. On implications for CCUS, see Al-Shamma, M. (2025, October 15). *Why EPA's Greenhouse Gas Reporting Program Matters for the 45Q Carbon Sequestration Credit*. Bipartisan Policy Center.

18 Dabbs, B., Anchando, C., & Marshall, C. (2023, May 10). *The complete guide to CCS and the EPA power plant rule*. E & E News by Politico.

19 Bush, T. (2025, September 7). *CF Industries Flips Switch on Massive CCS Hub That Changes Everything*. decarbonfuse.

than $4 billion under current policy.[20]

The fact that CCUS expansion is not only a climate problem but equally an environmental justice problem is thus already becoming evident on the ground, in terms of project siting; and with this, issues of race, it follows, are necessarily at the core of how carbon capture expansion needs to be researched, evaluated, explained, and ultimately resisted or reformed. With this report, we hope to contribute to a conversation about CCUS that includes but goes beyond technical debates about climate impacts and equally considers how CCUS operations, from point-source capture to sequestration underground (including offshore), could directly impact the communities that lie in its path and further compound environmental injustices that are endemic in the region.

The report is structured as follows: Part I assesses the current crossroads of CCUS expansion and its potential footprint in the Gulf South. Part II outlines key aspects of the policy history and subsidy structure for CCUS as it has taken center stage in today's polarized debates about energy system development, and it briefly sketches key policy issues that remain unresolved at this critical turning point in CCUS development. Part III then discusses the climate and environmental justice concerns surrounding CCUS. Part IV redirects this critical focus to what is happening on the ground, starting with an overview of key trends in the current pollution "baselines" of the Gulf South region and particularly in Louisiana and Texas. Part V brings the situation on the ground into sharper focus with an assessment of specific examples of CCUS development that are raising alarms in impacted communities. In a brief Conclusion, we refocus our analysis on the bigger picture of CCUS development—and embattlement—in the Gulf South, and we restate our justice-centered case against such schemes. Surely, at a minimum, taxpayers should not be footing the bill for an unproven and unaccountable climate solution, let alone one that threatens, if not promises to inflict further harm on the communities already most at risk in the climate crisis.

20 Construction Front Team. (2025, April). Technip Energies to Deliver Blue Point, World's Largest Low-Carbon Ammonia Facility in Louisiana. Constructionfront.com.

Part I. The Current Crossroads for CCUS

CCUS is a 50-year-old technology developed by the fossil fuel industry as a tool for boosting oil production and extending the commercial life of depleted oil reserves—what is commonly termed enhanced oil recovery (EOR).[21] As originally deployed, the "capture" and "storage" parts of CCUS were incidental to the "utilization" part, namely, using captured CO_2 as an injectant to get more oil out of the ground; further, although some CO_2 has been captured directly from fossil fuel and industrial facilities, most of the CO_2 for EOR, to this point, has been removed from permanent natural CO_2 deposits such as the Jackson Dome in Central Mississippi.[22] In any version of this, capturing or mining carbon for the purpose of extracting more oil is difficult to describe as a climate solution. But as industry lobbying, backing from some nonprofits (including environmental groups), and support from policymakers have grown substantially in recent years, today carbon capture is primarily promoted as a tool for climate change mitigation, with "point-source" (facility-level) capture of anthropogenic CO_2 and secure sequestration advertised as beneficial for the climate and therefore deserving of potentially massive taxpayer subsidies.[23]

Yet even as carbon capture is generally framed and promoted now as a climate solution, CCUS-EOR continues to be a focus and could be poised for further expansion thanks to a 40 percent increase in tax credits for CO_2 utilization under the One Big Beautiful Bill Act; the fossil fuel industry is certainly optimistic about the geophysical potential for vastly expanding EOR.[24] Further, with the potential repeal of the Greenhouse Gas Reporting Program (GHGRP) and its Subpart RR reporting framework for secure CO_2 sequestration, as noted above,

21 The very first commercial CCUS projects, starting in the mid-1970s, were for EOR using captured CO_2 from fertilizer production and gas processing. The first large-scale project was ExxonMobil/Shute Creek (1986). See Jones, A. C., & Lawson, A. J. (2022, October 5 [updated]). Carbon Capture and Sequestration (CCS) in the United States. Congressional Research Service.

22 Global Energy Monitor. (2026). Jackson Dome. Retrieved March 1, 2026.

23 The turning point in this direction was President Obama's establishment of an Interagency Task Force on Carbon Capture and Storage in 2010, followed by the release of a major report to advance the idea that "[b]y playing a leadership role in efforts to develop and deploy CCS technologies to reduce GHG emissions, the United States can preserve the option of using an affordable, abundant, and domestic energy resource, help improve national security, help to maximize production from existing oil fields through enhanced oil recovery (EOR), and assist in the creation of new technologies for export." [US Department of Energy. (2010, August). Report of the Interagency Task Force on Carbon Capture and Storage, p. 7.] The Carbon Capture Coalition, a membership association of fossil fuel companies, energy developers, unions, and advocacy groups, was formed soon after in 2011.

24 The National Petroleum Council estimates that CO_2-EOR has a potential storage capacity between 55-119 billion tons and a potential oil recovery volume of 84-181 billion barrels of depleted oil. See National Petroleum Council. (2019). Meeting the Dual Challenge: A Roadmap to At-Scale Deployment of Carbon Capture, Use, and Storage: Chapter 8. US Department of Energy. Updated March 12, 2021.

CCUS-EOR could be bolstered by greater regulatory certainty, in contrast. 45Q regulations issued in 2021 specifically allow credit claimants for CCUS-EOR to adopt the International Organization for Standardization's reporting framework as an alternative to the Subpart RR rules.[25] Thus, CCUS-EOR claimants may not necessarily be affected by the regulatory uncertainty introduced if the Greenhouse Gas Reporting Program is fully repealed.[26]

However the apparent new opening for CCUS-EOR may play out, it should be emphasized that, as a capture-and-sequestration solution for CO_2 emissions, CCUS has not seen any commercial growth despite massive public subsidies provided by Congress over the last 15 years, and it barely registers in GHG mitigation accounting. As of 2023, only 14 CCUS projects were operational in the US, according to the Global CCS Institute.The combined emissions capture capacity is equal to only 0.4 percent of total US CO_2 emissions, and all but two of these projects are for EOR.[27]

The potential breadth and scale of CCUS looks very different going forward, however, as the pool of CCUS projects proposed or in development has grown substantially in recent years. As noted, and to be discussed in more detail below, this is primarily due to significant increases in federal subsidies provided through the Inflation Reduction Act (IRA) and the One Big Beautiful Bill Act (OBBBA), in addition to substantial direct grant funding previously provided through the Infrastructure Investment and Jobs Act of 2021. At the core of this federal support is the 45Q tax credit program, which the IRA enhanced with a 40 percent increase in credit values, and the OBBBA further enhanced by increasing utilization credits—primarily for CCUS-EOR—to the same level as secure sequestration credits, with both now set at $85 per ton. At the same time, a weak and fragmented regulatory environment is likely to favor industry agendas and interests over community concerns in the course of CCUS development at the state level, especially in the growing number of states that have been granted or are currently seeking primary enforcement authority ("primacy") for regulating CCUS storage infrastructure, thus relegating the EPA to a secondary oversight role. The states currently approved for "primacy" are Wyoming, North

25 Jones, A. C. (2021, April 13). *Reporting Carbon Dioxide Injection and Storage: Federal Authorities and Programs*. Congressional Research Service.

26 In December 2025, the White House issued a Safe Harbor rule permitting 45Q claimants for secure storage (non-EOR) in 2025 to submit independent reports of a geologist or engineer in lieu of the GHGRP Subpart RR reporting requirements.

27 Global CCS Institute. (2023). *Global Status of CCS 2023*; Congressional Budget Office. (2023). Carbon Capture and Storage in the United States. Global CCUS capture capacity of 55 million tons in 2023 was equal to less than 0.2 percent of global emissions totaling 35.8 billion tons according to Carbon Monitor. See Bellafontaine, R. (2024, October 8). *Visualized: Which Countries Captured the Most Carbon?* DecarbonizationChannel; and Liu, Z., Deng, Z., Davis, S. J., & Ciais, P. (2024). Global carbon emissions in 2023. *Nature Reviews Earth & Environment*, 5(4), 253-254.

Dakota, West Virginia, Louisiana, Texas, and Arizona, and those actively seeking primacy (as of 2025) are Alabama, Alaska, Colorado, Mississippi, Nebraska, Oklahoma, and Utah.[28]

While it is impossible to predict with any certainty how the new wave of CCUS development will play out as to the number and scale of projects that will ultimately be built and begin operations, the CCUS footprint in the energy landscape could grow substantially over the next 10 to 15 years. Much of this buildout will be concentrated in places with the most economic, logistical, and political potential for capturing and either storing or utilizing CO_2. Thus, it is not surprising, as we will explore in more detail in Part V, that the Gulf South region is clearly the epicenter for carbon capture expansion. As noted in the Introduction, Louisiana and Texas are home to a combined 112 new facilities or facility expansions with CCUS, either proposed or under construction and with 53 already in the permitting stage. This includes 66 new CO_2 storage sites or multi-user storage hubs (including 31 in the permitting stage), in addition to 14 proposed new CO_2 pipelines or pipeline expansions. In the overall national picture (including power plants, biofuels production, and industrial projects), the Gulf South buildout comprises roughly 63 percent of CCUS projects nationally, and California is a distant second for project clusters, with 18 projects proposed, according to the Clean Air Task Force database.[29] A sprawling regional buildout of more than 50 biofuels CCUS projects—so-called bioenergy CCS or "BECCS"—is also proposed, primarily across 10 Midwestern and Plains states.[30]

It should be stressed that most of today's carbon capture development is connected with new facilities. Outside of the biofuels sector, only a handful of proposed projects can be described as "retrofits" of existing facilities, and most of these are in the power sector. As originally conceived in federal policy and research, during the Obama years, CCUS was narrowly understood and promoted as a way to reduce power sector CO_2 emissions without limiting the use of fossil fuels.[31] What we are seeing today is something qualitatively different: CCUS is being integrated as a structural feature—and subsidy magnet—for a large and growing expansion of fossil fuel uses and products in multiple pol-

28 Pickerill, S., Shenkman, E. G., Grey, S., & Glover, S. M. (2025, May 30). *Class VI Primacy Update*, Environmental Edge, Arnold & Porter.

29 Clean AirTask Force. U.S. Carbon Capture Activity and Project Table. Retrieved June 6, 2026.

30 The biofuels CCUS buildout is facing serious challenges, including grassroots resistance to the sprawling pipeline infrastructure needed to deliver captured CO_2 for storage over thousands of square miles. On the defeat of the 1,300-mile, five-state Navigator Pipeline for ethanol CO_2, see Eller, D. (2023, October 20). Navigator kills carbon pipeline for Iowa, South Dakota, other states. *Des Moines Register*.

31 Sassoon, D. (2010, February 10). *Obama: The Making of a Clean Coal President*. Inside Climate News.

luting sectors. This could likely mean *more* harm, not less, for the climate and the environment as more fossil fuels are extracted, transported, processed, and combusted for production in heavily-subsidized CCUS-adapted sectors and facilities. Thus, even with high carbon capture rates—which in fact have never been regularly achieved operationally, as we shall see—today's CCUS expansion could have the perverse result of *increasing* the use of fossil fuels in the economy and actually driving net increases in CO_2 emissions—all in the name of mitigating climate change.

Part II. How We Got Here: Subsidy Policy Behind the CCUS Buildout

Federal Funding Over Two Decades

While supporters and opponents of CCUS disagree on many things, in at least one respect there is broad agreement: CCUS will never be scalable for impact (whether good or bad) without a lot of government support.[32] Thus, as we turn our focus to what is emerging on the ground, it is important to understand how federal policy has supported and shaped CCUS development over the last 15 years, and how legislative changes introduced since 2021 have set the stage for a major leap forward in CCUS development over the next 10 to 15 years.

As noted, the oldest CCUS projects in the US began operations in the 1970s, but it was only in the late 2000s that carbon capture started to gain traction in federal policy amid growing concerns about climate change and the need for clean energy. The overriding focus was on technological feasibility and costs, which were addressed by a combination of direct public investment in research and development and, in 2008, the introduction of a dedicated CCUS tax credit, Section 45Q of the Internal Revenue Code.

Between 2011 and 2023, Congress appropriated around $400 million annually and a total of $5.3 billion for CCUS research and development; about 75 percent of all fossil energy R&D funding in this period was targeted for CCUS.[33] Additional funding of $3.4 billion, primarily for large demonstration projects, was provided separately through the American Recovery and Reinvestment Act of 2009. Out of nine CCUS demonstration projects, five were for retrofits of

32 Lo, J. (2025, September 15.). Industry says carbon capture still an expensive last resort to cut emissions. Climate Home News.

33 Congressional Budget Office. (2023). Carbon Capture and Storage in the United States. Table 2.1; Folger, P. (2016). Recovery Act Funding for DOE Carbon Capture and Sequestration (CCS) Projects, Congressional Research Service. Table 1.

large coal power plants. Only one of the power plant projects, Petra Nova at the W.A. Parish coal-fired power station in Southeast Texas, actually began operations in 2016, but it was shut down four years later, in 2020, due to collapsing fuel prices.[34]

With the passage of the Infrastructure Investment and Jobs Act (IIJA) in 2021, federal support for CCUS was renewed with an unprecedented package of programmatic investments, including funding targeted for areas thought to be lagging in CCUS development. As seen in Figure 2, overall, approximately $12 billion or nearly 20 percent of new DOE funding authorized by IIJA was targeted for CCUS, including $2.5 billion for carbon storage validation and testing, $2.5 billion for large capture and storage demonstration projects, $3.5 billion for four regional direct air capture hubs, and $2.1 billion for CO_2 transportation infrastructure projects.[35] In May of 2025, however, the Department of Energy announced that it was canceling 24 CCUS grant awards totaling $3.7 billion, or nearly one-third of the IIJA investments. Among these were two $270 million grants for CCUS retrofits of CALPINE natural gas power plants in Baytown, TX, and Yuba City, CA.[36] Although it's not yet clear if and how the grant cancellations will affect the CALPINE projects, this is potentially a significant blow to the broader CCUS buildout because natural gas power plants are the highest emitting sector in the scope of CCUS applications, but also, in turn, among the least economically viable for CCUS retrofits like the CALPINE projects.[37]

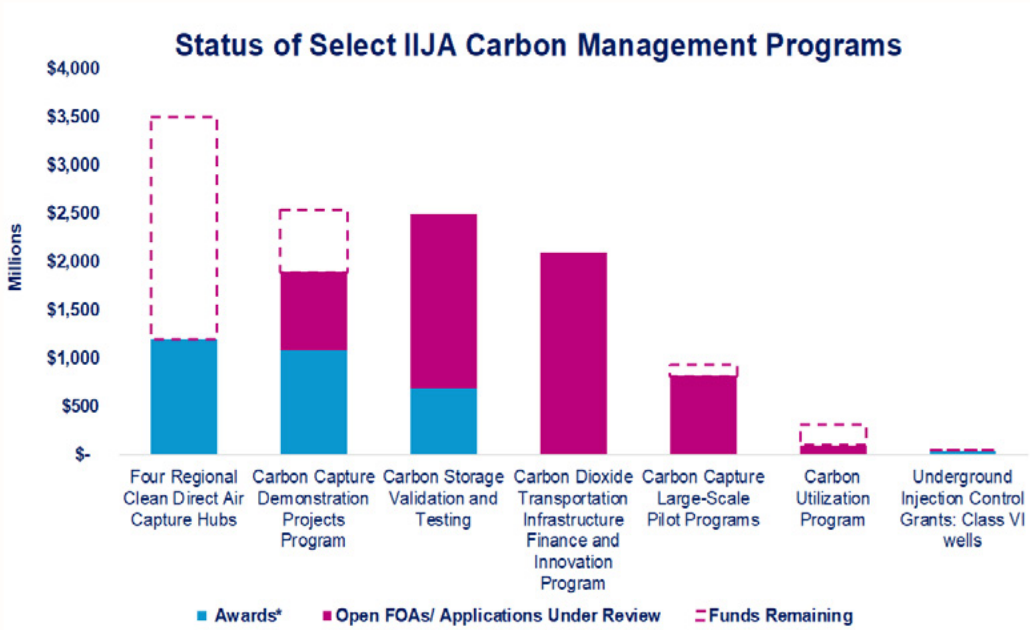
34 Patel, S. C. (2023, September 13). Petra Nova, Pioneering Power Plant Carbon Capture Unit, Is Up and Running Again, says JX Nippon; Power. In 2022 it was announced that Petra Nova would reopen and it started operating again in the Fall of 2023.

35 US Department of Energy. (2022). The Infrastructure Investment and Jobs Act: Opportunities to Accelerate Deployment in Fossil Energy and Carbon Management Activities. Updated September 2022.

36 Patel, S. C. (2025, June 4). DOE Scraps $3.7B in OCED Projects, Upending Carbon Capture Progress at Power Plants. Power.

37 Ng, C., & Salt, M. (2023, March 30). CCS for power yet to stack up against alternatives. Institute for Energy Economics and Financial Analysis.

Figure 2. Funding and Status for Select Carbon Management Programs Funded by the Infrastructure Investment and Jobs Act of 2022, through 2023.



Source: Figure 1 from Wymer, J., & Bowers, S. (2023). Two years of IIJA: An overview of carbon management implementation to date. Clean Air Task Force.

Tax Credits Take Center Stage

The 45Q tax credit program for CCUS was established by the Energy Improvement and Extension Act of 2008. The original credit amount was $20 per ton for geologically sequestered CO_2, and $10 per ton for CO_2 utilized as a tertiary injectant for enhanced oil recovery.[38] As originally authorized, 45Q was fiscally controlled under a cumulative CO_2 storage "cap" of 75 million tons. In addition to this quite stringent cap, eligibility was limited to large facilities with CO_2 emissions of no less than 500,000 metric tons annually.

The fiscal costs of 45Q, as it was originally designed, could only be tracked (and this is still the case today) in Treasury Department estimates of annual tax expenditures, and Treasury reporting does not include retroactive validation of expenditure estimates based on actual tax return information. Treasury estimated 45Q costs totaling approximately $1.3 billion in the decade from 2010 to 2019.

Importantly, it was also in the first decade of 45Q that serious flaws in oversight of the program—which remain unaddressed today—were brought to light when it was investigated by the Treasury Inspector General for Tax Administration (TIGTA) upon a request from Senator Robert Menendez in 2019. The

38 The concept of CO_2 as a tertiary injectant reflects the fact that other injectants, including water-based solutions, were more commonly used for EOR in the past.

results of the investigation, conveyed in a 2020 TIGTA letter to Senator Menendez, were notable in two key respects.[39] First, the investigation found that actual 45Q credit claims in IRS tax records from 2010 to 2019 totaled about $1.0 billion, not far from the mark as compared to Treasury's tax expenditure estimates for the same period. Second, and more important, the investigation found that 10 large corporations claimed nearly 100 percent of the credits, and 87 percent of these credits were claimed "by these ten taxpayers when they were not in compliance with the EPA" and, specifically, with CO_2 monitoring, reporting, and verification requirements as stipulated under the Safe Drinking Water Act and codified in Subpart RR of the Greenhouse Gas Reporting Program. The conclusion many correctly drew from the investigation was that 45Q is plagued with oversight and enforcement deficiencies and that more transparency and direct coordination are needed between the IRS and the EPA to ensure that the tax credit program is delivering real climate benefits that are worth the fiscal cost. As noted, six years later and despite two amended versions of the program (under the IRA and the OBBBA), nothing has changed to address these concerns.

The Bipartisan Budget Act of 2018 altered and enhanced the 45Q program in multiple ways, including: 1) replacing the cumulative cap on 45Q-credited CO_2 storage with a start-of-construction deadline (2023) and a 12-year eligibility period; 2) increasing credit values to $50 per metric ton for secure geologic sequestration and $35 per metric ton for CCUS-EOR; 3) expanding the credit to include non-EOR utilization (recycling/reuse of CO_2 in building materials and commercial products) as well as Direct Air Capture; and 4) broadening eligibility to smaller facilities.[40]

With ratification of the Inflation Reduction Act of 2022, the 2018 alterations were consolidated and further enhanced.[41] Respectively for secure geologic sequestration and EOR injection storage, credit rates increased to a top level of $85 and $60 per metric ton. The per-ton credits for other qualified uses of captured CO_2 and Direct Air Capture for sequestration were raised to $60 and $180, respectively. It should be noted that all of the higher values codified in the IRA were set against base rates 5 times lower and were tied to high-road labor standards by limiting eligibility (for the top-level rates) to projects paying prevailing wages during construction and the first 12 years of operations, in addition to participation in registered apprenticeship programs of labor organi-

39 The letter is posted by *Tax Notes*: TIGTA Says Numerous Improper Carbon Oxide Credits Claimed.

40 Jones, A. C., & Sherlock, M. (2020). The Tax Credit for Carbon Sequestration (Section 45Q). Congressional Research Service.

41 The IRA's 45Q changes are detailed in Jones, A. C., & Marples, D. J. (2023). The Section 45Q Tax Credit for Carbon Sequestration. Congressional Research Service.

zations. In addition, 45Q eligibility was broadened much further in the direction of including smaller projects, with annual emissions thresholds of qualifying facilities reduced to only 18,750 metric tons for power plants, 12,500 metric tons for other capture facilities, and 1,000 metric tons for Direct Air Capture projects.

In addition to the significant subsidy and eligibility enhancements, the IRA also introduced "transferability" and "elective pay" policies, with the goal of expanding and accelerating financial flexibility and market access for CCUS development. With transferability, 45Q claimants can directly sell their credits to third parties, thus avoiding expensive tax equity deals with banks that even large clean energy developers have often depended on for raising capital. With "elective pay" (often termed "direct pay"), 45Q is treated as a refundable credit, meaning that the value of unused credits for lack of sufficient tax liability is paid in cash to eligible entities. Elective pay is primarily meant to benefit tax-exempt entities that otherwise would not be eligible to receive tax credits—for example, public power authorities, rural electric co-ops, and municipal agencies; but the IRA stipulates that elective pay is also available, for the first 5 years, to for-profit (non-tax exempt) entities in several technological categories, including CCUS. Thus, as an alternative to selling credits, CCUS projects can get a direct refund for unused credits in the first five years.

Along with enhanced values, broader eligibility, and greater financial flexibility, the IRA moved the start-of-construction eligibility deadline forward to 2032, which means that, with 12 years of eligibility, 45Q credits could potentially be available well into the early 2040s or beyond, depending on when projects begin operations.

A final key aspect further enhanced by the IRA is tax liability for leakage, which is imposed by means of IRS "clawback" of credits in proportion to the CO_2 released during a leakage event. Under the 2018 version of 45Q, the clawback window encompassed the full period of credit claims plus an additional 5 years beyond the final year of credit claims or the cessation of monitoring (on which credit claims are based). The IRA shrank the outside window to only 3 years, thus reducing exposure to liability and increasing risks of fiscal waste linked to negative climate impacts due to CO_2 leakage. In addition, leakage events due to unpredictable natural causes, such as seismic activity, are not subject to credit clawbacks; and, further, there is nothing in the law to prevent multiple facility owners from mixing their carbon waste streams in a shared pipeline network and storage hub, as a means of both achieving economies of scale for operations and credits but also distributing liability for leakage events.[42]

42 Kamyans. S, Gamble, J., & Azinfar, A. (2024, October 4). IRS Must Defer to Industry Pacts for Carbon Capture Tax Credits. Kirkland & Ellis [reposted from *Bloomberg Law*].

CCUS's New Fiscal Footing

According to the Joint Committee on Taxation (JCT), 45Q, as codified under the OBBBA, will cost approximately $14 billion over a decade.[43] However, JCT estimates are limited in at least two key respects. As the basis for Congressional Budget Office "scores" of the budget effects of new tax legislation, JCT assessments only consider the effects of changes in tax law, for example, the OBBBA's provision to increase the credit rate for CCUS-EOR from $60 per ton to $85. Thus, the JCT/CBO score is only a partial measure of the fiscal costs of 45Q or any other tax provision; the initial CBO score for the IRA version of 45Q was $3.23 billion over a decade, but this estimate (and amount) is excluded from the subsequent OBBBA score because the latter only accounts for fiscal effects of changes in the tax code, not overall costs of the tax credit. In fact, overall, many of the IRA's other energy tax credits were repealed or curtailed by the OBBBA, with the result of generating large net gains in revenue as compared to the IRA's projected costs. It should also be noted that JCT/CBO assessments formulate budget scores primarily based on historical tax data, in this case previous revenue effects of the 45Q tax credit program as it has evolved. Commercial information is only incorporated on a limited basis, where such information is particularly reliable and tractable for predicting budget effects of tax credits; for example, electric vehicle credits are assessed in part based on information about electric vehicle sales and prices.[44]

More realistic assessments of the potential costs of 45Q point to vastly greater expenditures over the full lifetime of the credits. In an analysis that accounts for the full codified timeline of tax credit availability as well as extensive project development data emerging in just the last several years, the Institute for Energy Economics and Financial Analysis estimates that the fiscal costs of 45Q could grow to as much as $835 billion by 2042 and potentially to over $2 trillion if the program is extended and further enhanced.[45] It should be noted that this assessment does not account for the 40 percent increase in CCUS-EOR tax credits authorized by the OBBBA.

Such a massive public price tag for CCUS underscores the need for more

43 The Joint Committee On Taxation. (2026, May 28). JCS-1-26: General Explanation of the Tax Provisions of Public Law 119-21.

44 The Joint Committee On Taxation. (n.d.) Revenue Estimating. Retrieved March 14, 2026.

45 Institute for Energy Economics and Financial Analysis. (2025). Tax Credits for Carbon Capture, Utilization, and Storage (CCUS). [Fact sheet]. IEEFA's larger estimate assumes a credit rate increase to $100 per ton for both storage and utilization, and credit availability extended to 30 years. For a discussion of varying estimates of 45Q costs, see Daly, L., & Koplow, D. (2025). Taxpayer Costs for Carbon Capture, Utilization, and Storage: A Fiscal Disaster in the Making. Just Solutions.

transparency and public disclosure in the 45Q program as well as rigorous evaluation of program performance, informed by independent experts and affected community stakeholders. In addition to climate and environmental justice (EJ) perspectives, the sheer opportunity costs of such a questionable subsidy should be a focal point. For example, 45Q tax expenditures could end up costing 60 to 150 times more than the roughly $14 billion authorized for grid resilience investments under the IIJA, the single largest federal investment in grid infrastructure development since the rural electrification programs of the 1930s. 45Q expenditures could also end up costing as much as or more than the Medicaid budget cuts resulting from policy changes introduced by the OBBBA.[46]

Emerging Policy Battlelines

CCUS has long been and continues to be largely unregulated, including effectively no federal oversight to determine if the CCUS tax credit program is in fact subsidizing proven CO_2 storage and delivering real climate benefits that are worth the fiscal cost.[47] However, as noted earlier, with the proposed (and almost certain) repeal of the Greenhouse Gas Reporting Program and its Subpart RR rules for carbon storage monitoring, reporting, and verification, the situation could go from bad to worse. At the end of 2025, the IRS issued Notice 2026-01, establishing a Safe Harbor for 2025 45Q claimants and requiring that they submit a report on their storage results to a qualified engineer or geologist for certification. The Notice indicates that new IRS rules for verifying 45Q credit claims will follow at some point in the future.[48]

CCUS infrastructure development also suffers from policy gaps or uncertainties that could impede project development. In January of 2025, the Biden Administration issued a Notice of Proposed Rulemaking to establish largely new, comprehensive safety regulations for CO_2 pipelines.[49] The proposal would establish specific technical requirements for the design, installation, operations, and maintenance of CO_2 pipelines for the first time. Building on the US Department of Transportation Pipeline and Hazardous Materials Safety Administration's

46 The Congressional Budget Office estimated OBBBA Medicaid cuts of approximately $840 billion: Congressional Research Service. (2025). *Health Coverage Provisions in One Big Beautiful Bill Act (H.R. 1)*.

47 On the longstanding problems with storage verification under 45Q and the Subpart RR reporting program, see Bains, P. (2023). *Flaws in EPA's Monitoring and Verification of Carbon Capture Projects*. Environmental Integrity Project.

48 Internal Revenue Service. (2025, December 19). *Treasury, IRS provide safe harbor for taxpayers claiming the carbon capture credit.*

49 US Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2025, January 15). *USDOT Proposes New Rule to Strengthen Safety Requirements for Carbon Dioxide Pipelines*.

(PHMSA) investigation of the Satartia pipeline disaster (further discussed in Part III), requirements for analysis and monitoring of geohazards, plume dispersion modeling, setbacks and other safeguards to protect communities, emergency response planning, and public information protocols, would be imposed, in addition to design and operational specifications for converting natural gas pipelines into CO_2 pipelines.[50] However, in March of 2025, the Trump Administration withdrew the proposed rules and no further action has been taken.

Along with the need for CO_2 pipeline rules and safeguards, another major gap in CCUS policy development is offshore storage regulation. The Infrastructure Investment and Jobs Act of 2021 gave authority to the US Department of the Interior Bureau of Ocean Energy Management (BOEM) to set up and manage a leasing program for CO_2 storage under the subsea lands in the Outer Continental Shelf, with oversight and enforcement of rules carried out by the Bureau of Safety and Environmental Enforcement. A required rulemaking for the leasing program is now more than three-and-half-years overdue, but BOEM has indicated that a regulatory proposal is forthcoming.[51] In the meantime, leasing activity for potentially massive amounts of CO_2 storage appears to be well underway, starting in Texas state waters. ExxonMobil currently holds leases for 271,000 acres of subsea land for CO_2 storage in Texas state waters, and since IIJA's authorization of CO_2 storage in federal waters, ExxonMobil and Repsol have obtained new oil and gas leases covering nearly 1700 square miles of subsea land in the Western Gulf of Mexico. Subsequent lobbying to convert these leases into "multi-use" leases reflects the companies' anticipation of BOEM rules that will clear the way for large-scale CO_2 storage in federal waters off of Texas and Louisiana.[52]

Finally, the 45Q tax program itself is overdue for new regulations stemming from revisions to the program introduced by the Inflation Reduction Act in 2022. Among many unresolved issues that should be addressed in a new regulatory framework for 45Q, priority should be given to requiring greater transparency and public disclosure of the credits. Ideally, this could follow from putting a budgetary cap on the credits, which would, arguably, necessitate public disclosure requirements because allocation under a cap effectively turns the credits into a competitive grant program.

50 Bold Alliance. (2025). A Stroll Through the Proposed CO2 Pipeline Safety Rule. [PowerPoint Slides] Pipeline Fighters Hub.

51 U.S. Department of the Interior, Bureau of Ocean Energy Management. (Revised 2025, February) Carbon Sequestration.

52 Juhn, A. (2026). Out of Sight, Out of Mind: Pushing CO2 Storage Offshore. Institute for Energy Economics and Financial Analysis.

Part III. A False Climate Solution is Also Environmentally Unjust

The Climate Case Against CCUS

Carbon Capture and EOR

Across four decades of commercial use—and despite hundreds of billions of dollars in public subsidies—CCUS has little to show for itself as a climate solution. One often-noted reason is the limited effectiveness of carbon capture equipment, as reflected in widely varying capture rates that often fall well short of the theoretical 90 percent range commonly advertised by project owners.

In the track record of existing projects, subpar capture rates are not necessarily due to technological limits—capture rates of 90-99 percent are achievable experimentally today. Rather, in many cases, they are due either to operational limits or failures of the facility itself (not just the carbon capture equipment) or to intentional curtailment of CCUS operations. SaskPower's $1 billion (CAD) Boundary Dam coal power plant CCUS project in Saskatchewan, for example, tallied an eight-year average capture rate of under 60 percent between 2015 and 2023, and this "under-performance" (compared to the project's advertised 90 percent capacity rate) was in part due to operational shortfalls of the power plant itself (such as outages and derates), as well as intentional pre-capture venting of "excess" CO_2 still mixed in the flue gas of the power plant, for commercial or other reasons.[53] As SaskPower was financed and designed for supplying CO_2 for EOR and thus is impacted by changing oil prices, lower capture rates due to CO_2 venting is not surprising. In fact, CO_2 venting is fairly common already and may grow in the CCUS industry given 45Q's new parity for EOR amid fluctuating oil prices. ExxonMobil's Shute Creek natural gas processing facility, which is adapted with CCUS for EOR, is a case in point: Approximately 50 percent of its cumulative CO_2 emissions as of 2020 have been vented, with venting rates in large part rising or falling depending on oil price trends.[54] With more CCUS-EOR operations potentially coming online, high capture capacity rates with higher equipment and operational costs may not always pencil out

53 Schlissel, D., & Kalegha, M. (2024, April 30). Carbon Capture at Boundary Dam 3 still an underperforming failure. Institute for Energy Economics and Financial Analysis. On Boundary Dam's myriad operational problems related to carbon capture performance see Janowczyk, D., Giannaris, S., Hill, K., Ruffini, J., Jacobs, B., Feng, Y., Wayuta, S., & Bruce, C. (2021, April 6). Derates and Outages Analysis - A Diagnostic Tool for Performance Monitoring of SaskPower's Boundary Dam Unit 3 Carbon Capture Facility. *Proceedings of the 15th Greenhouse Gas Control Technologies Conference 15-18 March 2021*.

54 Robertson, B., & Mousavian, M. (2022). The Carbon Capture Crux: Lessons Learned. Institute for Energy Economics and Financial Analysis. Section 2, Figure 7.

financially—for example, if demand for CO_2 injection supplies shrinks due to falling oil prices.[55]

It should also be noted that the US's one CCUS project for secure sequestration, at Archer Daniels Midland's biofuels complex in Decatur, Illinois, has managed to store only a small fraction of its CO_2 emissions since launching its storage operation in 2017—as authorized under the country's first secure sequestration (Class VI) well permit issued by the EPA. Out of roughly 25.8 million metric tons (MMT) of CO_2 emissions reported to the EPA between 2017 and 2022, only about 2.9 million, or approximately 11 percent, have been captured and stored, with the rest being vented to the atmosphere.[56] Despite the fact that the project has benefited from approximately $280 million in federal grant subsidies since 2010,[57] the specific reasons for ADM's low CO_2 capture and storage rate over time have not been subject to publicly disclosed technical evaluation, let alone to any kind of enforcement action to improve performance. Nevertheless, specific operational risks of CCUS were brought to light dramatically in 2024 when ADM reported a significant leakage event due to corrosion of one of the monitoring wells in its storage operation. The leak entailed movement of an estimated 8000 metric tons of stored CO_2-infused brine into "unauthorized zones" (the estimated scale of the leak was later reduced to between 2670 and 3940 metric tons). Although the leakage reportedly had no effects on proximate groundwater or drinking water sources, arguably the largest negative impact was the resulting, nearly year-long shutdown of the storage system itself, which resulted in an additional 450,000 metric tons of CO_2 emissions escaping to the atmosphere, according to the company.[58]

In addition to concerns about under-performance of CCUS systems and storage well leakage risks, the potential growth of CCUS-EOR is raising concerns about broader negative climate impacts if and as the EOR market expands. As noted earlier, nearly 90 percent of CCUS operational capacity in the US (all but two of the 15 active projects as of 2023) is for utilization in EOR operations. From a life-cycle perspective—including future emissions of the resulting additional oil supplies—CCUS may actually be driving a net increase in CO_2 emissions; this is one reason why many advocates describe it as a "false solution"

55 The first operational power plant CCUS project in the US, Petra Nova at the W.A. Parish coal plant in Thompsons, TX, southwest of Houston, was for EOR and it was shuttered in 2020 due to falling oil prices at the outset of the coronavirus pandemic. However, it was reopened in 2023 and is currently operational again. See Anchando, C., & Klump, E. (2022, September 20). *Petra Nova is closed: What it means for carbon capture.* E&E News by POLITICO.

56 Gibbons, B. (2024, April 25). *In Illinois, a massive taxpayer-funded carbon capture project fails to capture about 90 percent of plant's emissions*. Environmental Integrity Project.

57 ADM's CCUS federal grant summary is here.

58 Bush, T. (2025, August 5). *Carbon Storage Site That Leaked Set to Restart*. decarbonfuse.

in the climate crisis.[59]

While today's project development data seem to reflect a significant pivot toward secure geologic sequestration, nevertheless, OBBBA's modification of 45Q to bring utilization and secure sequestration credits into parity is a significant direct boost for the fossil fuel industry, especially given its optimism about the technical potential for CCUS-EOR, as noted earlier.[60] Further, it should be stressed that "parity" between EOR utilization and secure sequestration is something of a misnomer. In the case of sequestration without EOR, the only incentive for CCUS is the $85 per ton credit, occasionally coupled with a DOE grant or loan. In connection with EOR, however, CCUS subsidies are linked in a value chain that also includes the commodity value of CO_2 as an EOR injectant, and in some cases, part or all of the sales revenue from the resulting oil supplies. If the three streams of revenue (CO_2 supply sales, tax credits, and recovered oil sales) are divided among different entities in the CCUS-EOR value chain, this could dilute the value and incentive effects of the tax credits, as would falling oil prices at the end point of the value chain. But OBBBA's 40 percent enhancement of the 45Q utilization credit is a significant boost overall, especially considering that it is not a one-time investment credit but rather a 12-year production credit. This is not even to mention that the OBBBA also raised the credit rate for Direct Air Capture (DAC) for utilization, including EOR, from $130 to $180 per ton, also a roughly 40 percent increase.[61] The intent with these targeted subsidy increases, it seems clear, is to complement and reinforce the commercial incentives favoring EOR over secure sequestration as a basis for obtaining 45Q credits—a long-coveted goal of the fossil fuel industry and its most powerful supporters in Congress.[62] It remains to be seen, however, if OBBBA's boost for EOR will stanch the seeming longer-term pivot toward secure sequestration in the project development landscape post-IRA.

59 For example: Earthjustice. (2023, September 19). Carbon Capture: The Fossil Fuel Industry's False Climate Solution; Rota, M. (2023, June 20). Carbon Dioxide Waste Capture and Injection: A False Solution for Louisiana and the World. Healthy Gulf; Llavero-Pasquina, M., Eckstein, S., Daley, F., Rugh, N., & Glimmerveen, J. (2025). False solutions: How do fossil fuel companies reproduce their power through the energy transition. *Energy Research & Social Science*, 104367.

60 National Petroleum Council. (2019). *Meeting the Dual Challenge: A Roadmap to At-Scale Deployment of Carbon Capture, Use, and Storage: Chapter 8*. US Department of Energy. Updated March 12, 2021.

61 Notwithstanding OBBBA, it should be clear that utilization for EOR is directly antithetical to the goals of DAC and, whatever the commercial incentives might be, EOR is not likely to be embraced by DAC developers or, more generally, by advocates for carbon removal.

62 In an August 2025 quarterly earnings call, Occidental Petroleum chief executive Vicki Hollub celebrated OBBBA's leveling of "the playing field between carbon storage and utilization pathways like DAC to EOR" and noted how the legislation will benefit carbon management efforts including its Stratos Direct Air Capture project in Ector County, Texas, which has an estimated carbon removal capacity of 500,000 tons per year and, according to Hollub, 60,000 tons per year already under contract with J.P. Morgan and Palo Alto Networks. See Stewart. R. (2025, August 7). *US player's direct air capture hub moving toward operations*. Upstream.

CCUS and Net GHG Emissions

The CCUS-EOR emissions problem may appear to be more extreme from a life-cycle perspective because of the resulting downstream emissions from combusting oil that otherwise would have stayed in the ground. But there is more to the question of the GHG emissions risks associated with CCUS. Specifically, with a growing share of CCUS applications, which involve the capture of stationary source CO_2 emissions from processing, burning, or converting fossil fuels, capturing these emissions does not reduce, and potentially increases, the significant "upstream" emissions from activities across the fossil fuel "well-to-gate" supply chain, including extraction, gathering and boosting, transport, and processing of fossil fuels for commercial end-uses.

Upstream GHG emissions from CCUS projects primarily include fugitive methane from oil and gas supply chains, along with a smaller share of CO_2 emissions from fossil fuel production activities. One leading national study estimates the upstream methane leakage rate at 2.43 percent on average across six regions encompassing 52 percent of on-shore oil and 29 percent of natural gas production.[63] This is more than twice the EPA's official estimate. In New Mexico's Permian Basin, the methane leakage rate is estimated at 9 percent by another group of researchers.[64] "It's worse than we thought by a long shot," said one of the New Mexico researchers.[65] Given that methane's global warming potential is more than 80 percent higher than that of CO_2 over a 20-year period and still 30 percent higher over 100 years, even a 1 or 2 percent leakage rate is a serious problem that must be accounted for and properly weighted in evaluating CCUS as an alternative to replacing fossil fuel energy with zero-emissions energy.

It should also be stressed that the problem of upstream emissions varies significantly by CCUS project type. With "blue" hydrogen, for example, reduced CO_2

63 Sherwin, E. D., Rutherford, J. S., Zhang, Z., Chen, Y., Wetherley, E. B., Yakovlev, P. V., ... & Brandt, A. R. (2024). US oil and gas system emissions from nearly one million aerial site measurements. *Nature*, 627(8003), 328-334.

64 Chen, Y., Sherwin, E. D., Berman, E. S., Jones, B. B., Gordon, M. P., Wetherley, E. B., Kort, E. A., ... & Brandt, A. R. (2022). Quantifying Regional Methane Emissions in the New Mexico Permian Basin with a Comprehensive Aerial Survey. *Environmental Science & Technology*, 56(7), 4317-4323.

65 *Stanford-led Study: Methane leaks are far worse than estimates, at least in New Mexico, but there's hope.* (2022, March 24). Stanford Report. One short-term study found that methane leakage dropped by 50 percent between 2022 and 2024: Leblanc, R. (2025, June 23). *Cleaning up: Overflight data show Permian methane emissions intensity down further 28% in 2024*. S&P Global Energy. It should also be noted that methane leakage studies generally do not include downstream leakage in municipal distribution systems or post-meter leakage from homes and businesses, which together may be greater in volume overall as compared to leakage from oil and gas production and pipelines. See Perkins, S. (2019, July 19). Major U.S. cities are leaking methane at twice the rate previously believed. Science.

emissions from the high-heat production process of separating hydrogen (H_2) and CO_2 from methane (CH_4)—typically via what is termed Steam Methane Reforming (SMR)—entails upstream emissions associated with 1) the natural gas feedstock supply chain, 2) the typically gas-fired electricity used to power the SMR process, and 3) the additional gas-fired electricity needed to power the carbon capture equipment.[66] With "blue" ammonia, upstream emissions from all of the above are further increased by the additional electricity needed to generate the high heat and high pressure conditions necessary for converting hydrogen and atmospheric nitrogen into ammonia (NH_3). So, too, for electricity itself, there are different upstream footprints for coal-fired versus gas-fired power plants. While coal has much higher concentrations of CO_2 for potential release as compared to natural gas, it is precisely because of this that CCUS can be more effective—and more cost-effective—on a coal plant. Put simply, higher capture rates can be achieved more efficiently with higher CO_2 concentrations, or, conversely, more energy is needed for separating typically much lower concentrations of CO_2 (~3 percent) from the flue gas of a natural gas power plant. Thus, CCUS-adapted gas power generation is more energy intensive and will generally have a higher rate of associated upstream emissions.

Further, as the studies of fugitive methane cited above indicate, the lifecycle share of upstream GHG emissions can vary significantly by regional differences in the source basins and extraction methods of natural gas production; in particular, gas supplied from the Permian Basin encompassing Central-to-Southwest Texas and Southeast New Mexico—the main source of gas feedstock and fuel in the Gulf South—has the highest rate and impact of upstream emissions due to higher rates of methane leakage and gas venting.[67]

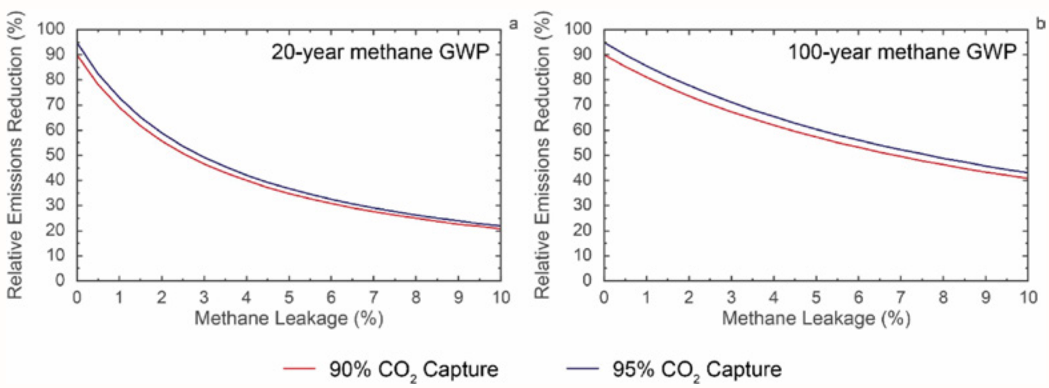
Leaving aside the wide variation and often very low capture rates reported in real-world CCUS operations, the theoretical capture rates of 90 percent or more advertised in many project proposals are just as doubtful in principle because they do not account for associated upstream emissions of hydrocarbon fuels or feedstocks as part of carbon capture performance. The critical factor in upstream emissions, as noted above, is methane leakage (sometimes termed "fugitive" methane) in the natural gas supply chain. One study of CCUS emissions reductions when accounting for upstream methane leakage estimates that, at a

66 The lifecycle emissions footprint of blue hydrogen should also include CO_2 emissions as well as potential hydrogen leakage in the "midstream" supply and delivery activities associated directly with end-uses, including compression, transport, and storage. Hydrogen is not itself a heat-trapping greenhouse gas, but it is well-understood to have reactive properties that contribute to methane persistence in the atmosphere. See Ocko, I. B., & Hamburg, S. P. (2022). Climate consequences of hydrogen emissions. *Atmospheric Chemistry and Physics*, 22(14), 9349-9368.

67 Hellgren, L, LaCount, R, & Martin, J. (2024). Benchmarking Methane and Other GHG Gas Emission of Oil and Gas Production in the United States. Clean Air Task Force and Ceres.

theoretical 90 percent capture rate and assuming an average methane leakage rate of 2.95 percent, carbon capture reduces emissions by only 68 percent if methane leakage is factored with a 100-year global warming potential and 47 percent if methane leakage is factored with a 20-year global warming potential.[68] As seen in Figure 3, higher rates of methane leakage, assuming a 20-year GWP and a 90 percent capture rate, could shrink carbon capture emissions reductions to between 20 and 40 percent (or to between 40-60 percent on a 100-year GWP). Accounting for upstream methane leakage is especially relevant in the Gulf South context where much of the current CCUS buildout is unfolding, because the natural gas fuel and feedstock supplies for CCUS-adapted facilities in the region are largely sourced from the Permian Basin, with its high estimated methane leakage rates, as noted earlier.

Figure 3. Net Carbon Capture Emissions Reductions When Accounting for Upstream Methane Leakage.



Source: Figure 1 in Hersbach, T. J. P., Mastandrea, M. D., & Wara, M. W. (2025) Flexible operation and fugitive methane emissions limit the potential of power plant carbon capture and storage. *The Electricity Journal*, *38*(3), 107494.

The role of CCUS in natural gas processing is another significant if less-noted problem from a climate perspective, especially given that this has been the most common type of CCUS project and, historically, the largest source of captured CO_2.[69] The problem with gas processing CCUS is that naturally occurring CO_2 is mixed with methane in raw natural gas (in varying concentrations) and its removal is essential for producing the sufficiently pure natural gas (> 90 percent methane) that is needed for end-uses involving combustion or chemical conversion. Especially at higher concentrations, the CO_2 removed during natural gas processing is often reinjected in EOR operations or sold to third

68 Hersbach, T. J. P., Mastandrea, M. D., & Wara, M. W. (2025). Flexible operation and fugitive methane emissions limit the potential of power plant carbon capture and storage. *The Electricity Journal*, 38(3), 107494.

69 Robertson, B., & Mousavian, M (2022). The Carbon Capture Crux: Lessons Learned. Institute for Energy Economics and Financial Analysis. Figure 5, p. 16.

parties for utilization in other carbon-infused products—potentially with 45Q eligibility in both cases. Thus, with gas processing CCUS, we are subsidizing, not GHG emissions reductions from the use of fossil fuels in the economy, but in fact a key step in producing and potentially increasing the very gas supplies that result in GHG emissions. The cure could be worse than the disease insofar as 45Q is potentially subsidizing production of the very source of the emissions that it is designed to "reduce" by incentivizing their capture and storage.[70] The perversity of 45Q as applied in natural gas processing is further underscored insofar as its net value is higher because CO_2 separation is already part of the cost of production in natural gas processing, in contrast with applications in other sectors such as electricity generation and chemicals production.

Leaving aside the problematic applications associated with EOR and natural gas processing, the climate case against CCUS may be strongest in the power sector. This starts with the fact that electricity generation is the least difficult sector to decarbonize, because you can directly reduce gross CO_2 emissions by replacing fossil fuel energy with wind and solar power backed by battery storage. At the same time, decarbonizing with CCUS is more expensive in the power sector than in other sectors such as gas processing and biofuels production. As noted, gas power plants in particular are more expensive to adapt with CCUS because of low CO_2 concentrations in the post-combustion flue gas, which means that more energy and more expensive equipment are needed to capture the CO_2.[71]

Critics of CCUS sometimes also point to opportunity costs, especially with power sector CCUS as an example: under typical budget constraints and a demand-driven ratepayer "cap" on how much electricity is actually needed, investing in more expensive, lower-mitigating CCUS for power plants can directly compete with investment in renewable energy sources for generating electricity. Power must be supplied either way, and the resources invested in one type of power inherently reduce the resources available for investing in the other type.[72]

70 45Q regulations issued in 2021 clarified eligibility of gas processing CO_2 capture by specifying that naturally occurring CO_2 can qualify for 45Q if it is extracted from reservoirs with CO_2 concentrations of 90 percent or less, or, regardless of CO_2 concentrations, if the reservoir contains a non-CO_2 potential product that does not depend on the 45Q credits for economic viability (e.g., methane). See, generally, Food & Water Watch. (2025). *Release and Catch: Government Subsidies for Moving CO_2 Around*. [Fact sheet].

71 Hersbach, T .J. P., Mastandrea, M. D., & Wara, M. W. (2025). Flexible operation and fugitive methane emissions limit the potential of power plant carbon capture and storage. *The Electricity Journal*, *38*(3), 107494.

72 Jacobson, M. Z., Fu, D., Sambor, D. J., & Muhlbauer, A. (2025). Energy, health, and climate costs of carbon-capture and direct-air-capture versus 100%-wind-water-solar climate policies in 149 countries. *Environmental Science & Technology*, *59*(6), 3034-3045.

Other critics focus more specifically on the perverse incentives introduced by large subsidies for carbon capture and storage. This, too, is particularly clear in the power sector, which is by far the largest CCUS-adaptable sector from an emissions perspective and thereby from a fiscal perspective as well. As Emily Grubert and Francis Sawyer write, an "ongoing challenge" with power sector CCUS "is that the tax credit is still issued per tonne of CO_2 utilized and/or stored rather than tonne of life cycle CO_2 abated or removed relative to some baseline."[73] In other words, with the government paying you to capture and store CO_2 emissions, rather than to actually reduce fossil fuel utilization in the economy, 45Q can be an incentive to actually increase generation at CCUS-adapted plants and thereby produce more CO_2 emissions for their subsidy value when captured and stored. Relatedly, the full operational chain of CCUS is a capital-intensive approach to mitigation, which dovetails with utility "cost of service" incentives to expand the capital basis of their operations. In states with clean electricity mandates or performance goals, for example, adapting power plants with high-cost CCUS operations could increase utility profits and overall system costs while diverting ratepayer resources from cheaper, more effective, and potentially more equitable (if less profitable) means of decarbonizing the grid. As a result, in part, of these essentially perverse incentives, power sector CCUS is likely to have "limited or negative abatement potential" in the energy transition, according to Grubert and Sawyer. This is not to mention the potential harm to both ratepayers and taxpayers if they are not shielded from the costs and risks of CCUS, which made headlines several years ago with the suspension or collapse of heavily subsidized coal plant CCUS projects.[74]

The Public Health and Environmental Justice Case Against CCUS

Environmental justice leaders have long argued that CCUS threatens further harm to communities already overburdened with poor air quality and other environmental impacts and risks.[75] The EJ analysis is multifaceted, but, with

73 Grubert, E., & Sawyer, F. (2023). US power sector carbon capture and storage under the Inflation Reduction Act could be costly with limited or negative abatement potential. *Environmental Research: Infrastructure and Sustainability*, *3*(1), 015008.

74 Grubert and Sawyer (2023), see footnote 73. On project risks in the power sector, see Wamsted D., & Schlissel, D. (2020). Petra Nova Mothballing Post-Mortem: Closure of Texas Carbon Capture is a Warning Sign. Institute for Energy Economics and Financial Analysis; and Swartz, K. E. (2021, October 26). *The Kemper project just collapsed. What it signifies for CCS*. E&E News by Politico.

75 Baptista, A. I., Lam, Y., Ventrella, J., Sheats, N., Ikeda, T., Zaman, A., & Helmick, B. (2025). Climate Justice Futures: Carbon Management Risks and Alternatives. *Journal of Climate Resilience & Climate Justice*, 2, 1-17; Lam, Y., Ventrella, J., Baptista, A., Castellanos, J. D. R., Sheats, N., Ikeda, T, Zaman, A., & Helmick, B. (2024). Environmental Justice Concerns with Carbon Capture and Hydrogen Co-firing in the Power Sector. Tishman School of Environment and Design, The New School.

CCUS, one can start with a basic research question: Does a technology designed to keep CO_2 out of the atmosphere end up causing more—or perpetuating existing—air pollution and other environmental harms, as well as built-environment risks, in surrounding communities? The fact is, in every phase of CCUS operations, local pollution and risks are added even as GHG emissions are, in theory, being reduced. In the EJ analysis, local pollution associated with CCUS is potentially a multiplier of negative health impacts from pre-existing poor air quality, an outcome more likely in areas with high concentrations of racial minority residents, because this is where many of the new CCUS-adapted facilities in development, especially larger facilities, are likely to be sited, as we will examine more closely in Part V.

The EJ impacts of CCUS can be tracked across the three main phases of operation: 1) upstream supply of fossil fuels; 2) point-source fossil fuel combustion or conversion; and 3) transport and storage of captured CO_2, the crediting of which through 45Q underwrites the whole CCUS operation.

Upstream Emissions

As noted above, CCUS does not reduce the amount of fossil fuels in the energy system or economy but only the resulting emissions when the fossil fuels are burned or converted. Therefore, all of the "upstream" pollution associated with extracting, transporting, and processing fossil fuels continues or even expands with the use of CCUS. In addition to methane leakage, as previously discussed, upstream air pollution from the oil and gas system is primarily comprised of common pollutants such as fine particulate matter, nitrogen oxides, sulfur dioxide, and ozone. These are termed "criteria air pollutants," discussed in more detail below; ozone is considered a "secondary" pollutant, as it is produced through atmospheric reactions with other pollutants, while particulate matter pollution can be both primary (e.g. present in construction site dust, vehicle exhaust, and wildfire smoke) or secondary (formed through atmospheric reactions with precursor gases such as nitrogen dioxide and ammonia). Other oil and gas production emissions include volatile organic compounds classified as hazardous air pollutants, including benzene, toluene, mixed xylenes, and n-hexane.[76]

Air pollution contributes to respiratory, cardiovascular, and neurological problems and is a factor in mortality risk. A 2023 national study of air quality im-

76 Hazardous air pollutants of oil and gas production are regulated by the Environmental Protection Agency under the National Emissions Standards for Hazardous Air Pollutants. See US Environmental Protection Agency. (Updated 2026, May 6). Oil and Natural Gas Production Facilities: National Emission Standards for Hazardous Air Pollutants (NESHAP). Retrieved March 3, 2026.

pacts of oil and gas production in the US found that, in 2016, the combined effects of particulate matter, nitrogen dioxide, and ozone pollution from oil and gas production resulted in 410,000 asthma exacerbations, 22,000 new asthma cases, and 7,500 excess deaths. The monetary cost of these health impacts was estimated to be $77 billion.[77]

Along with air quality impacts, oil and gas production is a major source of both water consumption (for drilling) and wastewater production (produced water from extraction). The oil and gas sector as a whole produces about 2.5 billion gallons of wastewater daily, which can be toxic and is often highly saline.[78] Most of this produced water is reinjected for EOR or for disposal, which is poorly regulated, posing serious health hazards through potential contamination of drinking water supplies, groundwater, and rivers and streams.[79] More directly, fossil fuel wastewater spills have also occurred. In 2014, a broken pipeline spilled more than 1 million gallons of wastewater from unconventional oil drilling into a spring-fed ravine on the Fort Berthold Indian Reservation in North Dakota. The toxic water seeped into a nearby drinking water source, but fortunately did not reach the intake of the water plant. As much as 5 percent of oil and gas wastewater is accidentally or illegally leaked.[80] Myriad other local, non-GHG gas or co-pollutant impacts of oil and gas production include both onshore and offshore oil spills (the latter are typically much larger) and related soil/coastal pollution, as well as seismic effects that can compromise the safety of drilling operations.

EJ analysis always comes to the question of who is affected by pollution, and a large body of research consistently has shown that Black people, Hispanics (per US Census categories), Native Americans, and other racial-ethnic groups are disproportionately exposed to and negatively impacted by fossil fuel pollution and industrial chemical releases.[81] While much of this research naturally focuses on urban areas with many polluting facilities and heavy road traffic, oil and gas production areas, which tend to be less densely populated, are also, in

77 Buonocore, J. J., Reka, S., Yang, D., Chang, C., Roy, A., Thompson, T., ... & Arunachalam, S. (2023). Air pollution and health impacts of oil & gas production in the United States. *Environmental Research: Health*, *1*(2), 021006.

78 Allison, E., & Mandler, B. (2018). Petroleum and the Environment. American Geosciences Institute.

79 Hammer, R., & VanBriesen, J. (2012). In Fracking's Wake - New Rules are Needed to Protect Our Health and Environment from Contaminated Wastewater. Natural Resources Defense Council.

80 Konkel, L. (2016). Salting the Earth: The Environmental Impact of Oil and Gas Wastewater Spills. *Environmental Health Perspectives*, *124*(12), A230.

81 See, generally, Donaghy, T. Q., Healy, N., Jiang, C. Y., & Battle, C. P. (2023). Fossil fuel racism in the United States: How phasing out coal, oil, and gas can protect communities. *Energy Research & Social Science*, *100*, 103104.

some cases, characterized by racial disparities of pollution exposure. A 2023 study of oil and gas production in California found that "Black, Hispanic, and socioeconomically marginalized people persistently had disproportionately high exposure to oil and gas development...[and the] widest observed disparities were for Black people residing in neighborhoods with the most intensive oil and gas production."[82] Another study of oil and gas production in the high-producing Eagle Ford shale play in the South Texas Permian found that majority-Hispanic census blocks in the region were exposed to twice as many gas well flaring events as compared to census blocks with smaller Hispanic populations (< 20 percent).[83] The health impacts of oil and gas flaring and venting are significant, and satellite imaging of associated pollution—including fine particulate matter, nitrogen dioxide, and ozone—finds levels much higher than those recorded in the National Emissions Inventories. Based on this new data, researchers estimate that venting and flaring cause 710 premature deaths and 73,000 childhood asthma exacerbations annually.[84]

Downstream Emissions

For a broad range of polluting facilities, "post-combustion" CCUS capture equipment works by means of amine absorption of CO_2 from the flue exhaust produced by combustion of fossil fuels in a production process. The separated CO_2 is then compressed into a supercritical state (low-viscosity liquid gas), which is the required phase for high-pressure pipeline transport to the storage wells. However, other emissions, often termed "co-pollutants," from the same facilities and production processes are not captured with the CO_2, and carbon capture operations can actually increase co-pollutant emissions, as we will discuss in more detail below.[85]

82 González, D. J., Morton, C. M., Hill, L. A. L., Michanowicz, D. R., Rossi, R. J., Shonkoff, S. B., ... & Morello-Frosch, R. (2023). Temporal Trends of Racial and Socioeconomic Disparities in Population Exposures to Upstream Oil and Gas Development in California. *GeoHealth*, *7*(3), e2022GH000690.

83 Johnston, J. E., Chau, K., Franklin, M., & Cushing, L. (2020). Environmental Justice Dimensions of Oil and Gas Flaring in South Texas: Disproportionate Exposure among Hispanic communities. *Environmental Science & Technology*, *54*(10), 6289-6298.

84 Tran, H., Polka, E., Buonocore, J. J., Roy, A., Trask, B., Hull, H., & Arunachalam, S. (2024). Air Quality and Health Impacts of Onshore Oil and Gas Flaring and Venting Activities Estimated Using Refined Satellite-Based Emissions. *GeoHealth*, *8*(3), e2023GH000938.

85 To be clear, co-pollutants of CCUS-adapted facilities are regulated under the Clean Air Act (CAA), with emissions standards set according to health-based criteria. But co-pollutant emissions are not prohibited under the Clean Air Act; rather, they are limited to allowable levels as set in air permits and as feasible given the best available control technologies or the performance of the lowest-emitting facilities in a given industry. Among the critical structural weaknesses of Clean Air Act regulation, however, is its focus on pollutant- and facility-specific limits, without considering how a given new facility and its pollutants could contribute, in some places, to combined and cumulative impacts of multiple polluting facilities and pollution combinations in the same area. We will come back to the problem of cumulative impacts in Part V.

The most common are known as "criteria air pollutants" (CAPs), which are regulated under the EPA's National Ambient Air Quality Standards (NAAQS) program based on scientific "criteria" for protecting human health and the environment. From a health perspective today, the most concerning co-pollutants include fine particulate matter ($PM_{2.5}$; aka "soot") and nitrogen oxides (primarily NO_2), as these pollutants are both prevalent and clearly associated with serious respiratory, cardiovascular, and neurological problems and premature death. $PM_{2.5}$ is both a primary (directly emitted) and secondary (reactively formed in the air) pollutant, and is considered to be the most dangerous common air pollutant, responsible for approximately 350,000 deaths per year in the United States and 1 in 5 deaths overall in the world. A large body of research also consistently finds that racial-ethnic minority populations are disproportionately exposed to $PM_{2.5}$ and suffer more from its health impacts, often in combination with other health stressors such as excessive heat.[86] With CCUS in particular, the health impacts of $PM_{2.5}$ are important to consider because, as detailed below, chemical emissions of the capture process can contribute to secondary $PM_{2.5}$ formation in surrounding areas.

The EPA regulates CAPs from large stationary sources, setting health-based standards for each pollutant. These standards are "ambient" thresholds, that is, allowable concentrations of the pollutant in the surrounding air; for example, the most recent $PM_{2.5}$ standard, set in 2024, is 9 micrograms per cubic meter. It should be noted that, while the NAAQS have generally been strengthened over time, improved standards are often decades in the making, which effectively means that people are being exposed to unhealthy pollution levels during the periods when stronger standards are deferred. The $PM_{2.5}$ standard, for example, was last updated in 2012, meaning that, for more than a decade, the federal standard was less protective of health than it should have been.[87] Nevertheless, the more stringent 2024 standard means that an estimated 75 million people in 22 states—roughly half of whom are Black or Hispanic/Latino—live in counties currently exceeding the standard; many millions who were previously exposed to what are now considered unhealthy levels of particulate matter should be

86 Miller, A. (2021, February 9). *Fossil fuel air pollution responsible for 1 in 5 deaths worldwide*. Harvard T. H. Chan School of Public Health; *Racial, ethnic minorities and low-income groups in U.S. exposed to higher levels of air pollution*. (2022, January 12). Harvard T. H. Chan School of Public Health [the study referenced in the article is here (behind paywall): Jbaily, A., Zhou, X., Liu, J., Lee, T. H., Kamareddine, L., Verguet, S., & Dominici, F. (2022) Air pollution exposure disparities across US population and income groups. *Nature*, *601*(7892), 228-233]; see also Josey, K. P., Delaney, S. W., Wu, X., Nethery, R. C., DeSouza, P., Braun, D., & Dominici, F. (2023). Air Pollution and Mortality at the Intersection of Race and Social Class. *New England Journal of Medicine*, *388*(15), 1396-1404.

87 Individual NAAQS are subject to review in five-year intervals, and the first Trump Administration in fact reviewed the 2012 $PM_{2.5}$ standard, deciding (in 2020) that it should not be revised.

able to obtain protection under the new, more stringent standard.[88] However, in 2025, the Trump Administration acted to strike down the 2024 standard, a move that is still being litigated as of June 2026.[89] Such extended timelines and political challenges in strengthening the standard of, and protecting more people from, a deadly air pollutant raises the important question of cumulative impacts, which we will come back to in Part V.

When it comes to measuring CCUS impacts on local pollution, it should be emphasized that CAPs are regulated by the EPA based on concentration averages calculated over large areas (typically counties or even larger air districts), with the result that "pollution hotspots"—smaller, highly polluted areas or "microclimates" within otherwise less polluted larger areas—can effectively be "masked" for purposes of compliance with the NAAQS.[90] Prior to the strengthened 2024 $PM_{2.5}$ standard, only five areas and 15 counties (almost all in California) were designated as in "nonattainment" (out of compliance) with the 2012 $PM_{2.5}$ standard. Yet many cities and thousands of neighborhoods are likely exposed to what would otherwise be considered illegal levels of particulate matter emissions if measured locally (via denser monitoring networks) or hyper-locally (via mobile monitoring) instead of county-wide for purposes of enforcing the NAAQS.[91] In Louisiana, for example, not a single parish is currently designated as in nonattainment with the 2012 $PM_{2.5}$ standard; yet, according to EPA Air Pollution Emissions Trends data, in 2024 the state overall had per-capita $PM_{2.5}$ emissions (from all sources) roughly 55 percent greater than in the country as a whole and 2.3 times greater for emissions from stationary sources.[92] Given the clear historical pattern of clustering polluting facilities in certain areas of

88 Winz, R., & Johnson, S. (2025) Assessing the 2024 PM2.5 Standard So Far: Who's on Track to Get Clean Air and Who's Left Behind. Earthjustice.

89 Natural Resources Defense Council. (2026, February 11). *Trump EPA Misses Legal Deadline to Reduce Deadly Air Pollution*; Harvard Environmental and Energy Law Program, Regulatory Tracker. National Ambient Air Quality Standards (NAAQS) for Particulate Matter (PM). Harvard Law School. Retrieved on June 10, 2026.

90 Carlson, A. E. (2018). The Clean Air Act's blind spot: microclimates and hotspot pollution. *UCLA L. Rev.*, 65, 1036. The article is summarized by Kamhi, J. (2018, November 23). The Clean Air Act Obscures Polluted 'Hotspots.' The Regulatory Review.

91 It should be noted, however, that monitoring inadequacy plays out even at the county level. In a 2018 study, 54 counties in 11 states, home to a combined population of more than 24 million people, were found to be misclassified as in attainment (or as non-classified) with the 2012 $PM_{2.5}$ standard when monitored using satellite data. See Sullivan, D. M., & Krupnick, A. (2018) .*Using Satellite Data to Fill the Gaps in the US Air Pollution Monitoring Network*. Resources for the Future.

92 Author's calculations based on US Environmental Protection Agency. (Updated 2026, April 7). Air Pollutant Emissions Trends Data. Retrieved on April 12, 2026. Calculation excludes emissions from wildfires and prescribed fires. To be clear, higher amounts of pollution per capita do not necessarily reflect higher rates of exposure per person; exposure depends on source proximity and other community characteristics such as traffic density and patterns. The former is clearly a factor in Louisiana's SE industrial corridor, with its extensive clustering of polluting facilities, but the latter may be less relevant in the region, certainly as compared to other high $PM_{2.5}$ regions such as the Los Angeles metropolitan area.

the state and particularly the SE industrial corridor parishes, it seems likely that many Louisianans are exposed to high levels of $PM_{2.5}$. Evidence for this, however, is hard to gather because the Louisiana Department of Environmental Quality's existing monitoring network is spread thin across the region, with only six $PM_{2.5}$ monitors for nine parishes and large unmonitored areas, including all of Black-majority Ascension and Saint John the Baptist Parishes, as well as the more diverse Saint Charles Parish.[93]

Another group of 189 specific chemical pollutants considered particularly dangerous to human health is termed hazardous air pollutants (HAPs) or air toxics. Most HAPs are gaseous emissions from the production of commodity chemicals that are used to manufacture consumer and industrial materials such as plastics, resins, solvents, and cleaning fluids. Some HAPs prevalent in the Gulf South, such as formaldehyde and ethylene oxide, are known carcinogens, and many are produced from hydrocarbons such as ethane and therefore are linked to significant CO_2 emissions. Ethylene, for example (the largest volume commodity chemical globally), is produced via steam cracking of ethane, with CO_2 emissions totaling approximately 44.4 million metric tons annually.[94]

According to the Greenhouse Gas Reporting Program, the CO_2e emissions[95] from chemicals production (including CCUS-adaptable ammonia, hydrogen, and petrochemicals production) totaled approximately 185 million metric tons in 2023, nearly 60 percent of which came from facilities in just two states, Texas and Louisiana, as seen in Figure 4.[96] In fact, the single largest climate polluter within the broader chemicals sector, by a wide margin, is CF Industries Nitrogen in Donaldsonville, Ascension Parish, LA, with annual CO_2 emissions of 7.8 million metric tons CO_2e in 2023 and, additionally, nitrous oxide (N_2O)

93 Runwal, P. (2025, April 9). *Will community air monitoring bring 'Cancer Alley' cleaner air?* Chemical and Engineering News. The Louisiana Environmental Action Network has been working to deploy its own Community Air Monitoring Network, but the Louisiana Community Air Monitoring Reliability Act, which was signed into law in 2024, restricts the use of community-deployed and -managed monitoring networks, including mobile monitoring, in regulatory proceedings and other public settings. See Heimbinder, M. (2025, July 23). *Louisiana's ban on community air monitoring is an attack on science and free speech*. The Lens; the EPA's current Interactive Map of Air Quality Monitors appears to show that there is only one active $PM_{2.5}$ monitor (in St. Gabriel, Iberville Parish) along the entire SE industrial corridor outside of Baton Rouge and New Orleans.

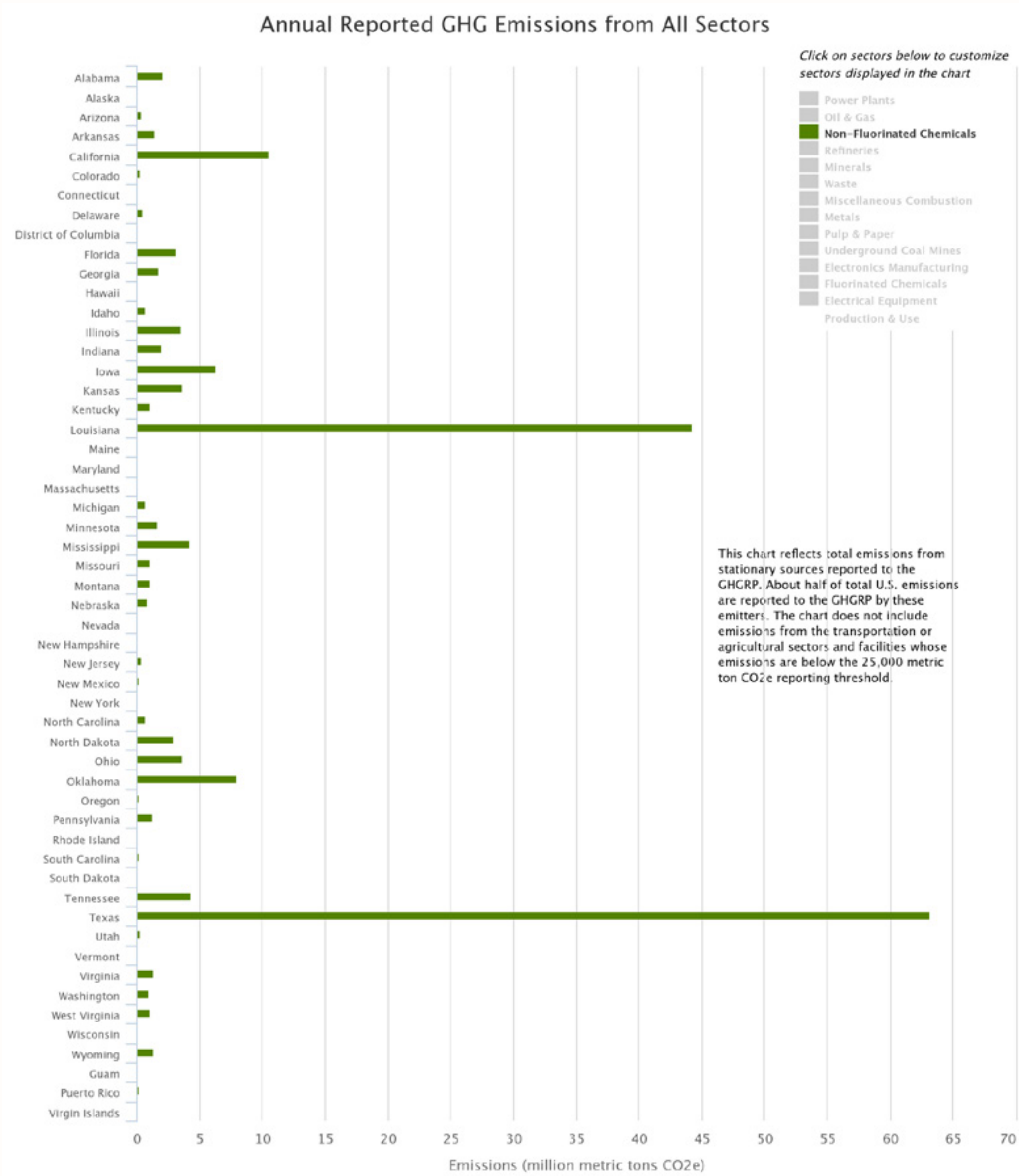
94 American Council for an Energy Efficient Economy. (2025, June). *Manufacturing ethylene: facts, impacts, and pathways.* [Policy brief].

95 "CO_2e" or "carbon dioxide equivalent" is a standard unit of measurement expressing the climate impact of other greenhouse gases as an equivalent amount of CO_2 emissions. For example, nitrous oxide (N_2O) has a 100-year global warming potential 273 times that of CO_2, which means that one ton of nitrous oxide emissions is equal to 273 tons of CO_2e emissions. The point is to be able to calculate all greenhouse gas emissions (of a facility, a sector, a state, etc.) as a single amount of CO_2 emissions.

96 See also, US Environmental Protection Agency. (2024). *2011-2023 Greenhouse Gas Reporting Program Sector Profile: Chemicals Sector (Non-Fluorinated)*.

emissions of 1.7 million metric tons CO_2e (with N_2O having a global warming potential estimated at 273 times that of CO_2 over a 100-year period).[97]

Figure 4. Non-flourinated Chemicals Production: GHG Emissions by State in Millions of Metric Tons CO2e (2023).



Source: US Environmental Protection Agency, Office of Atmospheric Protection. (2026). Greenhouse Gas Reporting Program (GHGRP): GHGRP Emissions by Location. Reporting Year 2023.

As noted in Part I, CF Industries Nitrogen, the world's largest and longest-operating ammonia and fertilizers production plant, is also the first chemical production facility in the US to adopt and launch a CCUS operation (as of July 2025). Carbon capture adoption in the chemicals sector could be further spearheaded

97 US Environmental Protection Agency. (2026). Greenhouse Gas Reporting Program (GHGRP): EPA Facility Level GHG Emissions Data. Reporting Year 2023.

by Dow Chemicals' "net zero" CCUS retrofit of its massive ethylene cracking complex in Alberta. Dow has also announced plans for a new plant in the Gulf Coast that will capture CO_2 from ethylene production to produce carbonate solvents that are a key component of electrolyte solutions needed for improving lithium-ion battery performance. Fourteen other ethane-based chemical production facilities currently proposed or under development could also be candidates for CCUS adaptations.[98]

The question of massive and potentially growing HAP emissions associated with what is supposed to be a positive climate solution must be pressed, and most certainly so from a local perspective. In this light, it is important to understand that HAPs are not federally regulated by setting health-based emissions thresholds based on publicly monitored air concentration levels. Instead, HAPs are regulated for each specific polluting facility based on technological considerations, or what is known as Maximum Achievable Control Technology, and this is determined based on current practice in the industry and not on human health. Essentially, HAPs are regulated by industry standards of operational and fugitive emissions control, with "risk-based" additional requirements potentially recommended, though rarely enforced, only after arduous review, negotiation, and often litigation by affected residents and sometimes workers.[99]

More Pollution for Your Money

A direct but often overlooked problem with CCUS and local pollution is the factor of "energy penalties." Running the CCUS equipment, say, on a fossil fuel power plant, requires *additional* energy and thus *more fuel combustion* than would otherwise be needed simply to generate the electricity. This is a "penalty" because the energy required for carbon capture increases the total energy used—and total fuel supply needed—to produce the now lower-carbon version of the electricity. In the power sector, 20-30 percent of plant output may be needed to run the capture equipment, thus requiring substantial additional fuel

98 Dow Chemicals. (2021, October 6). Dow announces plan to build world's first net|zero carbon emissions ethylene and derivatives complex; The Dow carbonate solvents project was awarded a conditional Department of Energy grant of up to $95 million in 2024, but the grant was cancelled by the Trump Administration in 2025. See Dow Chemicals. (2024, March 25). *Dow announces intent to invest in new world|scale carbonate solvents facility in the U.S.* On the broader ethane-based chemical production buildout see Bernhardt, C. (2025, July 24). With 14 ethane cracker projects looming, analysts wonder whether companies are overbuilding. Oil & Gas Watch.

99 Younes, L., Kofman, A., Shaw, A., & Song, L., with additional reporting by Miller, M. (2021, November 2). *Poison in the Air*. Pro Publica.

to maintain the same level of output.[100]

Petra Nova's carbon capture project at the W.A. Parish coal-fired generating station in Thompsons, Texas—which operated from 2017 to 2020, shut down for economic reasons, and restarted in 2023—is one of the few large-scale examples of post-combustion CCUS with observational data on capture performance.[101] The capture unit was applied to a 240-megawatt slipstream of the 654-megawatt Unit 8 of the plant (a slipstream is a controlled fraction of the Unit's overall process emissions). Powering the capture system required installation of a dedicated cogeneration unit (combustion gas turbine and heat recovery steam generator) with a capacity of 85 megawatts, amounting to roughly 35 percent of additional power capacity installed for the carbon capture operation. According to the project's federal air permit renewal (in 2023) from the Texas Commission on Environmental Quality, additional annual emissions allowed from the dedicated power source includes 3360 tons of CAPs, 34 tons of ammonia, and 13 tons of volatile organic compounds (VOCs); permitted annual emissions of the capture unit itself and primarily the CO_2 removal "scrubber" are 37 tons of VOCs and 5.7 tons of ammonia.[102] Thus, the obvious result of adaptation with carbon capture is increased local pollution from operating the carbon capture equipment and the dedicated generator for powering the equipment.

With that said, according to the Department of Energy's "Final Scientific/Technical Report" (issued in 2020, when the operation first shut down), Petra Nova's operational power capacity requirement is reported to have been approximately 35 megawatts, with the remaining output from the dedicated power unit sold in the wholesale electricity market. Notably, however, the report also states that, over three years, incremental outages of the power unit resulted in the equivalent of 88 days of operational downtime for the carbon

100 Rasool, M. H., & Hashmi, S. A. M. (2025). Carbon capture and storage: An evidence-based review of its limitations and missed promises. *Petroleum Research 11(1)*, 176-205.

101 Petra Nova was awarded a $195 million demonstration project grant from the DOE in 2010 and was the only clean coal project out of a total of eight supported by the DOE in the 2010s that commenced operations. See US Government Accountability Office. (2021). *Carbon Capture and Storage: Actions Needed to Improve DOE Management of Demonstration Projects*.

102 Texas Commission on Environmental Quality. (2023, February 13). Federal Operating Permit No. 03611. Ammonia injection is a key component of selective catalytic reduction to control nitrogen dioxide emissions from gas power generators; Petra Nova's 34 tons of ammonia emissions is what is known as an ammonia "slip," that is, emissions of unreacted ammonia from the power generator stack. See CECO Environmental. (2025, August 12). *The Role of Ammonia Injection in SCR Systems for Achieving EPA Compliance: Ensuring Optimal NOx Reduction and Regulatory Success*.

capture unit—thus presumably diminishing capture results.[103] Also notable is the net reduction in Petra Nova's CO_2 capture amount when accounting for CO_2 emissions from the additional generating unit, which totaled approximately 1.1 million metric tons over three years, as compared to reported total emissions capture of 3.5 million metric tons—and this does not even include the associated upstream emissions of the additional generation.[104]

Directly measuring the local pollution impacts of CCUS is challenging because there is little observational data, given the small number, generally smaller scale, and mostly rural geography of active CCUS projects currently. However, some indication of the potential local pollution impacts of CCUS in the Gulf South can be gleaned from recent modeling work. A study from researchers at the University of Texas, focusing on Texas and Louisiana, estimates local pollution impacts of CCUS with a model incorporating data from engineering studies, air quality and health research, and geospatial proximity analysis.[105] Based on a sample of high-emitting facilities including 87 industrial plants, 22 gas power plants, and three coal power plants, the study reaches two broad conclusions. First, industrial production and gas power plants with CCUS will increase local pollution, causing additional deaths disproportionately for Black and Hispanic people; this is primarily due to increases in ammonia emissions, and associated secondary $PM_{2.5}$ formation, caused by amine solvent degradation in the CO_2 capture process, as well as NO_2 and $PM_{2.5}$ increases from additional fuel combustion needed to power the CCUS equipment on site. Second, and conversely, coal power plant CCUS will reduce local pollution,[106] with death reductions disproportionately benefiting Black and Hispanic people; the positive scenario for coal power plants, however, is not likely to be impactful overall, the study concludes, because coal power is a shrinking fraction of electricity generation. For example, in Louisiana, only three of 33 power plants in the Greenhouse Gas Reporting Program, and less than 15 percent of electricity CO_2 emissions, are coal-fired as of 2023. At the same time, gas power, chemical and alternative fuels production, and industrial production are growing, which raises concerns about CCUS adaptation in these sectors and the region, given

103 US Department of Energy, National Energy Technology Laboratory. (2020). *W.A. Parish Post-Combustion CO_2 Capture and Sequestration Demonstration Project: Final Scientific/Technical Report.*

104 Wamsted, D., & Schlissel, D. (2020). *Petra Nova Mothballing Post-Mortem: Closure of Texas Carbon Capture Plant is a Warning Sign*. Institute for Energy Economics and Financial Analysis.

105 Waxman, A., Huber-Rodriguez, H. R., & Olmstead, S. M. (2024). What are the likely air pollution impacts of carbon capture and storage? *SSRN*.

106 One significant coal power co-pollutant, SO_2, essentially must be eliminated from the post-combustion flue gas for carbon capture equipment to effectively absorb the CO_2; adapting a coal plant with CCUS thus requires adoption of the most stringent SO_2 pollution controls, which in turn reduces SO_2 emissions that might otherwise be released.

the local pollution increases likely to follow.

Transport and Storage Health and Safety Risks

Pipelines

The health and safety risk of CO_2 transport and storage is a vast technical subject that can only be touched on in this report, but the broad issues of concern are reasonably clear. CO_2 is not flammable, which is an inherent safety feature of CO_2 pipelines; however, CO_2 is an asphyxiant, highly reactive to temperature (dry ice is essentially frozen carbon dioxide), and heavier than air, which means it can displace oxygen and spread quickly over large distances at ground level.

As reported to the federal Pipeline and Hazardous Materials Safety Administration (PHMSA), between 2006 and 2025, there were 5,672 significant pipeline safety incidents, resulting in 235 fatalities, 1,009 injuries, and nearly $12 billion in associated costs.[107] CO_2 is transported in hazardous materials pipelines, and safety incidents, termed "accidents," must be reported to PHMSA for any one of four reasons: a fire or explosion not intentionally set/controlled by the operator, a fatality or injury leading to hospitalization, leakage of five gallons or more or five barrels during maintenance, or $50,000 in property damage. The average yearly accident rate for CO_2 pipelines was 4.1 between 1994 and 2023. Cumulative unintentional leakage totaled 135,000 barrels as of 2023, with five releases of 5,000 barrels or more comprising 79 percent of total leakage; altogether, the leakage rate of CO_2 pipelines is approximately 0.001.[108] Since this leakage rate is from reported accidents, not equipment monitoring or system-wide modeling, it should not be compared to the much higher leakage rates estimated for natural gas pipelines. Further, we should not read too much into a historic safety record based on a very small sample size, as there are only about 5,300 miles of CO_2 pipelines today as compared to roughly 300,000 miles of natural gas transmission pipelines.[109] Low-carbon modeling that includes CCUS estimates a CO_2 pipeline build-out to a scale of between 30,000 and 96,000 miles by 2050, as illustrated in Figure 5.[110] At this scale, the number of and potential harm from accident events will almost certainly grow

107 "Significant" incidents entail fatalities or injury requiring in-patient hospitalization, at least $50,000 in costs, highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more, or liquid releases resulting in unintentional fire or explosion. See US Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2026). Significant Incidents. Reporting Years 2006-2025. Date Run June 16, 2026.

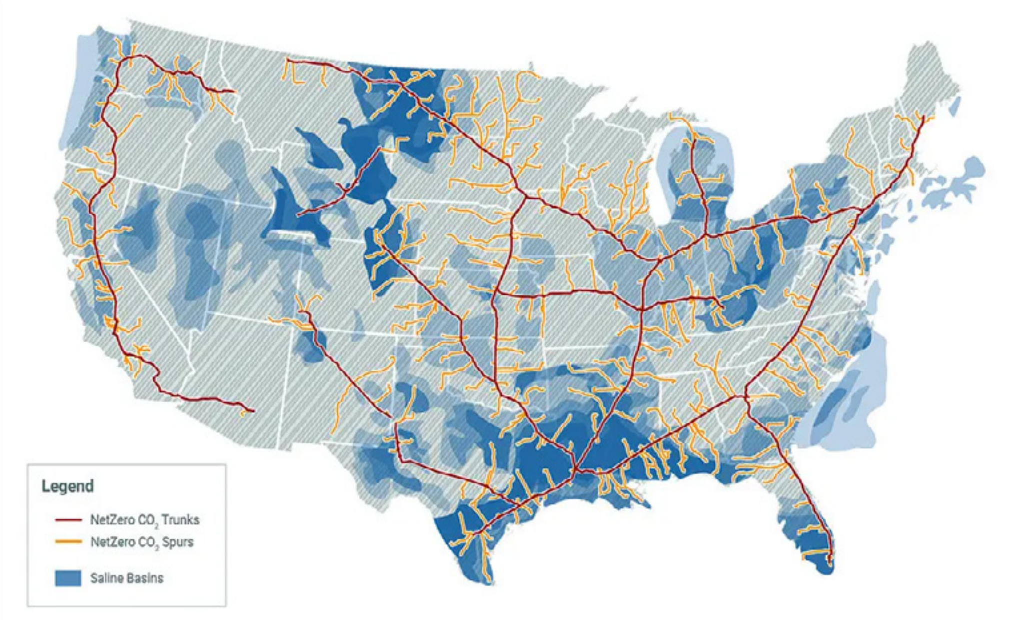
108 Kammer, R. (2024). A Review of the Safety Record of CO_2 Pipelines in the United States. Great Plains Institute. Controlled CO_2 leakage related to accidents, typically to depressurize pipelines during repairs, is also reported to PHMSA and totaled 278,000 barrels as of 2023.

109 See US Department of Energy. (n. d.). Alternative Fuels Data Center: Natural Gas Distribution.

110 ClearPath analysis drawing on National Carbon Sequestration Database: Saline Spatial Database and projected CO_2 trunk-and-spur pipeline needs in Princeton's Net Zero High-Electrification Scenario. See Grant, K. (2025). Carbon Dioxide Pipelines 101. ClearPath.

by multiple factors because there is more pipeline infrastructure that could fail.

Figure 5. Projected CO2 Pipeline Network for High Electrification/Low Emissions Scenario.



Source: ClearPath analysis, "Illustrative 2050 CO2 Pipeline Network," in Carbon Dioxide Pipelines 101.

One key concern with carbon pipeline safety is the corrosive potential of CO_2 when mixed with even trace amounts of water (forming carbonic acid) or other impurities. Between 2006 and 2025, corrosion caused 10 accident events, whereas equipment failure caused 24 accidents and material defects caused 15 accidents.[111]

Two major ruptures in the last several years, both in the Gulf South and involving the pipeline operator Denbury (now owned by ExxonMobil), have raised concerns about siting risks and poor maintenance of CO_2 pipelines. On April 3, 2024, a carbon pipeline rupture near Sulphur, Louisiana, in Calcasieu Parish, released 100,000 gallons of CO_2 into the area. Parish officials put up roadblocks and issued shelter-in-place warnings, and, fortunately, there were no reported injuries.

Four years earlier, residents of Satartia, Mississippi, were not so lucky to avoid potential serious injury when a Denbury pipeline rupture released 31,405 barrels of CO_2 and left a 40-foot crater at the site (as seen in Figure 6), while

111 US Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2026). Significant Incidents. Reporting Years 2006-2025. Date Run June 16, 2026.

sending 45 people to the hospital as the town was evacuated.[112] As noted, CO_2 is an asphyxiant that is heavier than air, and so it collects near the ground and in confined areas, causing headaches, dizziness, and disorientation at low concentrations and potentially rapid suffocation at higher concentrations. Large CO_2 releases can also cause vehicle and other equipment failures that put people at risk, as was the case in Satartia, where people trying to evacuate could not keep their car engines running.

Figure 6. Aerial Drone Photograph of Satartia, MS, Denbury Pipeline Rupture.

Source: Mississippi Emergency Management Agency, included in PHMSA Failure Investigation Report.

Aside from the rapid and unexpected exposure to an asphyxiant and the resulting evacuation and hospitalizations, the most concerning feature of the Satartia pipeline disaster was its cause, which was determined upon investigation. According to PHMSA's Failure Investigation Report (see footnote 112), the cause was a failure to monitor and prepare for geohazards, namely a heavy rain-driven soil subsidence with enough force to "cause excessive axial loading leading to failure at the girth weld." Essentially, the pipeline was snapped by a

112 US Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2022). *Failure Investigation Report - Denbury Gulf Coast Pipeline*. Denbury initially estimated that only 222 barrels of CO_2 had escaped but later revised the amount to 31,405 barrels; in the Failure Investigation Report, the revised estimate is attributed to continuing leakage caused by incomplete closure of a sectional block valve. See also Simon, J. (2023, May 21) *The US is expanding CO2 pipelines. One poisoned town wants you to know its story*. Oregon Public Broadcasting.

landslide,[113] and the lesson should be clear. As with other networked infrastructures sprawling across large areas, like the electricity transmission grid, the growing scale of CCUS pipeline networks only makes them more vulnerable to the accelerating and intensifying impacts of climate change. Essentially, more CCUS means more infrastructure with failure potential, including exposure to geohazards and major disaster events, even if the overall failure rate remains relatively low. Further, just as carbon pipeline expansion means more exposure to climate impacts, it could also entail more exposure of residential populations to potential accidents, as is already the case in at least one major CCUS project in Ascension Parish, LA, discussed in more detail in Part V.

The Satartia and Sulphur examples should give us further specific pause: while Denbury was responsible for only 12 out of 76 carbon pipeline failures since 2010, these failures tended to be larger than average and caused 81 percent of total pipeline releases of CO_2 over this period.[114] This track record of major leakage events should bring specific regulatory attention to the Exxon Mobil/ Denbury CCUS business, which is poised for significant expansion in the Gulf South, as reflected in the project data where Denbury is involved in at least 25 projects in the Oil & Gas Watch database. It should also be noted that Denbury's poor safety track record also includes accidents during routine maintenance; in fact, a second major Denbury leakage event near Satartia, in October 2020, occurred due to a valve malfunction during a controlled release that could not be stopped for 24 hours, leading to highway closures.[115]

Currently, Denbury is operating under a 2023 Consent Order negotiated with PHMSA over the February 2020 Satartia disaster, in which the company agreed to pay a fine of $2.4 million in addition to adopting a battery of new and improved public safety measures and procedures in its pipeline operations.[116] In January 2025, however, the company was issued a second Notice of Probable Violation and Proposed Civil Penalty—this time set at $2.3 million—for six separate actions of obstructing PHMSA's efforts to inspect its construction of a replacement pipeline segment. The company did not respond within 30 days as required, and no further action has been taken by the Trump Administration, which suggests that pipeline safety may not be a federal regulatory priority or

113 Blackburn, P. (2023, April 24) What Did PHMSA's "Consent Agreement" Over Denbury's CO2 Pipeline Rupture in Satartia Really Do? Pipeline Fighters Hub.

114 Bains, P. (2024, July 18). *Data shows Denbury's carbon pipelines leak more than any other CO_2 pipeline company's*. Oil & Gas Watch.

115 Schueler, Y., Saltzer, S. D., & Benson, S. M. (2026). Accident Analysis Of CO_2 Pipeline Failures: Patterns, Detection, and Consequences. *International Journal of Greenhouse Gas Control, 152*, 104621.

116 Blackburn, P. (2023, April 24). See footnote 113.

may not be enforced even as new and extensive CO_2 transport and storage systems are being developed across the Gulf South and in other regions.[117]

Geologic Storage

Regulators seeking to protect surrounding communities from the health and safety risks of secure geologic CO_2 sequestration are not able to draw on a wealth of operational data or practical experience in the United States, as there is only one carbon capture project currently operating with secure sequestration—the Archer Daniels Midland (ADM) biofuels complex in Decatur, Illinois.

The most important considerations involve assessing the geological strata that comprise the storage infrastructure. The injection space must be deep underground to access the necessary heat and pressure to keep the stored CO_2 in a semi-liquid, less diffusible state so that it cannot migrate. Its essential geological characteristics are twofold: a base layer of porous rock filled with saline water, usually sandstone, such that the injected CO_2 has "pore space" in which to settle, mix with the salt water, and stabilize; above the pore space layer a second, impermeable layer is needed, usually shale, which serves as the "cap rock" to prevent CO_2 leakage into groundwater supplies or through to the surface by way of geological fissures or faults. In addition, monitoring wells reaching down to the caprock must be drilled and constructed for measuring injection well activity that could indicate leakage or potential leakage, such as seismicity, CO_2 movement, and caprock cracking.

In 2024, the ADM biofuels facility incurred significant leakage of liquid CO_2 through holes near the base of one of its monitoring wells. Although an EPA investigation determined groundwater supplies and a nearby drinking water reservoir were not impacted or threatened by the leak, the agency issued an enforcement order pertaining to the facility's monitoring well system and emergency response planning.[118]

The ADM example underscores the problem of insufficient observational data on storage well performance. For example, to inform geological and technological choices for injection, there needs to be investments in monitoring and best practices for emergency response and reporting. Given the prevalence of

117 US Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2025, January 17). NOPV (civil penalty and compliance order; the Notice is summarized here: Pipeline Safety Trust. (2025, February 7). Denbury Gulf Coast Pipelines Assessed over $2 Million Civil Penalty for Obstructing and Preventing PHMSA Inspection on Welding Procedure During Replacement of Pipeline that Ruptured Near Satartia, MS.

118 US Environmental Protection Agency. (2024, September 19). EPA Announces Proposed Order Requiring Archer Daniels Midland Co. to Take Actions to Ensure Safe Operation of its Carbon Sequestration Well in Decatur, Illinois. [Press release]. Updated September 20, 2024.

CCUS for EOR, much of the observational information about carbon storage is informed by extraction rather than secure sequestration. This points to the need for state regulators to seek independent expert review of project proposals regarding geological design and injection operations for secure sequestration, if such expert review is not already part of the permitting process in a given state.

In addition to concerns about CO_2 leakage or migration affecting water supplies, induced seismic activity—well documented in shale gas hydraulic fracturing and wastewater injection—are also potentially a significant concern. Given the unique properties of stored CO_2 and the unique geological characteristics and pressure mechanics of well design for secure sequestration, seismic risks of CO_2 storage are a relative unknown among regulatory factors, and surrounding communities are rightly concerned about how state permitting programs will address these risks.[119]

Secure CO_2 storage is an unproven and essentially untested method of CO_2 reductions; thus, in the US context, it is concerning that a number of states with poor environmental track records, including Louisiana and Texas, have obtained or are seeking federally-granted "primacy"—primary regulatory and enforcement authority—over CO_2 secure storage ("Class VI" wells), as regulated under the Safe Drinking Water Act. While this report does not attempt to assess the growing wave of state primacy approvals and applications, an unsuccessful lawsuit to reverse the EPA's approval of Louisiana's primacy application in 2024—the first such approval for CCUS-heavy state—raises serious concerns about potential health and safety impacts of expanding CO_2 storage infrastructure in the region. Among other things, the lawsuit challenged the Louisiana program's waiver of post-closure liabilities for operators of CO_2 storage sites, CO_2 owners, or other associated interests—a feature flatly in conflict with the EPA's approach of maintaining private liability for well safety performance and risk management after site closure.[120]

119 White, J. A., & Foxall, W. (2016). Assessing induced seismicity risk at CO2 storage projects: Recent progress and remaining challenges. *International Journal of Greenhouse Gas Control*, *49*, 413-424.

120 The petition to reverse the EPA's primacy approval for Louisiana was led by Earthjustice on behalf of the Alliance for Affordable Energy, the Deep South Center for Environmental Justice, and Healthy Gulf. On the issue of post-closure liability, see Carna, A. J., Gann, A. F., Franchina, D. A., Wood, A. D., Diles, M. D., & Bassick, C. T. (2024, July 26). EPA, States Differ on Approach to Carbon Capture and Storage Facility Liability. McGuireWoods.

Part IV. CCUS and Added Harm: The Gulf Coast Pollution Baseline

As we stressed at the outset, with more than 60 percent of CCUS projects proposed or under development being sited in Louisiana and Texas, the Gulf South region is ground zero for the CCUS buildout. Further, as we also noted, virtually all of the projects are for new or expanded facilities, which means that CCUS goes hand-in-hand with adding more pollution sources in the region. Understanding the current pollution "baseline" for CCUS development, then, should be a starting point for assessing the potential impacts of CCUS going forward. At a minimum, such a baseline should account for three types of point-source pollution—GHG emissions, toxic releases (HAPs/air toxics), and criteria air pollutants (CAPs).

In what follows, we outline select data of these pollution baselines as reported for both Louisiana and Texas. With greenhouse gases, the region's high emissions output is relevant for understanding why the CCUS buildout is gaining traction there: more CO_2 emissions potentially mean more federal subsidy through the 45Q tax credit program. In addition, the region's vulnerability to climate hazards underscores the question of how cumulative CO_2 emissions from facilities in the region could grow as new CCUS-involved facilities incrementally contribute to climate change, and climate change impacts, in turn, increasingly affect local communities and people who live in the region. With air toxics and CAPs, the baselines are important for understanding how CCUS development could have a perverse effect of making local pollution worse, while project owners or other claimants to the CCUS subsidies may also be doing more harm than good in the fight against climate change.

Gulf Coast GHG Emissions From Large Facilities (2023)[121]

Louisiana:

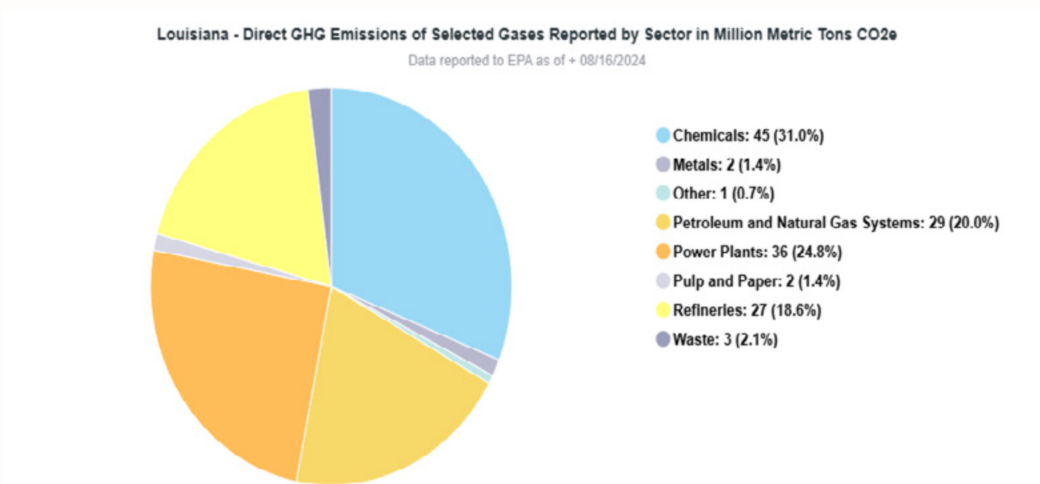
- According to the EPA's Greenhouse Gas Reporting Program (GHGRP), in 2023 direct GHG emissions in Louisiana totaled 144 million metric tons (MMT CO_2e) from 403 large facilities (>25,000 metric tons annually). This is equal to roughly 5 percent of total emissions reported for large facilities

121 All GHG emissions data in this section are from the Greenhouse Gas Reporting Program facility-level database for large facilities with direct emissions (>25,000 metric tons CO_2e), in the following sectors: power plants; oil and gas systems; refineries; chemicals; minerals; metals; waste management; food processing; ethanol; pulp and paper. According to the EPA, direct emissions from large facilities comprise about half of total US emissions from all sources.

nationally, as compared to a national population share of 1.3 percent. The state's GHG-polluting facilities reporting to the GHGRP include 33 power plants emitting 36 MMT CO_2e as well as 320 facilities in three fossil fuel-based subsectors: oil and gas systems (processing, transport, storage), chemicals and fuels (petrochemicals, ammonia, hydrogen, and methanol), and oil refineries.[122]

- Louisiana has a very high concentration of large facility GHG emissions on a population basis and by land area: 31 metric tons per capita and 2,750 metric tons per square mile of land and water in 2023, as compared to 7.6 metric tons per capita and 38 metric tons per square mile nationally.[123]
- Chemicals production is Louisiana's largest GHG-emitting sector, generating 31 percent of statewide facility emissions, as seen in Figure 7. Only 7 percent of total GHG emissions from large facilities, nationally, are from the chemicals sector, but 24 percent of these are generated by Louisiana's 78 reporting chemical facilities, which total 18 percent of all chemical facilities reporting to the GHGRP. CF Industries Nitrogen in Donaldsonville, Ascension Parish, LA, tops the list of climate polluters in the chemicals sector, with GHG emissions totaling a staggering 9.5 million metric tons in 2023 and including 1.7 MMT of highly potent nitrous oxide emissions—with a 100-year global warming potential 273 times that of CO_2.

Figure 7. Louisiana Facilities' Direct GHG Emissions (MMT CO2e) by Sector (2023).



Source: US Environmental Protection Agency, Office of Atmospheric Protection. (2026). Greenhouse Gas Reporting Program: EPA Facility Level GHG EmissionsData. Reporting Year 2023.

122 US Environmental Protection Agency, Office of Atmospheric Protection. (2026). Greenhouse Gas Reporting Program (GHGRP): EPA Facility Level GHG Emissions Data. Reporting Year 2023.

123 Author's calculations based on EPA facility-level GHG emissions data and United States Census data.

- Louisiana's own most recent Greenhouse Gas Inventory[124] found that roughly two thirds of emissions are from industrial production, compared to 23 percent nationally.[125] The state's overall energy consumption is 72 percent industrial, compared to only 35 percent nationally,[126] and it ranks 4th among states for total energy consumption and 2nd only to Alaska for per capita energy consumption.[127]
- In 2023, combined GHG emissions of 93 reporting facilities in eight parishes of Louisiana's SE industrial corridor totaled 71.4 million MMT CO2e, comprising about 50 percent of Louisiana's statewide facility emissions and roughly equal to the emissions of all 222 facilities reporting in Illinois. Per-facility emissions in the LA's SE industrial corridor averaged approximately 767 metric tons as compared to a national average of 342 metric tons.[128]
- In 2023, combined GHG emissions from 1,534 facilities across Texas, Louisiana, Mississippi, and Alabama totaled 708 MMT CO2e, which is equal to 30 percent of the emissions from 6,470 facilities in all other states combined.[129] In Figure 8, GHG point source facilities in the Gulf South energy region, stretching roughly 1000 miles from the Port of Corpus Christi to Louisiana's SE industrial corridor, are mapped and scaled in a range from 200,000 tons per year to 22 million tons per year, with the darker to lighter grid squares indicating relative area densities of emissions, higher to lower.

124 Dismukes, D.E. (2021). Louisiana 2021 Greenhouse Gas Inventory. LSU Center for Energy Studies. The Inventory tracks emissions in the 2000-2018 period.

125 US Environmental Protection Agency. (2022). Sources of Greenhouse Gas Emission. Retrieved June 10, 2026. Industrial emissions including indirect emissions from electricity use totaled 30 percent of US GHG emissions by economic sector.

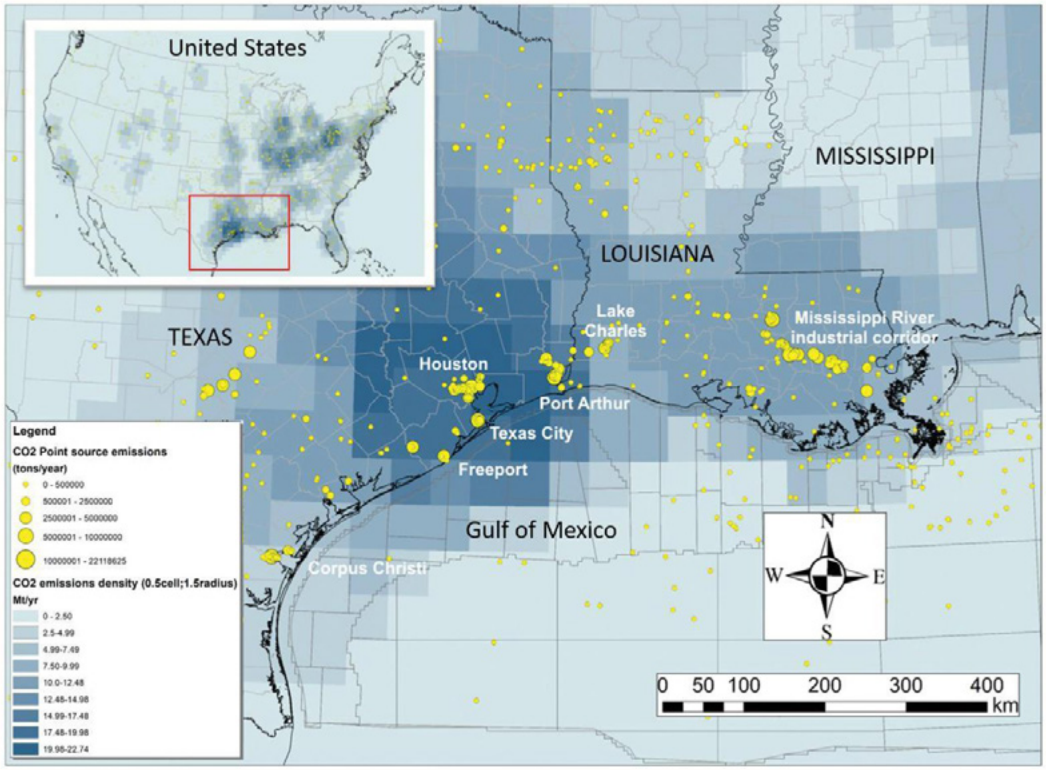
126 US Energy Information Administration. (n.d.). U.S. Energy Consumption by Source and Sector, 2025.

127 US Energy Information Administration. (2026). Analysis (Louisiana). Updated August 21, 2025.

128 Author's calculations based on GHGRP facility-level emissions data.The parishes are East Baton Rouge, West Baton Rouge, Iberville, Ascension, St. James, St. John the Baptist, St. Charles, and Jefferson.

129 Author's calculations based on GHGRP facility-level emissions data.

Figure 8. Point Source CO2 Emissions in the Gulf Coast Industrial Corridor (Southeast Texas-to-Southeast Louisiana), as reported in the GHGRP.

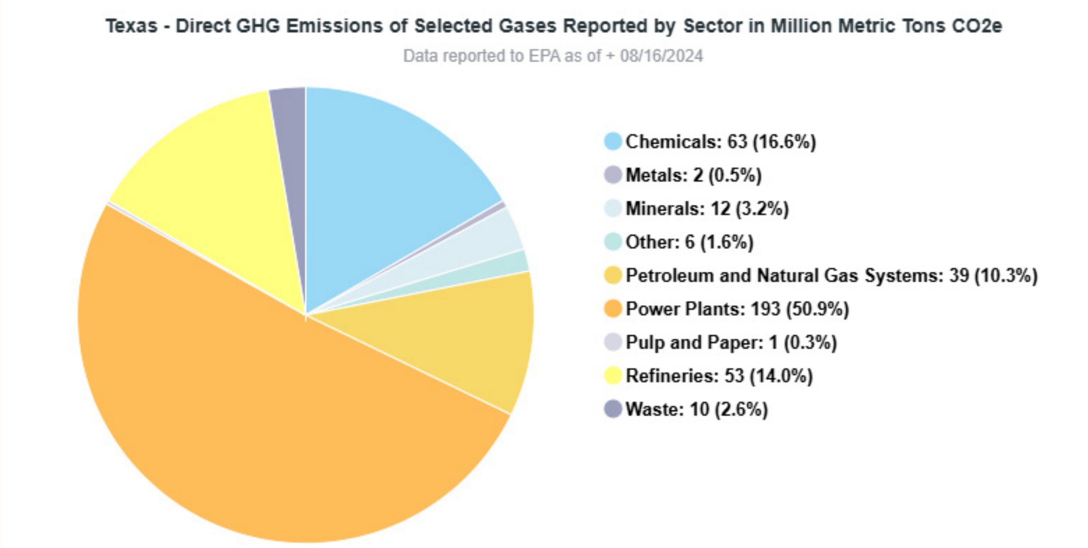


Source: Figure 1 in Meckel, T. A., Bump, A. P., Hovorka, S. D., & Trevino, R. H. (2021). Carbon capture, utilization, and storage hub development on the Gulf Coast. *Greenhouse Gases: Science and Technology*, *11*(4), 619-632.

Texas:

- In 2023, Texas GHG emissions totaled 381 MMT CO_2e from 869 facilities, in keeping with essentially a flat trend in reported emissions over the last decade or more. Texas's facility-level GHG emissions are equal to nearly 15 percent of total US emissions (facility-level), as compared to having a national population share of less than 10 percent. As seen in Figure 9, roughly two-thirds of the state's facility-level emissions come from the power and chemicals sectors, but, in contrast with Louisiana, where power plants contribute roughly one-fourth of GHG emissions and the chemicals sector contributes more than 30 percent, in Texas the chemicals' share of emissions is only 17 percent while power plants contribute more than 50 percent.

Figure 9. Texas Facilities' Direct GHG Emissions (MMT CO2e) by Sector **(2023).**



Source: US Environmental Protection Agency, Office of Atmospheric Protection. (2026). Greenhouse Gas Reporting Program (GHGRP): EPA Facility Level GHG Emissions Data. Reporting Year 2023.

- In Southeast Texas, Harris County alone was home to 52.6 MMT of CO_2e emissions, including 12.6 MMT from ExxonMobil's massive Baytown refinery and chemicals plant; 188 facilities in six SE Texas Counties (Harris, Jefferson, Galveston, Brazoria, Chambers, and Orange) generated 35 percent of statewide emissions.
- Texas' emissions were less concentrated as compared to Louisiana's, at 12 tons per capita and 1,416 tons per square mile, although still much more concentrated by population and area as compared to US emissions in total.[130]
- About 100 reporting facilities in SE Texas generated approximately one third of total US GHG emissions reported from the chemicals sector in 2023; Texas and Louisiana chemical GHG missions taken together comprised nearly 60 percent of total US emissions reported from the sector.[131]

130 Author's calculations based on GHGRP facility level GHG emissions data and United States Census data.

131 US Environmental Protection Agency. (n.d.). 2011-2023 Greenhouse Gas Reporting Program Sector Profile: Chemicals Sector (Non-Fluorinated).

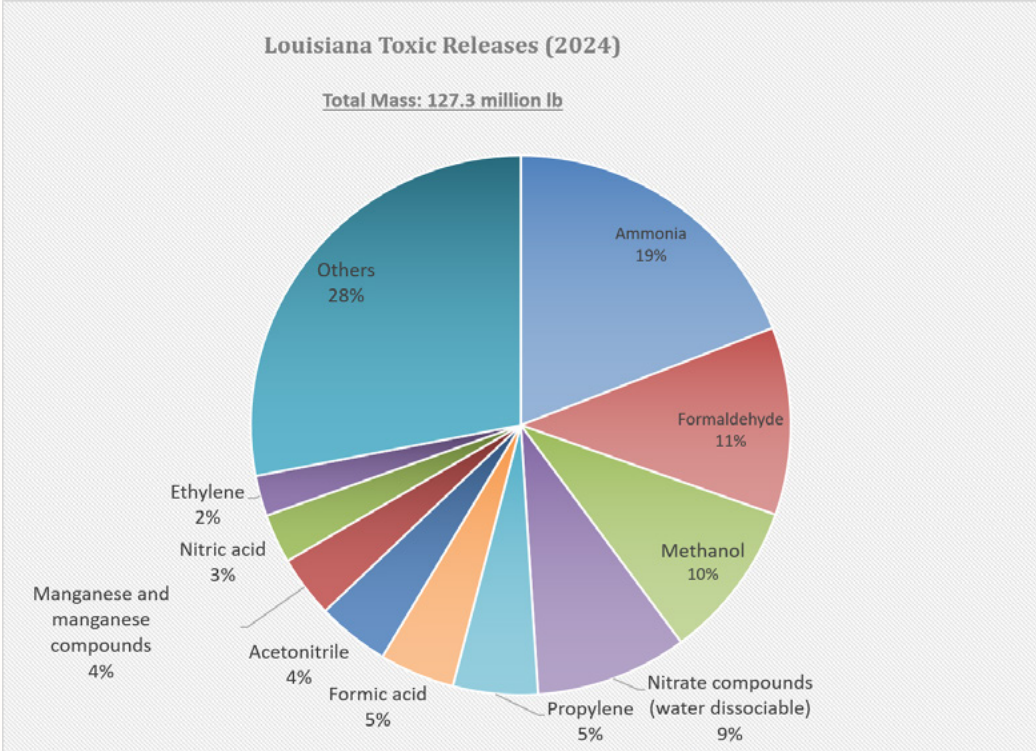
Toxic Releases and Criteria Air Pollutants

Louisiana and Texas:

- Louisianans are disproportionately exposed to local toxic pollution. According to the EPA Toxics Release Inventory, in the period of 2015–2024, the state had 532 facilities reporting 278 chemicals, or one facility for every 8,650 residents.[132] Cumulative toxic releases over the decade, including air, water, land, and offsite releases, totaled approximately 1.4 billion lb, with an annual average of 30 lb per capita, nearly three times greater than per capita toxic releases nationally over the same period. Top releases in Louisiana include ammonia, methanol, formaldehyde, and nitrate compounds, as seen in Figure 10. In considering the distribution of releases by mass (lb), it is important to understand that toxicity can vary greatly, such that smaller releases of or limited exposure to a more toxic pollutant, such as ethylene oxide (further discussed below), may contribute more to serious health impacts, such as cancer risk, as compared to larger releases of a less toxic pollutant that may have serious health effects or mortality risk only with extreme levels of exposure.

132 The following analyses utilize the EPA's TRI Toxics Tracker, the most useful tool in the agency's Toxics Release Inventory (TRI), including queries by years, state, county, city, zip code, chemical, release media, and other categories.

Figure 10. Louisiana Toxic Releases (2024).



Source: US Environmental Protection Agency. (2026). Toxics Release Inventory Program (TRI): TRI Toxics Tracker. Reporting Year 2024.

- Texas facilities produced more than 2.2 billion lb of toxic releases (not including metals mining waste) between 2015 and 2024, with about 54 percent of the total concentrated in Harris County and four Gulf Coast counties (Jefferson, Brazoria, Calhoun, Nueces), all of which have majority Black and Hispanic/Latino populations.[133] Texas and Louisiana combined produced nearly 20 percent of the total US toxic air releases over the same period, but on a per capita basis, Louisiana had roughly four times more toxic air pollutant emissions.
- Over the decade from 2015–2024, cumulative air toxics releases in Louisiana totaled approximately 519 million lb, emitted by 478 reporting facilities. On average, the number of people living within three miles of each facility was 14,662.[134]
- As of 2024, three of the top 10 and eight of the top 25 most toxic chemicals production facilities in the country are in Louisiana, with combined chemical

133 According to United State Census data, in 2023, 44 percent of Harris County residents identified as Hispanic, 19 percent as Black, 7 percent as Asian, and 26 percent as White. See the Harris County Census profile at Harris County, TX - Profile data - Census Reporter.

134 The TRI uses "average 3-mile population" to estimate the average number of people exposed to reported releases per facility.

releases of nearly 60 million lb.[135]

- Formaldehyde releases, in particular, are disproportionately prevalent in Louisiana, at 14.3 million lb in 2024, which is 72 percent of reported releases in all states combined; one SE industrial corridor parish alone, Saint Charles, is host to *more than half* of all reported formaldehyde releases in the US, nearly all of which are reported by one facility, Bayer Crop Science's (formerly Monsanto's) giant herbicide production plant in Luling, 30 miles outside of New Orleans.[136] Notably, in 2024, the EPA released its first comprehensive toxicological assessment of formaldehyde, confirming the long-established scientific view that it is a human carcinogen via inhalation and potentially unsafe even at low levels of exposure.[137]

- Louisiana's most prevalent air toxic (by weight) is ammonia, with releases totaling more than 238 million lb between 2014 and 2023. This is equal to an average of more than 5 lb per capita each year, compared to only 0.5 lb per capita in the country as a whole—a tenfold difference in ammonia emissions between Louisianans and the rest of the country. Ammonia releases in just two zip codes in one parish, Ascension, accounted for more than 75 percent of combined releases across the rest of the state. Two new "blue ammonia" facilities backed by 45Q credits are under development in the same two zip codes.

- Dozens of additional chemical releases in Louisiana are classified as "other" and amount to roughly one fourth of the total. Among these is the volatile organic compound ethylene oxide (EtO), with the formula C_2H_4O, a known carcinogen and reproductive toxin used to produce other chemicals and consumer goods (antifreeze, detergents), as well as for sterilizing medical equipment. Between 2015 and 2024, Louisiana and Texas alone were

135 US Environmental Protection Agency. (2026). Toxics Release Inventory Program (TRI): TRI Explorer (2024 National Analysis Dataset released November 2025), Releases: Facility Report. Reporting Year 2024.

136 The Luling plant is the world's largest producer of glyphosate (aka the weedkiller "Roundup"), which is classified by the International Agency for Research on Cancer as a group "2A" probable carcinogen for humans: World Health Organization, International Agency for Research on Cancer. (2015, March 20). *IARC Monograph on Glyphosate*. On February 18, 2026, President Trump issued an executive order declaring domestic glyphosate production as a national security priority under the Defense Production Act (Bayer's Luling plant is the only domestic producer). See Gremillion, T. (2026, February 25). *The Round-Up Executive Order: The Silver Lining to a Tale of MAHA Bait-and-Switch.* The day before, Bayer-Monsanto announced a proposed $7.25 billion class settlement fund to resolve thousands of claims against the company for glyphosate-related non-Hodgkin lymphoma injuries.

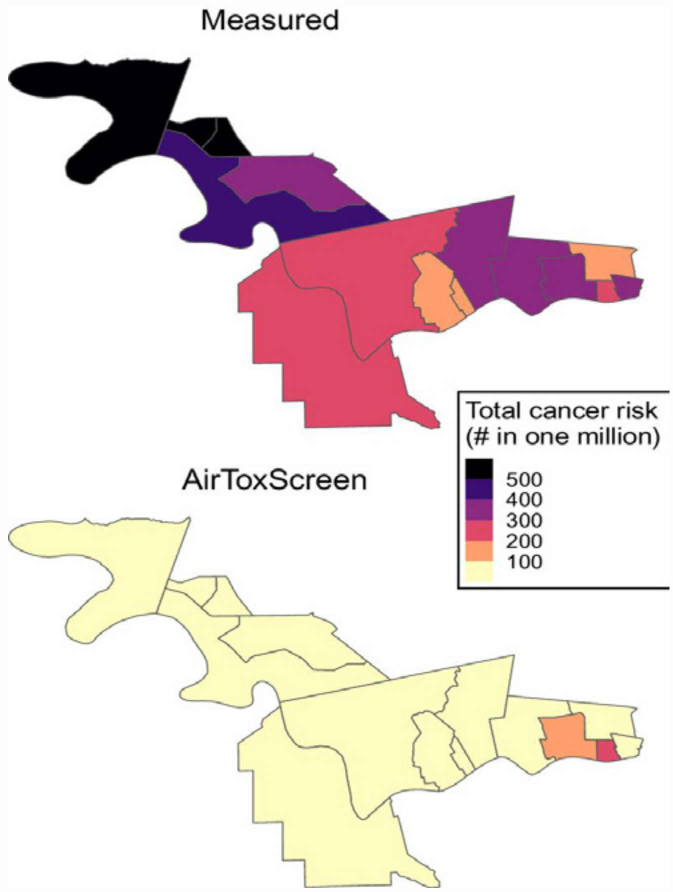
137 US Environmental Protection Agency, Integrated Risk Information System. (2024). *IRIS Toxicological Review of Formaldehyde (Inhalation) (Final Report 2024)*. With this report, the EPA set the stage for regulating formaldehyde based on the "linear" assumption of no safe level of exposure. But in 2025 the Trump Administration rejected this precautionary approach in favor of "threshold" regulation, allowing industry to effectively pre-empt potentially stringent new limits, including workplace restrictions, or even bans, on using formaldehyde in the production of a wide range of consumer goods. See Tabuchi, H. (2025, December 10). Starting With Formaldehyde, Trump Administration Reassesses Chemical Risks. *The New York Times*.

home to about 70 percent of total US EtO air releases, and the two states were home to eight of the top 10 counties for EtO releases, including three in Louisiana's SE industrial corridor (Iberville, Ascension, and St. Charles). Notwithstanding the disproportionate Gulf South EtO levels captured in the TRI, we should underscore that these data are self-reported by facilities, rarely directly monitored, and tell us nothing about actual chemical concentrations in the air people breathe. As noted in the Introduction, researchers utilizing a mobile laboratory monitoring system have found that EtO is present throughout SE Louisiana at much higher concentrations than those previously estimated. In a 2024 study across 13 parishes in the Southeast industrial corridor, EtO was measured at a median aggregate air concentration of 23.3 parts per trillion, more than twice the level above which long-term exposure to the chemical is considered hazardous to health. The researchers also estimate that EtO, because of its high carcinogenicity, represents approximately 68 percent of the total hazard from toxic air releases in the region.[138] As seen in Figure 11, a related study of 15 census tracts spanning Iberville, Ascension, St. James, and St. John the Baptist Parishes found much higher levels of cancer risk, based on measured ambient concentrations of 17 hazardous air pollutants, as compared to cancer risk identified for the same areas in the EPA's Air Toxics Screening Assessment (AirToxScreen), which uses modeled concentration estimates of 72 hazardous air pollutants. Ethylene oxide, chloroprene, and formaldehyde drive the large majority of cancer risk (between 62.6 and 96.2 percent), and median tract-level cancer risk estimated from measured as compared to modeled pollutant concentrations is higher by a factor of five.[139]

138 Robinson, E. S., Tehrani, M. W., Yassine, A., Agarwal, S., Nault, B. A., Gigot, C., ... & DeCarlo, P. F. (2024). Ethylene oxide in southeastern Louisiana's petrochemical corridor: high spatial resolution mobile monitoring during HAP-MAP. *Environmental Science & Technology*, *58*(25), 11084-11095.

139 Robinson, E. S., Yassine, A., Agarwal, S., Tehrani, M. W., Lupolt, S. N., Chiger, A. A., ... & DeCarlo, P. F. (2025). Total cancer risk estimates from measured concentrations of volatile organic compounds in industrialized southeastern Louisiana. *Proceedings of the National Academy of Sciences*, *122*(41), e2504770122.

Figure 11: Cancer Risk* in 15 Census Tracts of Southeast Louisiana's "Cancer Alley" Industrial Corridor, Based on Measured Ambient Pollutant Concentrations Compared to Modeled Concentrations.



Source: Figure 3 in Robinson, E. S., Yassine, A., Agarwal, S., Tehrani, M. W., Lupolt, S. N., Chiger, A. A., ... & DeCarlo, P. F. (2025). Total cancer risk estimates from measured concentrations of volatile organic compounds in industrialized southeastern Louisiana Proceedings of the National Academy of Sciences, 122(41), e2504770122.

*Cancer risk in Figure 11 is as defined in the Air Toxics Screening Assessment: "*A lifetime cancer risk of "N"-in-1 million (where "N" is a number) means that, for every 1 million people who are continuously exposed to a certain level of a pollutant over 70 years, "N" people may develop cancer. For example, a 1-in-1 million risk means that one person may develop cancer for every 1 million people exposed. A 10-in-1 million risk means 10 people may develop cancer per 1 million exposed, etc. These risks are on top of any other cancer risks from other sources.*"

- Overall, nearly 60 percent of Louisiana's toxic releases were reported from facilities in only five parishes, and roughly 34 percent were concentrated in just two zip codes in one parish, Ascension, in the center-north of the SE industrial corridor. Louisianans in the two zip codes exposed to 34 percent of the state's toxic emissions include residents of the city of Donaldsonville, more than 80 percent of whom are Black, and of Geismar township, 45 percent of whom are Black or Hispanic.

- In the National Emissions Inventory of 2020, nine parishes of Louisiana's SE industrial corridor were home to 142,000 tons of criteria air pollutants (CAPs) from stationary sources, including particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide, and ozone, as well as volatile organic compounds. Mobile and nonpoint sources added about 382,000 tons. Total CAP and VOC emissions amounted to about 672 lb per person in the industrial corridor.[140]

- According to EPA Air Pollutant Emissions Trends data, in 2024, Louisiana had per capita $PM_{2.5}$ emissions (from all sources) roughly two times greater than in the country as a whole and 2.3 times greater for emissions from stationary sources. In 2024, Louisiana and Texas had combined $PM_{2.5}$ and VOCs emissions of nearly 3 million tons, equal to about 20 percent of such emissions in all other states combined.[141]

- Racial disparities in CAPs emissions are evident at the census tract level. Research developed by Kimberly A. Terrell and Gianna St. Julien demonstrates significant disparities in reported emissions within census tracts with industrial activity.[142] As seen in Table 1, based on their research, for five CAPs and Volatile Organic Compounds, "disparity factors"—the ratio of emissions between predominantly non-white (65.5-100 percent people of color) and predominantly white (0-16.9 percent people of color) census tracts—range from 7.4 (NO_x) to 12.9 (VOCs) to 19.7 ($PM_{2.5}$). Out of 108 facilities reporting emissions in predominantly people-of-color census tracts, the largest grouping, 35, is in the chemicals sector. Notably, CCUS development in Louisiana, and particularly in the SE industrial corridor, is also concentrated in the chemicals sector, as we will examine in more detail in Part V.

140 US Environmental Protection Agency. (2026). National Emissions Inventory: 2020 NEI Data Retrieval Tool.

141 US Environmental Protection Agency. (2026). National Emissions Inventory: Air Pollutant Emissions Trends Data. Updated February 21, 2025.

142 Terrell, K. A., & St. Julien, G. (2023). Discriminatory Outcomes of Industrial Air Permitting in Louisiana, United States. *Environmental Challenges*, *10*, 100672.

Table 1. Median Emissions* versus Race among Louisiana Census Tracts with Industrial Activity (2019-2021).

Census Tract Group (% Population of Color [POC])	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC
Mostly POC (65.5-100%)	1.37	1.97	5.41	0.21	5.73	6.83
Mostly White (0-16.9% POC)	0.13	0.10	0.73	0.01	0.64	0.53
Disparity Factor	10.5	19.7	7.4	21.0	9.0	12.9

*Emissions measured in tons per year per square mile, from facilities regulated by the Louisiana Department of Environmental Quality.

Source: Adapted from Table 3 in Terrell, K. A., & St. Julien, G. (2023). Discriminatory Outcomes of Industrial Air Permitting in Louisiana, United States. *Environmental Challenges*, *10*, 100672.

Part V: A Closer Look at the Gulf Coast CCUS Buildout

CCUS Expansion by the Numbers

According to the Oil & Gas Watch database,[143] 638 fossil fuel and related projects (not including onshore and offshore oil and gas drilling) have been built or expanded since 2012. Today, however, despite the growing urgency of reducing GHG emissions, fossil fuel expansion appears to be continuing at a similar or even faster rate, with 925 new facilities or facility expansions proposed or under construction. In contrast with its negligible role in the previous decade of fossil fuel expansion, however, CCUS appears poised to play a much larger role today and is associated with 177 projects (19 percent) in the current development pipeline, 149 of which are associated with new facilities and 28 of which are facility expansions. While only a handful of these projects are currently under construction, 73 are already permitted or have permits pending.

Among the new or expanded facilities associated with CCUS, 64, or 36 percent, are sited in Louisiana, and Louisiana and Texas are host to a combined 112 CCUS projects, 53 of which are already permitted or have permits pending. These projects include 65 CO_2 sequestration sites or large-scale hubs—and both states now have primary enforcement authority to regulate Class VI wells for secure sequestration. Notably, more than 60 percent of the CO_2 storage

143 Environmental Integrity Project. Summary | Oil & Gas Watch Database. The following project data were retrieved June 23, 2026.

buildout nationally by number of projects—and an even greater share by potential storage volume—is based in the two states; clearly this reflects the region's unique nexus of deep geologic storage potential and CO_2 emissions intensity. In addition, 14 new or expanded CO_2 pipeline projects are proposed in the two states. Relatively speaking, CCUS has a larger role in Louisiana's overall fossil fuel buildout, with 39 percent of new fossil fuel-related projects involving CCUS as compared to 17 percent in Texas.

The combined CO_2e emissions of the new facilities and expansion projects with CCUS are estimated at approximately 28 million tons annually in the OGW database, including an estimated 12.9 million tons from facilities in Louisiana and 10.3 million tons from Texas facilities. In 2023, 403 large facilities in Louisiana reported, in total, 144 million tons of CO_2e emissions, which means that the CCUS buildout is associated with a potential 9 percent increase in greenhouse gas emissions from facilities in the state.[144] In the more expansive Clean Air Task Force project data, the potential emissions to be captured in the Gulf South—including from power plants, steel and cement plants, and biofuel plants—could be closer to 450 million tons annually, albeit many projects may not end up being developed, whether for economic reasons, regulatory barriers and/or litigation, local opposition, or other factors. For the narrower scope of proposed CCUS-adapted fossil fuel and petrochemical facilities, the Gulf South is home to more than 80 percent of potential CCUS-associated GHG emissions across the country.

CCUS for "Clean" Fuels and Chemicals: A Cure Worse Than the Disease

Across eight parishes—East Baton Rouge, West Baton Rouge, Iberville, Ascension, Saint James, Saint John the Baptist, Jefferson, and Saint Charles—in the SE industrial corridor, 22 new fossil fuel and chemical production facilities and 20 facility expansions are either proposed or under construction; 26 are already permitted or have permits pending. Twenty of the new facilities or facility expansions are associated with CCUS, including 9 sequestration hubs, 7 of which have permits pending. Nine of the 20 proposed CCUS-involved projects in the SE industrial corridor are sited in Ascension Parish alone, including five production facilities (either including or considering CCUS adaptations) with as much as 3 million tons of CO_2e emissions (this is not including Air Products LCEC's estimated emissions). Additionally, five CCUS projects, including three sequestration hubs, are under development in Calcasieu Parish in Southwest Louisiana, with a mostly rural population that is 25 percent Black and a poverty rate

144 OGW's emissions estimates for CCUS-involved projects primarily draw on air permitting documents and corporate announcements.

of 15.5 percent. At least on paper, the onshore sequestration buildout across Louisiana could have a massive imprint above and below ground, with 35 new facilities, 20 with permits pending, and potential storage capacity approaching 1 billion tons with nine new pipelines connecting the hubs to CO_2 source facilities.

The CCUS footprint in the Southeast industrial corridor is associated with a combined potential CO_2 output of nearly 4 million tons per year, the majority of which, as noted, is from facilities in Ascension Parish. If even one-half of these new emissions are captured and stored or utilized, under the current 45Q program, cumulative subsidies—at $85 per ton over 12 years—for the owners/storers of the new CO_2 emissions could total more than $2 billion (in current dollars), an amount roughly equal to 12 years of the state's federal block grant funding for poverty relief.[145]

Arguably, the most significant threatening trend associated with CCUS in the Gulf South is the buildout of new facilities and infrastructure for fossil-fuel based low-carbon ("blue") chemicals and fuels, particularly ammonia, hydrogen, and methanol destined for export markets. In most cases, blue hydrogen is produced from natural gas via steam or autothermal methane reforming with CO_2 capture, and much of it is converted into low-carbon ammonia; although most commonly used as the key ingredient in nitrogen-based fertilizers, ammonia can also be utilized as a carbon-free fuel for generating power or heat, as a clean shipping fuel, or as carrier—a transport medium—for otherwise hard-to-store and -transport hydrogen gas.[146] To be clear, the term "blue ammonia" refers to reducing CO_2 emissions from the methane-to-hydrogen reforming process with an on-site carbon capture system. The "blue" (low-emissions) hydrogen is then reacted with atmospheric nitrogen (N_2) through the Haber-Bosch process to produce "blue" ammonia (NH_3).

The Haber-Bosch process, which catalytically breaks nitrogen's strong covalent (triple) molecular bond, is energy intensive, requiring very high temperatures (500 degrees Celsius) and pressure (20 megapascals/MPa). To produce 1 ton of ammonia, roughly 33 thousand cubic feet of natural gas must be combusted, and the most efficient ammonia plants expend approximately 10 MWh of energy for every ton of ammonia produced, whereas 1 ton of ammonia contains

145 Louisiana's annual block grant from Temporary Assistance to Needy Families was $163.4 million in 2024.

146 Spatolisano, E., Pellegrini, L. A., de Angelis, A. R., Cattaneo, S., & Roccaro, E. (2023). Ammonia as a Carbon-Free Energy Carrier: NH_3 Cracking to H_2. *Industrial & Engineering Chemical Research*, 62(28), 10813-10827.

the equivalent of only 5 MWh of energy.[147] This is not to mention that the "blue" part of blue ammonia—the low-carbon hydrogen feedstock—is also energy-intensive due to high heat and pressure requirements for steam methane reforming as well as additional gas combustion typically needed to power the carbon capture equipment; further, when accounting for upstream emissions of hydrogen's natural gas feedstock and additional direct and indirect emissions from powering the capture equipment, blue ammonia's full production chain is likely to be, at best, only marginally less GHG-intensive than it would be without CCUS.[148] In addition, there are commercial considerations: If ammonia production expands as proposed in current project development data, this could divert roughly five percent of domestic natural gas supplies from current uses, likely raising natural gas prices throughout the economy.[149]

As noted previously, the city of Donaldsonville in Ascension Parish is already home to the world's largest ammonia plant, CF Industries Nitrogen, which, among more than 21,000 reporting facilities in the EPA Toxics Release Inventory, has long been one of the most polluting industrial plants in the United States, ranking #1 for point source toxic air emissions, at 7.2 million lb, and with total toxic releases of 9.2 million lb, in 2024.[150] In 2025, this ammonia behemoth at the heart of the SE industrial corridor commenced operations of a carbon capture system, promising capture and secure storage of as much as 2 million tons of CO_2 per year, with ExxonMobil as the transport and storage partner. Despite knowledge of the CF Industries' toxic emissions, along a short stretch of the Mississippi River between Donaldsonville and Modeste, the anchor facility in Donaldsonville is now joined by two additional blue ammonia plants under development in Ascension Parish, and a third is being developed downriver in St. Charles Parish, not far from New Orleans. Rounding off the large and expanding ammonia footprint in the area, Canada-based Nutrien's PCS Nitrogen Fertilizer Plant, in Geismar, Ascension Parish—like CF Industries, a long-time major polluter in the area—has proposed a new CCUS-adapted clean ammonia project and received a final modified air permit for the project from LDEQ in 2023, but the company announced that it was suspending the

147 Boerner, L. K. (2019, June 15). *Industrial ammonia production emits more CO_2 than any other chemical-making reaction. Chemists want to change that*. Chemical & Engineering News.

148 According to a paper by Robert Howarth and Mark Jacobson, blue hydrogen is only 9-12 percent less GHG-intensive than conventionally produced "gray" hydrogen. See Howarth, R. W., & Jacobson, M. Z. (2021). How green is blue hydrogen?. *Energy Science and Engineering*, 9(10), 1676-1687.

149 Shaykevich, A. (2025, January 9). *Manufacturers of ammonia plan a boom in the U.S. Will it bust under Trump?* Environmental Integrity Project.

150 US Environmental Protection Agency. (2026). Toxics Release Inventory Program (TRI): TRI Explorer (2024 National Analysis Dataset released November 2025), Releases: Facility Report. Reporting year 2024.

project in 2024, citing economic considerations.[151]

The three new plants moving forward will further degrade local air quality with criteria air pollutants (CAPs), volatile organic compounds (VOCs), and toxic air pollutants (TAPs), and contribute to global warming with greenhouse gas emissions (CO_2e), which are permitted (draft or final) as follows (in tons per year [tpy]):[152]

CF Industries, Blue Point Complex ***(Modeste, Ascension Parish)***

- 940 tpy of CAPs and VOCs.
- 171 tpy of TAPs.
- 467,000 tpy of CO_2e emissions.

Clean Hydrogen Works, Ascension Clean Energy Project ***(Donaldsonville, Ascension Parish)***

- 680 tpy of CAPs and VOCs.
- 147 tpy of TAPs.
- 400,000 tpy of CO_2e emissions.

St. Charles Clean Fuels LLC, St. Rose Blue Ammonia Facility ***(St. Rose, St. Charles Parish)***

- 201 tpy of CAPs and VOCs.
- 66 tpy of TAPs.
- 155,000 tpy per year of CO_2e emissions.

The buildout of CF Industries' Blue Point Complex (CFBP) and Clean Hydrogen Works' Ascension Clean Energy project (ACE) is particularly concerning given the cumulative toxic load of the nearby CF Industries anchor plant. As noted, these new facilities are only a few miles apart along the Mississippi River in Ascension Parish and both are being developed as "blue" facilities, pairing methane-to-hydrogen reforming with CCUS, for both commercial hydrogen

151 Louisiana Department of Environmental Quality. (2023, November 9). PCS Nitrogen Fertilizer, LP–Ammonia Group Part 70 Operating Permit Renewal and Modification No. 2241-V11; Quantum Commodity Intelligence. (2024, June 13). Nutrien scraps $2bn clean ammonia project in Geismar.

152 Emissions information is gathered from facility air permitting documents for these facilities: Louisiana Department of Environmental Quality (2025, October 17). CF Industries Blue Point LLC Proposed Part 70 Air Operating Permit No. 0180-00237-V0 & PSD Permit No. PSD-LA-859; Louisiana Department of Environmental Quality. (2025, October 16.) Clean Hydrogen Works Ascension Clean Energy Project Part 70 Operating Permit No. 0180-00235-V0; Louisiana Department of Environmental Quality. (2025, November 17); St. Charles Clean Fuels LLC-Blue Ammonia Facility Minor Source Permit No. 2520-00187-00. In Louisiana state law, "toxic air pollutants" (TAPs) include 197 hazardous chemicals linked to serious health problems including cancer; Louisiana's TAPs list largely overlaps with federally regulated "hazardous air pollutants" (HAPs) but includes some chemicals that are excluded from the federal HAPs list, most notably ammonia (NH_3).

production and providing low-carbon hydrogen feedstock for producing blue ammonia.

In taking stock of the CCUS buildout in the SE industrial corridor, the now-cancelled Air Products' Louisiana Clean Energy Complex (as of June 30, 2026) was slated to be one of the largest new CCUS-involved projects. The LCEC cancellation is significant and could be a bellwether of further disruption in the field, whether due to commercial challenges, political challenges, or, as in the LCEC case, likely a combination of both. It is important to understand the LCEC model and proposal, both for the record of what was averted and for comparative purposes in the wider field. Most notably, in contrast with other similar projects (including those being developed in Ascension Parish), the LCEC included a fully planned and integrated CCUS operation, with a 38-mile dedicated CO_2 pipeline and a dedicated secure sequestration operation with 10 injection wells and eight monitoring wells, to be installed under Lake Maurepas in southeast Livingston Parish. Once operational at its proposed scale, the LCEC would likely have been the most heavily subsidized CCUS project in the United States. IEEFA estimates cumulative total taxpayer costs for the project in a range from \$3-\$6.3 billion under the 45Q program as currently codified, or between \$14.6 and \$23 billion if credit values are increased and the timeline of credit availability is extended.[153] These ranges are matched to a potential range of carbon capture rates between the project's advertised rate of 95 percent and a more realistic rate (from real-world examples) closer to 60 percent or less, in which case the taxpayer costs under current law are likely to be closer to \$4 billion rather than \$6.3 billion.

As proposed, the LCEC's main output is an estimated 585,000 tons per year of blue hydrogen, along with a secondary amount of low-carbon ammonia produced for export from some portion of the main output of blue hydrogen. In May 2025, however, Air Products announced that the sprawling project's ammonia operations would be put up for sale,[154] and in December 2025 it announced advanced negotiations to transfer ownership or control of the ammonia operations to the Norway-based global fertilizer conglomerate Yara International. In exchange, Yara would finance 25 percent of total project costs and commit to a 25-year blue hydrogen offtake agreement with Air Products, toward producing 2.8 million tons of ammonia annually for global distribution. Eighty percent of Air Products' blue hydrogen output would be diverted to ammonia production, with the remainder sold to hydrogen customers in the re-

153 Juhn, A., & Schlissel, D. (2025). Blue Hydrogen's Carbon Capture Boondoggle, Institute for Energy Economics and Financial Analysis.

154 Gibbons, B. (2025, May 14). Company announces major shakeup of controversial Louisiana hydrogen plant. Environmental Integrity Project.

gion. Air Products claimed that as much as 5 million tons of CO_2 emissions per year would be captured on-site and, via a third-party agreement, transported by dedicated pipeline to a secure geologic sequestration complex under Lake Maurepas.[155] Directly west of Lake Pontchartrain in the southeast corner of Livingston Parish and also bordering Saint John the Baptist Parish, Lake Maurepas is a shallow, 93 square mile brackish estuarine tidal water body and a treasured local habitat and resource for sport fishing, recreational boating, and ecotourism, as well as homes and camps.

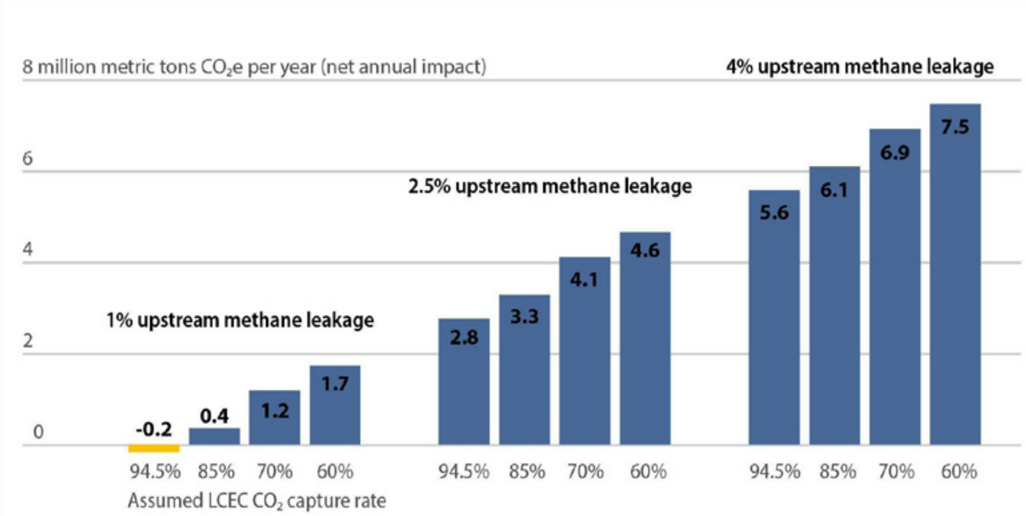
As noted, the LCEC was advertised to capture 95 percent of its CO_2 emissions from reforming methane into hydrogen, but this estimate is extremely unrealistic. According to IEEFA, demonstrated capture rates in similar facilities in other countries range between 40 and 60 percent; more importantly, as we explained in Part III, capture rate estimates for such facilities do not account for upstream methane leakage, which ranges as high as 2-3 percent nationally and potentially higher for end-uses in the Gulf South region, where natural gas is primarily sourced from the Permian Basin.[156] By IEEFA's estimate for the LCEC project, accounting for methane leakage with a 20-year global warming potential effectively reduces the CO_2e capture rate from 95 percent (as advertised) into a range between 33 and 52 percent (based on a 4 percent or a 1 percent methane leakage rate, respectively).[157] In addition to being undemonstrated and unadjusted for upstream methane leakage, advertised capture rates for blue hydrogen also do not account for the upstream and downstream emissions from powering the capture equipment, as we generally explained in Part III (the IEEFA analysis described above includes "energy penalty" emissions); also excluded are the GHG effects of downstream hydrogen leakage if the hydrogen output is compressed and transported off-site for purchase instead of being converted into ammonia. Accounting for the full scope of uncaptured upstream and downstream emissions linked with LCEC operations, IEEFA calculates net emissions impact scenarios for the LCEC, as seen in Figure 12.

155 Air Products. (2025, December 8). Air Products and Yara in Advanced Negotiations on Low-Emission Ammonia Projects. [Press Release].

156 See footnote 64, and Zhang, Y., Gautam, R., Pandey, S., Omara, M., Maasakkers, J. D., Sadavarte, P., ... & Jacob, D. J. (2020). Quantifying methane emissions from the largest oil-producing basin in the United States from space. *Science advances*, *6*(17), eaaz5120.

157 Juhn, A., & Schlissel, D. (2025). *Blue Hydrogen's Carbon Capture Boondoggle*, Institute for Energy Economics and Financial Analysis.

Figure 12. Air Products' Louisiana Clean Energy Complex, Net Life-Cycle Annual Emissions Impact in Million Metric Tons CO2e.*



*Net emissions per year in million metric tons CO_2e are calculated for four different capture rates under three methane leakage scenarios of low, medium, or high leakage (factored with a 20-year GWP), and further adjusted for emissions from powering the capture equipment, global warming effects of downstream hydrogen leakage, and potential emissions benefits from replacing fossil fuel combustion with hydrogen combustion.

Source: Figure 3 in Juhn, A., & Schlissel D. (2025). Blue Hydrogen's Carbon Capture Boondoggle. Institute for Energy Economics and Financial Analysis.

Under a highly unlikely best-case scenario, with an average annual capture rate of 94.5 percent and an upstream methane leakage rate of only 1 percent, LCEC operations may, at best, result in net CO_2e emissions reductions of 200,000 metric tons per year.[158] A more likely scenario, with a 2.5 percent methane leakage rate and a 60-85 percent carbon capture rate, results in a net emissions *increase* between 3.3 and 4.6 million metric tons. In a worse scenario, with a 4 percent methane leakage rate and a 60 percent carbon capture rate, the result is a net emissions increase of 7.5 million metric tons.[159] Under the best case, high capture/low methane leakage scenario, the LCEC's cumulative cost to taxpayers under current policy could be as much as $440 million per year; but, remarkably, since this scenario yields a net CO_2 emissions reduction of only 200,000 metric tons per year, the inflation-adjusted cost to taxpayers

158 In IEEFA's analysis, hydrogen leakage impact is calculated based on an assumed 50 percent diversion of the LCEC hydrogen output to ammonia production, but late last year Air Products publicly stated that 80 percent of the hydrogen will be converted to ammonia and only 20 percent will be set aside for sales to hydrogen customers. Thus, the IEEFA analysis may somewhat over-estimate emissions impact from hydrogen leakage associated with LCEC's downstream hydrogen sales.

159 Notably, IEEFA describes the worst scenario in its estimates as "realistic," not an extreme case. See Juhn, A., & Schlissel, D. (2025), at footnote 157, p. 4.

per ton of avoided emissions would be approximately $2600, roughly 30 times more than the 45Q credit rate of $85 per ton of stored CO_2.[160] This sharp deficit between its fiscal cost and climate value underscores not only the poor design of 45Q but the basic contradiction of CCUS—namely, that paying polluters to sequester CO_2 effectively turns a climate-harming waste stream into a valuable commodity, with uncapped credits potentially encouraging gross emissions increases, not reductions. Considering the result—spending billions of tax dollars on a climate solution that, realistically, may only make things worse—should, at a minimum, raise concerns about CCUS's potentially massive opportunity costs as compared to investing in truly low-carbon, climate-benefiting solutions such as renewable energy.

Not a Public Good: "Blue Ammonia" and Local Air Quality

While not moving forward, the LCEC is still a telling example of how CCUS is inviting added air quality burdens for local communities and often in areas that are already highly polluted by other nearby and sometimes directly associated facilities. Experts and advocates who publicly commented on LDEQ's initial proposed air permit (in 2025) for LCEC's "Clean Energy Production Facility"—the dedicated hydrogen and ammonia plant—identified many specific flaws in it, but an overarching concern was that Air Products was applying (and eventually approved) for a minor source permit.[161] Designation as a minor source means that the project is not subject to review under the EPA's Prevention of Significant Deterioration (PSD) program for pre-construction air permits in areas designated as "in attainment" or "unclassified" for the facility's applicable criteria air pollutants (CAPs).[162] In this respect, the LCEC as proposed is important as a cautionary example of how CCUS, perhaps most acutely in the chemicals sector, is contributing to added harm in local communities even as its climate impacts—as the IEEFA modeling demonstrates—are likely to be minimally beneficial at best and could be extremely negative at worst. Instructively, the LCEC's bid for a minor source permit is not an isolated example: St. Charles Clean Fuels also pursued and was awarded a minor source permit for its St.

160 Juhn & Schlissel (2025), p. 14.

161 Louisiana Department of Environmental Quality. (2025, June 6). Air Products Blue Energy LLC Clean Energy Production Facility Permit No. 0180-00231-00. Public comments on the permit are compiled in: Louisiana Department of Environmental Quality, Office of Environmental Services. (2025, June 6). Basis for Decision, Air Permit No. 0180-00231-00.

162 US Environmental Protection Agency. (Updated 2025, December 16). *Prevention of Significant Deterioration Basic Information.* Retrieved on June 10, 2026. It should be emphasized that PSD permitting addresses how a facility, in its design and processes, will limit its air pollution and thus prevent deterioration of air quality; for major sources, PSD permits for construction are generally coupled with Title V operating permits that consolidate air quality requirements for purposes of ongoing compliance. In most cases, PSD and Title V permits are issued by state environmental agencies under Clean Air Act rules, but state-level standards can be and often are developed and applied as long as they are no less stringent than the federal standards.

Rose Blue Ammonia facility in St. Charles Parish, despite significant, technically-detailed concerns and disagreements shared with the Department in public comments on the draft permit (more on this below).

Under the Clean Air Act's Title 1 New Source Review permitting framework, the PSD program (Part C) aims to prevent the deterioration of good local air quality and applies to new facilities determined to be "major sources" of air pollution, as well as to significant modifications of existing major sources or to modifications of minor sources that entail emissions increases of one or more regulated pollutant above the major source thresholds. The facility is considered a major source if it has the potential to emit one or more CAPs at or above a threshold of 100 tons per year (tpy).[163] In general, PSD permitting is based on setting allowable levels of air pollutant emissions from the facility such that the facility (whether it is new or significantly modified) will not significantly worsen air quality to a degree that contributes to or causes a violation of the NAAQS. PSD permits do not directly prohibit or restrict emissions reductions but instead rely on determination and adoption of pollutant-specific Best Available Control Technologies (BACT), on the principle of effectively but practicably limiting emissions in order to protect human health, albeit also including economic considerations. Major source thresholds also apply for hazardous air pollutants, at 10 tpy for any one federally-designated HAP or 25 tpy for any combination of HAPs; with the same thresholds, Louisiana regulates its own list of toxic air pollutants (TAPs), which includes all federal HAPs plus additional toxic pollutants, most notably ammonia and nitric acid.[164] Major sources of HAPs/TAPs are subject to federal Maximum Achievable Control Technology standards, which means that a new major source or source modification is required to adopt the most effective pollution controls for each exceedant HAP it emits based on industry-leading examples. However, Louisiana also sets ambient thresholds for many TAPs, such as ammonia and formaldehyde, to prevent unhealthy concentrations of the pollutant in surrounding areas of regulated facilities, and these thresholds are generally more stringent than those of the NAAQS due to the higher toxicities of many TAPs.[165] However, as we discussed in Part III, incomplete monitoring and reliance on modeled estimates can mask ambient concentrations of high-toxicity HAPs/TAPs that are much higher than those deemed acceptable for cancer risk by the EPA, as researchers have found to be the case in 15 census tracts of the SE industrial corridor.

163 The 100 tpy threshold applies to facilities in 28 categories, encompassing the vast majority of stationary pollution sources; for facilities not classifiable in one of the 28 categories, the major source/PSD threshold is 250 tpy for any air pollutant.

164 Louisiana Department of Environmental Quality. (n.d.) *TAPs not on the Federal HAP List*; Louisiana Department of Environmental Quality. (n.d.) *Toxic Air Pollutants Fact Sheet*.

165 Louisiana Department of Environmental Quality. (n.d.) *Louisiana Toxic Air Pollutant Ambient Air Standards*.

In addition, beginning in 2011 (and stemming from the EPA's now-retracted Endangerment Finding for greenhouse gases), greenhouse gases have been addressed under Clean Air Act permitting programs, specifically for new sources with the potential to emit at least 75,000 CO_2e tons or more per year and for modifications of existing sources that would increase GHG emissions from the source by at least 75,000 tons per year.[166] However, GHG emissions of major sources are not enforceably regulated; they are only subject to EPA guidance, which is a significant limitation given the increasing—and heavily-subsidized—role of CCUS in polluting sectors otherwise regulated under the Clean Air Act.[167]

The minor source designation is limited to facilities with no CAP emissions at or above the major source limit 100 tons per year; HAP emissions are also considered and a facility can be both a minor source of CAPs and a major source of HAPS, and vice versa. Designation as a minor source is very often a pivotal and coveted distinction for project owners because it means they will not be subject to EPA rules and requirements under the PSD program, which can involve setting more stringent, enforceable emissions limits as well as adoption of costly emissions controls and implementation of enhanced on-site monitoring requirements.

Public comments on LDEQ's draft minor source permit for the LCEC insisted that the facility should be classified as a major source subject to PSD requirements.[168] One key problem identified is that emissions increases associated with "commissioning activities," such as piloting and testing operations or special equipment, are not accounted for in the permit. Likewise, emissions associated with maintenance, start-up, and stoppage activities (MSS), whether as part of routine operations or operational changes, or in response to external events such as power outages or extreme heat risks, are not accounted for in the permit. Neither are emissions from non-routine venting and flaring, for example, in response to forecast severe weather events or overheating of ammonia storage tanks during a power outage. Strictly as a result of not accounting for irregular but substantial operational emissions from the facility,

166 US Environmental Protection Agency. (Updated 2026, May 5) Clean Air Act Permitting for Greenhouse Gases. Retrieved on June 10, 2026. In 2014, the US Supreme Court, in *Utility Air Regulatory Group v. EPA*, ruled that greenhouse gas emissions cannot be a trigger for designating a facility to be a major source subject to PSD review, but PSD permits otherwise required due to other pollutants can require GHG limits based on the application of Best Available Control Technology.

167 US Environmental Protection Agency. (2011). *PSD and Title V Permitting Requirements for Greenhouse Gases*. The Obama and Biden Administrations' unsuccessful efforts to establish GHG limits for power plants would have replaced current guidance with enforceable rules.

168 Louisiana Department of Environmental Quality, Office of Environmental Services. (2025, June 6). Basis for Decision. Air Permit No. 0180-00231-00. Comment No. 7, p. 35.

commenters argued, Air Products was able to calculate a CAP emissions profile without any exceedances that would trigger a major source designation leading to PSD review and requirements. Further, the permit included no discussion of CO_2 emissions, even to explain why the project is not designated as a major source of CO_2 or to provide design and operational specifications of the carbon capture system to be employed in achieving the project's advertised 95 percent carbon capture rate. Also striking is the omission of any explicit discussion of the facility's energy penalty for powering the capture equipment and the associated additional emissions from burning more natural gas for the same output of hydrogen in CCUS-adapted facilities.

In September 2025, however, Air Products applied to convert its minor source permit to a major source permit due to changes in the facility's emissions profile, specifically CO_2e emissions. In the state's now major source draft operating permit, the facility could emit 2.17 million metric tons of CO_2e emissions per year, based on a revised carbon capture scenario assuming that CO_2 emissions will be vented by design for up to " 25% of the year," with emissions reductions carried out at a 95 percent capture rate for the remaining 75 percent of operational time per year. The stated reason for this capture curtailment is expected downtime for "transportation and sequestration" of the CO_2, which suggests technological concerns and/or other uncertainties about operations of its controversial (and separately proposed/permitted) pipeline system and geologic storage facilities under Lake Maurepas.[169] In addition, modifications proposed in the major source permit result in net increases in CAP and VOC emissions, triggering PSD/BACT requirements for particulate matter, nitrogen oxides, carbon monoxide, and VOCs, as well as for CO_2e (due to net increases caused by designed curtailment of carbon capture operations). However, a technical review of the facility's potential to emit as represented in the draft modified permit, submitted on behalf of Earthjustice, "does not include technically accurate or enforceable emissions limits," and, once again, the modified permit failed to incorporate any specific consideration of emissions from commissioning activities as part of the facility's potential to emit and authorized limits.[170]

A few miles up river from the proposed LCEC, CF Industries' Blue Point ammonia plant (CFBP), sited in Modeste, near Donaldsonville, received draft major source air permits (PSD and Title V Operating) in October 2025, including PSD requirements, but only for two criteria air pollutants—NO_2 and CO—and for

169 Louisiana Department of Environmental Quality. (2026, March 12). Air Products and Chemicals Inc. Clean Energy Production Facility Proposed Part 70 Operating Air Permit 0180-00231-VO & PSD Permit No. PSD-LA-867.

170 Louisiana Department of Environmental Quality. (2026, May 5). Public Comments Exhibit 1-51, pp. 37, 55.

CO_2e emissions.[171] As detailed in public comments submitted by Rural Roots Louisiana, Louisiana Bucket Brigade, and Environmental Integrity Project (December 5, 2025),[172] the proposed PSD permit is notable for illustrating how adapting chemical production with CCUS can introduce potentially harmful regulatory gaps in emissions control due to avoidance of PSD review and requirements. The pollutants at issue with CCUS in the Blue Point project are VOCs—primarily methanol, along with smaller amounts of alkanolamines—which are formed in flue gas of the facility's CO_2 venting system. The permit indicates that methanol formation in the CO_2 flue gas derives from catalyst degradation in the absorbent capture process.[173]

The facility's combined VOCs emissions rate is designated at about 59 lb per hour on average or 80 lb per hour at a maximum rate, which translates to VOCs emissions of roughly 258 to 350 tons per year, assuming round-the-clock production.[174] This range of yearly VOCs emissions is more than 6-8 times higher than the *de minimus* incremental threshold for triggering PSD review and BACT requirements for VOCs, which is 40 tons per year. But the permit indicates that VOCs in the facility's vented CO_2 stream ("downstream of the CO_2 absorber and CO_2 flash stripper") will have a yearly emissions rate of only 28.6 tons, far below what their combined hourly emissions rates would predict. The reason for this, as stated in the permit, is an assumed CO_2 capture rate of 89 percent, whereby VOCs emissions are reduced by 89 percent, from 258 tons per year to 28.6 tons per year. With VOCs formed in the carbon capture process reduced by an estimated 89 percent, the total amount of VOCs emissions from the Blue Point facility is designated at 39.52 tons per year, just a fraction below the *de minimum* threshold for triggering PSD review and BACT requirements for VOCs.

The obvious problem in this case is that, unlike other component emissions estimates, CFBP's assumed 89 percent CO_2 capture rate is neither predictable nor testable for purposes of preconstruction permitting; crucial determinations such as PSD status clearly should not depend on theoretical carbon capture rates, as is the case with the CFBP major source permit. For example, a variance of just 5 percent in the facility's average annual capture performance would mean that yearly VOCs emissions would exceed the PSD threshold and

171 Louisiana Department of Environmental Quality. (2025, October 17). CF Industries Blue Point LLC Low-Carbon Ammonia Plant Part 70 Operating Permit No. 0180–00237-V0 and PSD Permit No. PSD-LA-859.

172 Environmental Integrity Project. (2025, December 5). Comments on Draft Title V Permit No. 0180-00237-V0 and Draft PSD Permit No. PSD-LA-859 for CF Industries Blue Point, LLC's Low Carbon Ammonia Plant.

173 CF Industries Blue Point air permit, see footnote 171, p. 260.

174 The following analyses are informed by the public comments submitted by the Environmental Integrity Project and its partners (see footnote 172).

trigger review for a BACT determination that could alter the project. If average capture performance of the CFBP project mirrors the bulk of observable performance data in the field or, more specifically, in the chemicals sector, Blue Point's VOCs emissions could greatly exceed the PSD threshold and add significantly to the detrimental health impacts of other permitted emissions of the project—which include 297 tons per year of nitrogen oxides, 582 tons per year of carbon monoxide, and 144 tons per year of ammonia, in addition to 467,298 tons per year of CO_2e emissions. It should be noted that methanol, CFBP's primary VOC pollutant, is classified as a HAP by the EPA, with effects of chronic exposure at low concentrations including eye irritation, respiratory impairment, and neurological disturbance.[175]

Another question raised by the CFBP permit is whether adapting a facility with CCUS can qualify as a federally enforceable limitation on the facility's potential to emit air pollutants. As the public comments submitted by Rural Roots Louisiana, Louisiana Bucket Brigade, and Environmental Integrity Project explain, the answer is no because CCUS does not limit the facility's potential to emit VOCs or any other pollutants, as could occur with changes in the facility's production components, fuel supplies, or operational design and schedule. In other words, since it is not a "physical or operational limitation" on the design capacity of the facility to emit VOCs (per the Clean Air Act language), a presumed CCUS capture rate applied to the facility's VOCs-forming CO_2 waste stream cannot be applicable in determining whether the facility has the potential to emit VOCs that trigger PSD review and requirements for controlling VOCs. Further, even if a presumed carbon capture rate could qualify as such a limitation, this limitation is not federally enforceable because it depends on third-party enablement in the form of transport and sequestration operations that are typically contracted out and completely external to the facility design and its potential to emit VOCs (or other pollutants). Emissions limits can only be federally enforceable against the facility that is emitting them; if emissions limits are exceeded due to CO_2 venting caused by contractual or operational disruptions of transport and storage—a scenario that is not at all unlikely—the emissions limits in such a case would not be federally enforceable, and the excess emissions could continue unabated.[176] Moreover, none of the permits in question with the new CCUS-adapted chemical facilities actually explain or even technically identify the capture systems to be employed in achieving advertised capture rates, let alone how transport and storage will be guaranteed (and consistently prof-

175 US Environmental Protection Agency, Integrated Risk Information System. (2013). *Toxicological Review of Methanol (Noncancer)*; US Environmental Protection Agency. (1992). *Methanol Hazard Summary*. Updated January 2000.

176 See Environmental Integrity Project (2025, December 5). Comments on Draft Title V Permit No. 0180-00237-V0 and Draft PSD Permit No. PSD-LA-859 for CF Industries Blue Point, LLC's Low Carbon Ammonia Plant , pp. 3-10.

itable?) such that no capture curtailment or capture rate shortfalls that could affect emissions of regulated pollutants would ever be necessary or desirable for the company. How can carbon capture be accounted for as a potential limitation on CO_2 waste stream co-pollutants if permit applicants do not explain or say anything about the capture system in question and its expected performance?

Southeast Louisiana's CCUS Ammonia Triangle

A second new ammonia plant in the same vicinity is the Ascension Clean Energy (ACE) project of Clean Hydrogen Works, which is sited near Donaldsonville. The ACE Project is described as follows in its approved major source air permit:[177]

- Blue ammonia plant with six identical ammonia "trains" (self-contained units), producing a combined 21,600 metric tons per day, all for export to produce fertilizers and fuels (including potentially for power generation).
- Powered on-site by five gas turbine cogeneration units with heat recovery steam generators.
- Power and steam heat fuel source is a low-carbon natural gas/hydrogen blend (with > 75 percent hydrogen).
- The facility is permitted for the following air emissions:
    - GHG emissions of nearly 400,000 tons per year; approximately 90 percent of emissions are released from the ammonia production units, with only a small fraction from the very low-carbon on-site power.
    - Criteria air pollutant emissions of 659 tons per year, including 1100 lb of NO_2 per hour from the on-site power system.
    - PSD requirements for PM_{10}, $PM_{2.5}$, NO_2, CO, and GHGs (CO_2e).
    - Ammonia emissions of 143 tons per year.
    - CO_2 transport was planned via a contract to utilize Denbury's 600+-mile CO_2 pipeline network, but contracts for a dedicated spur line to the ACE facility were cancelled after ExxonMobil bought Denbury Carbon Solutions in 2023 for nearly $5 billion; Clean Hydrogen Works filed an unfair competition lawsuit against ExxonMobil in February 2026, alleging that the company is blocking access to critical infrastructure in order to consolidate its interests and influence in

177 Louisiana Department of Environmental Quality. (2025, October 16). Clean Hydrogen Works LA-1 LLC--Ascension Clean Energy Project Preconstruction and Title V Operating Permit No. 0180-00235-V0.

the emerging blue chemical markets.[178]

According to the ACE project's EJ Screen Report, residents of the surrounding area within a 3-mile radius are predominantly people of color (81 percent) and low-income (63 percent). EJ indices for the surrounding community, as compared to the rest of the country, place the community in the 86th percentile for $PM_{2.5}$, the 98th percentile for toxic air releases, and the 92nd percentile for hazardous waste proximity.[179] Adding two new ammonia plants and one major modification of what is already the largest ammonia plant in the world can only mean more potential harm from air pollution in an area that is already among the most polluted in the country.[180]

The Great (Regulatory) Unknown: Combined and Cumulative Impacts of Multi-Pollutant Facility Clusters

CCUS, as we've argued, is both a false climate solution and a threat multiplier for local communities. A subsidy magnet that drives and possibly even incentivizes (while greenwashing) ongoing fossil fuel and petrochemical GHG and co-pollutant emissions, CCUS is also a pollution driver in its own right and entails a chain of operations—from capture to transport to storage— that will create or heighten health and safety risks for the communities in its path.

For decades, residents of Southeast Louisiana and Southeast Texas have battled uphill against fossil fuel power and money with little recourse to environmental protection as a backstop for keeping fossil fuel development and

178 George, V. (2026, February 6). Clean Hydrogen Works Takes ExxonMobil To Court Over CO2 Pipeline Access. Carbon Herald.

179 US Environmental Protection Agency. (n.d.) EJ Screen Community Report: Clean Hydrogen Works/Ascension Clean Energy Facility (3-mile perimeter). The EPA's EJ Screen interactive database was disabled by the Trump Administration. Screen captures of EJ Screen reports for specific facilities are linked in the Oil & Gas Watch database.

180 In November 2025, Rural Roots Louisiana and Louisiana Bucket Brigade filed a lawsuit to overturn the LDEQ air permits for the Ascension Clean Energy Project, specifically alleging failure to consider cumulative impacts of adding another ammonia plant in Ascension Parish. See Jackson, E. (2025, November 27). Environmental Groups Sue Over Ammonia Plant Permits in Ascension Parish. ChemAnalyst News. The lawsuit is still pending as of June 2026.

pollution at bay and often literally out of their own backyards.[181] One major reason for this failure of environmental protection is that facility permitting under federal environmental laws is not required—or even allowed—to account for combined and cumulative impacts of pollution in places like Ascension Parish and Harris County. As I have written elsewhere:

> Regulators should be able to ask if a facility's allowable pollution may be more harmful if considered, not in isolation, but as one factor among many that may be affecting people's health in the surrounding community. Without this, while a given facility may be deemed "healthy" by EPA standards, the same facility clustered among 5 or 10 others within, say, a 3- or 5-mile radius, is contributing to a total pollution level and a combination of pollutants that could be extremely unhealthy, even deadly, for vulnerable residents of the community. Put simply, in communities with a high concentration of polluting facilities and infrastructure, and multi-pollutant effects, the air that people actually breathe is likely to be more toxic than might appear on paper according to the NAAQS.[182]

A startling case in point is the cumulative ammonia releases plaguing the Donaldsonville area in Ascension Parish over multiple decades, including total reported emissions of more than 100 million pounds or roughly 15,000 lb per city resident between 2015 and 2024.[183] Ammonia is classified by the Occupational Safety and Health Administration as Highly Hazardous for its short-term toxicological effects at higher concentrations and its flammability and explosibility

181 In 2022, community groups from St. John the Baptist and St. James Parishes brought a civil rights complaint to the EPA's External Civil Rights Division, accusing the LDEQ of racial discrimination in its permitting programs (the complaint also targeted the Department of Health and Hospitals). The EPA was close to reaching a groundbreaking settlement agreement with LDEQ when then-Attorney General (now Governor) Jeff Landry responded by suing the EPA, accusing the agency of "reverse discrimination" in its efforts to address environmental racism in LDEQ decisionmaking and permitting outcomes. The lawsuit caused the Department of Justice to get involved and it buckled, forcing the EPA to withdraw the settlement agreement. See Jenni Doering's interview with Monique Harden of the Deep South Center for Environmental Justice, in which Harden details the importance of the case and implications of severing environmental justice from civil rights enforcement: Doering, J. (2024, July 13). *Following Cancer Alley Decision, States Pit Themselves Against Environmental Justice Efforts*. Inside Climate News. Another major battle is to stop Formosa's massive plastics complex in St. James Parish, air permits for which were reinstated on appeal in January 2024 after being vacated in state district court in 2022. Unfortunately, a critical linchpin in the now-resurrected permitting fight, the upgraded 2024 $PM_{2.5}$ standard, is now facing repeal. See Dryfoos, D. (2024, August 19). *Formosa Plastics returns to fight again*. The Lens. Notably, the Formosa Plant, as proposed, is sited just a few miles downriver from CF Industries Nitrogen, adding yet another emissions source to the already massive toxic load in the area.

182 Daly, L., & Vaquero, I. (2024, May 22). *Where EPA Falls Short, States Lead the Way on Addressing Pollution Burden in Disadvantaged Communities*. Just Solutions.

183 US Environmental Protection Agency. (2026). Toxics Release Inventory Program (TRI): TRI Toxics Tracker. Reporting Years 2015-2024.

risks in non-atmospheric production and storage environments.[184] Significant respiratory and other physiological effects of chronic exposure at lower concentrations are also a major concern.[185] But if we consider the cumulative ammonia emissions load in combination with other chemical releases that coexist in the air people actually breathe, including known carcinogens such as formaldehyde and ethylene oxide, the health-based goals of federal environmental laws are neither achievable nor even discernible under current regulation. Each new chemical plant that supposedly (and dubiously) "adds" to the regional economy also adds, far more clearly, to the overall toxic load of the surrounding areas. One could speculate on formulating something like an area-cumulative hazard rate, factoring the combined effects of multiple pollutants with the cumulative levels of multi-pollutant exposure over time, especially for longtime residents. But the combined and cumulative impacts of chemical pollutants are still a nascent topic in the health sciences even today, and were never contemplated at all in the design of federal air quality regulation under the Clean Air Act.[186] Whether in law, regulation, or practice, criteria and hazardous air pollutants are treated separately, even as they co-exist in the air people breathe. Ammonia, for example, is both a HAP (in Louisiana, but not federally) and, as noted earlier, a known precursor to $PM_{2.5}$—the deadliest and most studied pollutant within the NAAQS and long a focal point in environmental justice advocacy.[187] One can make a strong case that ammonia should be regulated as a criteria air pollutant under the NAAQS, which the EPA's Clean Air Scientific Advisory Committee has considered in the past. If only regulated as a HAP, operational and fugitive ammonia emissions from a given source can only be held to the standard of the lowest-emitting facilities in the sector, regardless of the health impacts of the ammonia emissions as permitted and the associated $PM_{2.5}$ for-

184 Tribouilloy, B., Paillery, E., Palomino, R., & Vignes, A. (2025, June). Evaluating Ammonia's Flammability and Explosion Hazards in Air and Oxygen at Elevated Conditions: Data Generation and Review According to the New European Standard. *18th International Symposium on Loss Prevention and Safety Promotion in the Process Industries* (Vol. 116, pp. 235-240). AIDIC.

185 US Environmental Protection Agency. Integrated Risk Information System. (2016, September). *Toxicological Review of Ammonia (Noncancer Inhalation)*.

186 A seminal article bringing attention to this question is Behles, D. (2010). Examining the air we breathe: EPA should evaluate cumulative impacts when it promulgates national ambient air quality standards. *Pace Envtl. L. Rev.*, *28*, 200. Notably, in the now-overturned state district court decision vacating Formosa's air permits in 2022, the court agreed with the plaintiffs' charge that LDEQ had failed in its duties under the state's public trust doctrine by not conducting a cumulative impacts analysis for the facility's toxic air emissions, including 7.7 tons of ethylene oxide and 36.6 tons of benzene per year that were authorized by the agency.

187 Ammonia-related $PM_{2.5}$ formation is predominantly linked to agriculture and concentrated animal feeding operations, but $PM_{2.5}$ formation linked to industrial and mobile source ammonia emissions is also potentially an emerging air quality problem in some urban areas: Wu, Y., Gu, B., Erisman, J. W., Reis, S.,
Fang, Y., Lu, X., & Zhang, X. (2016). PM2. 5 pollution is substantially affected by ammonia emissions in China. *Environmental Pollution*, *218*, 86-94.

mation that may result.[188]

Taking stock of the blue ammonia footprint and cumulative impacts in Ascension Parish starts with a veritable elephant in the room: Ohio-based CF Industries Nitrogen megacomplex in Donaldsonville. Operating for six decades as one of the country's worst chemical polluters, CF Industries Nitrogen, as noted earlier, is also the first large chemical plant in the US to adopt CCUS, with operations already underway as of July 2025. The plant's surrounding community, in a 3–mile radius, is 79 percent people of color and 59 percent low-income, and compared to the rest of the country, the community ranks in the 86th percentile for fine particulate matter, the 97th percentile for toxic releases, and the 81st percentile for risk management plan proximity.[189]

Combined with the two new blue ammonia plants nearby, total area emissions of the future are hard to imagine even on paper, let alone as active and reactive pollution in the air people actually breathe:

- CF Industries Nitrogen's 2025 air permit renewal[190] allows a 144 tons per year increase in ammonia emissions, now rising to nearly 5,100 tons per year or 10.2 million lb. In 2024, the facility reported ammonia emissions of 3,600 tons or 7.2 million lb, roughly 30 percent less than the current allowable limit. However, it is difficult to describe CF Industries Nitrogen as "over-performing" on its allowable emissions when it ranks third in the country for ammonia emissions, is the source of 4.2 percent of all ammonia emissions from TRI-reporting facilities (as of 2024), and is sited in a county that also ranks third nationally for overall toxic releases from chemicals production.
- Ascension Parish's ammonia footprint extends to Geismar, north of Donaldsonville, where, as noted earlier, Nutrien's PCS Nitrogen Fertilizer plant was awarded a renewal and modification air permit for a proposed blue ammonia unit in 2023. While the project was suspended in 2024, the existing ammonia plant has been polluting the area for decades, with reported ammonia emissions averaging 357 tons per year between 2015 and 2024; the company's toxic track record also includes a 2022 settlement with the EPA and LDEQ over multiple violations of hazardous waste management

188 States can incorporate ammonia reduction strategies into State Implementation Plans for achieving or maintaining attainment of $PM_{2.5}$ standards, but ammonia cannot be directly regulated as a means of reducing $PM_{2.5}$ concentrations in an area.

189 US Environmental Protection Agency. (n.d.). EJ Screen Community Report: Donaldsonville Nitrogen Complex (3-mile perimeter).

190 Louisiana Department of Environmental Quality. (2025, June 20). CF Industries Nitrogen LLC Proposed Part 70 Air Operating Permit Renewal and Modification, Permit No. 0180-00004-V24.

rules under the Resource Conservation and Recovery Act.[191]

- Filling out Ascension's toxic air emissions load, the Methanex Geismar Methanol plant, a few miles north of the Nutrien plant and also with a proposed CCUS project (currently on hold), reported 657 tons of ammonia emissions and 58,000 lb of methanol emissions in 2024.[192]
- The new plants, Clean Hydrogen Works Ascension Clean Energy Project and CF Industries Blue Point Complex, are authorized (or proposing) to add ammonia emissions totaling 287 tons per year, such that reported plus newly permitted ammonia emissions in the surrounding neighborhoods of the five facilities (three old and two new) could total as much as 4,900 tons per year or 9.8 million lb.

For Ascension Parish, the combined climate and local pollution of the two new CCUS-involved ammonia facilities, set against the county's current overall facility baselines of CAPS/VOCs, TAPs, and GHGs, is presented in Table 2.

191 US Environmental Protection Agency. (2026). Air Pollutant Report: PCS Nitrogen Fertilizer LC. Retrieved June 23, 2026. The 2022 settlement with the EPA and LDEQ was over multiple violations of the Resource Conservation and Recovery Act pertaining to as much as 1 billion lb of acidic hazardous process wastewaters disposed of in the gypsum stacks of the company's phosphate fertilizer plant, which was closed in 2018. See US Environmental Protection Agency. (2022, July 14). PCS Nitrogen Fertilizer, L.P. Settlement Information Sheet | US EPA. Settlement Information Sheet.

192 US Environmental Protection Agency. (2026). Detailed Facility Report: Geismar Methanol Plant. Retrieved June 23, 2026.

Table 2. Ascension Parish Blue Ammonia Buildout: Emissions Increases and Cumulative Tax Credits.

Blue Ammonia facilities*	**CAPS + VOCs** (tons per year)	**Toxic Air Pollutants** (tons per year)	**CO_2e** (metric tons per year)***	**45Q credits** (potential cumulative subsidy in current dollars for company-estimated CO_2 capture, under current tax policy)
Clean Hydrogen Works ACE	680	147	4,000,000	$4,080,000,000****
CF Industries Blue Point	940	171	2,300,000	$2,346,000,000
Ascension Parish all reporting facilities**	16,000	6,200	16,900,000	$2,040,000,000 (CF Industries Nitrogen CCUS retrofit)
Totals	17,620	6,518	23,200,0000	$8,466,000,000
Net increase from new blue ammonia plants	1620	318	6,300,000	$6,426,000,000
Net Increase %	10.1%	5.1%	37.3%	315%

* Facility co-pollutant data drawn from Louisiana Department of Environmental Quality air permits: (October 16, 2025). Clean Hydrogen Works LLC Ascension Clean Energy Project Part 70 Operating Permit No. 0180-00235-V0; (October 17, 2025). CF Industries Blue Point LLC Proposed Part 70 Air Operating Permit No. 0180-00237-V0 & PSD Permit No. PSD-LA-859.

** Ascension Parish All Reporting Facilities: **CAPS/VOCs**: US Environmental Protection Agency. (2026). National Emissions Inventory: 2020 Facility Level Data for Point Emissions; **Toxic Air Pollutants**: US Environmental Protection Agency. (2026). Toxics Release Inventory Program (TRI): TRI Toxics Tracker. Reporting Year 2024; **CO_2e**: Environmental Protection Agency, Office of Atmospheric Protection. (2026). Greenhouse Gas Reporting Program (GHGRP): EPA Facility Level GHG Emissions Data. Reporting Year 2023.

*** Blue Ammonia CO_2e emissions are company projections. Parish-wide facility CO_2e emissions are as reported in the Greenhouse Gas Reporting Program for 2023.

**** Clean Hydrogen Works' ACE project is being built in two phases, with full-scale CO_2 capture estimated at 12 million metric tons per year for annual production of 7.2 million tons of blue ammonia; CHWs estimated 45Q credits in Table 2 is for phase one of the project, producing 2.4 million tons of blue ammonia per year by 2030.

Although permitted emissions can often exceed reported emissions by a significant margin, as in the case of CF Industries Nitrogen in recent years, the SE industrial corridor's reported pollution load is nonetheless staggering, and in connection with CCUS, it will only get worse. As one group of environmental justice leaders has clearly stated: "There is no regulatory regime at any level of government—local, state, or federal—that can protect environmental justice communities from the cumulative risks and dangers associated with industrial carbon management like CCS." Further, in many cases, they point out, referencing the wave of new federal approvals and applications for state "primacy" in regulating CCUS, "[w]ithin the weak regulatory frameworks many of us fight to change, bad actors that fail to enforce environmental regulations are in the process of being approved to hold primary permitting authority over CCS projects."[193]

Adapting new facilities and associated pollution loads with CCUS is a recipe for causing more local harm and doing so, perversely, in the name of fighting climate change and with taxpayers footing the bill. In addition to increasing local pollution, CCUS is a regulatory quagmire at the facility level, as we saw in the case of CF Industries Blue Point. Theoretical capture rates and sequestration targets, asserted without explanation in the permitting proposals or finalized permit examined for this report, cannot be assumed, or considered as a basis, for determining whether a facility must submit to PSD review and requirements for one or more pollutants, arguably the most crucial "decision point" in all of air quality regulation under the Clean Air Act.

Carbon Sink or Places Sink? The CCUS Infrastructure Buildout

Gulf Coast ecosystems and communities are uniquely subject to a kind of double jeopardy when it comes to fossil fuel development. On the one hand, the regional economy's concentrated and disproportionate output of greenhouse gas emissions contribute to global warming that is eroding or outright sinking coastal barriers and wetlands under sea-level rise and intensifying hurricane impacts. At the same time, thousands of miles of pipelines in matrices connecting on-shore and off-shore drilling wells to refineries and, increasingly, connecting point-source carbon capture operations to storage well infrastructure, encumber land and interior wetlands and waterways, and further accelerate

193 Wright, B., Shepard, P., Baptista, A. I., Lopez-Nunez, M., Hadayia, J. M., Martinez, B. L., Rogers-Wright, A. K., Lewis, S., Sheats, N., Alkaff, H., Shariff, N., Magana, M., Márquez, I. B., & Yearwood, L. (2023, June 7). Statement by Environmental Justice Organizations on the National Symposium on Climate Justice & Carbon Management. [Press Release]. Deep South Center for Environmental Justice.

coastal subsidence through excavation, construction, operations and maintenance, and other means of making room for fossil fuel infrastructure and now, as well, for CO_2 transport and storage development. Because of climate change, additional pipeline infrastructure that could be associated with CCUS is likely to be increasingly prone to accidents and leakage events as expanding pipeline areas and usage are subject to accelerating and intensifying severe weather events, as well as land subsidence and other geohazards. In addition, the potential for induced seismicity of increasingly complex and potentially interacting underground operations of EOR, waste storage from fossil fuel drilling and processing, and pressurized CO_2 sequestration, poses health and safety risks that may be low probability but not zero probability.[194]

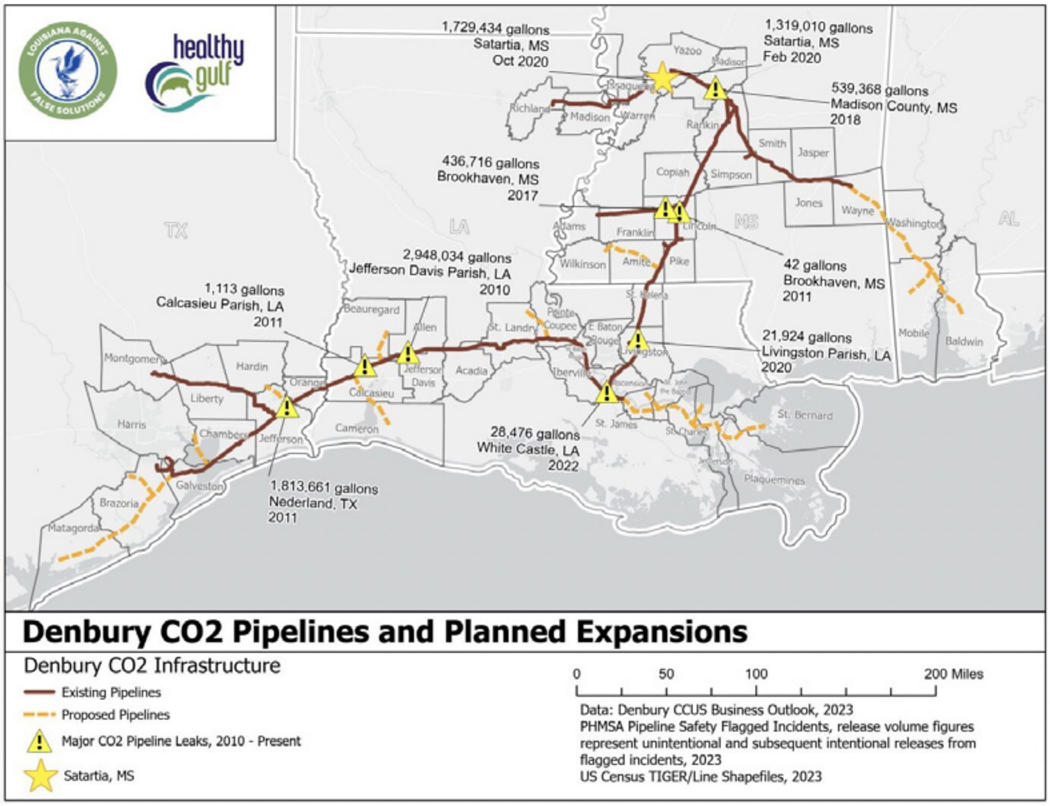
In keeping with the buildout of point-source carbon capture operations, CO_2 pipeline infrastructure appears poised to grow as well. There are 91 new pipelines or pipeline expansions proposed or under development in Louisiana and Texas. Fourteen of these are for $CO_{2,}$ and 10 are Louisiana-based. As seen in Figure 13, currently the Gulf Coast CO_2 pipeline network is composed of two high-volume systems, both now owned by ExxonMobil—the Northeast Jackson Dome line transporting biogenic CO_2 and running from the Jackson Dome source field in South Central Mississippi to Donaldsonville, LA (183 miles), and the Denbury Green Line running from Donaldsonville to Houston (320 miles), which was built in the late 2000s for delivering both natural and industrial CO_2 supplies to EOR operations in SE Texas.[195] A third major system, the Free State Pipeline, runs from the Jackson Dome to oil fields in East Mississippi. In addition to proposed pipeline expansions in both Southeast Louisiana and Texas and a number of shorter, lateral line projects connecting CO_2 sources to the Green Pipeline or directly to storage hubs, several other larger pipeline projects are proposed, including the 110-mile Crescent Midstream Pipeline running from Geismar in Ascension Parish to a proposed off-shore storage hub off of Grand Isle (a barrier island and part of Jefferson Parish), with potential cumulative storage capacity of 300 million tons.[196]

194 In addition to storage risks, the risks to pipeline safety from impacts of climate change cannot be ignored. As Scott Eustis of Healthy Gulf explains: "Maps showing the high geographic densities of pipeline incidents in Texas and Louisiana do not simply reflect the large amount of pipelines in Texas and Louisiana. When we examine incidents per mile of pipeline, there are substantial increases in incident rate in Texas, Louisiana, as well as Offshore Gulf waters. Each jurisdiction shows some attention to certain pipelines, but the overall rate changes show an increasing lack of integrity as proximity to the ocean increases. We conclude, then, that, over the project life of any new proposed pipeline or infrastructure, these rates will increase with the rising sea." See Eustis, S. (2021). Oil and Gas Pipeline Integrity in Texas and Louisiana, 2010-2020. Healthy Gulf.

195 Schnacke, G. (2010, February). CO2 Enhanced Oil Recovery: Denbury's Business Model Demonstrates Feasibility Of CO2 EOR In Mature Fields. *The American Oil & Gas Reporter.*

196 Oil & Gas Watch. (n.d.). Project Lochridge. Retrieved June 25, 2026.

Figure 13. Denbury CO2 Pipelines and Planned Expansions, With Major Leak Events (2010-2023).



Source: Courtesy of Healthy Gulf.

In the emerging CCUS landscape, most new pipelines are either smaller lateral lines connecting new CCUS-adapted facilities with existing major pipelines for transport to large sequestration hubs or direct feeder lines from a specific facility to a contracted storage hub nearby. Currently, such pipelines include:

- Denbury's 1.2-mile lateral pipeline to transfer captured CO_2 from Clean Hydrogen Works' ACE blue ammonia facility into Denbury's Green Pipeline system. A Coastal Use Permit is pending with the United States Army Corps of Engineers.[197] As noted earlier, however, in 2023 Denbury was acquired by ExxonMobil and its contracts with CHW were terminated in 2025, prompting a still pending lawsuit accusing ExxonMobil of anticompetitive practices.
- 1Point5 and Enbridge have a joint venture for building local feeder pipelines to 1Point5's Pelican Sequestration Hub in North-Central Livingston Parish. CF Industries and 1Point5 have a 25-year offtake agreement to store ~ 2.3 million tons of CO_2 annually from the Blue Point Complex in Donaldsonville, Ascension Parish.

Air Products' 38-mile pipeline for its LCEC project has been the most controver-

197 US Army Corps of Engineers (2024, April 1). PUBLIC NOTICE: Denbury Gulf Coast Pipelines LLC CHW Lateral Pipeline Project.

sial CO_2 pipeline proposal in Louisiana's CCUS buildout thus far, and for good reason, as the pipeline would have posed serious risks to children and other residents in its path:

- The pipeline would traverse roughly 38 miles across multiple parishes, with proximity to residential areas, a primary school, and other critical facilities; it would run within 0.5 miles of the school and even closer to an adjacent residential subdivision.
- When a high-pressure CO_2 pipeline ruptures, the gas is denser than air, so as it spreads from the rupture, it stays low to the ground and displaces the oxygen people normally breathe.
- If the pipeline ruptured where it passes near the school, the CO_2 gas could reach the school even if the pipeline is shut off within a very optimistic five minutes of the rupture; the result would be 10 minutes of exposure at the school, at a CO_2 concentration of 50,000 parts per million, a level which is considered highly hazardous and indicated for strong respiratory stimulation, dizziness, headache, and confusion. With longer shut-off times, the gas plume would travel further downstream from the rupture and potentially reach more people at the same concentration.[198]

For industry-backed and government engineers and geologists, potential CO_2 storage capacity in the Gulf Coast region, onshore and offshore, is a source of great theoretical optimism about the potential scale of CCUS and its contributions to climate change mitigation.[199] More than 60 secure sequestration facilities and multi-user hubs are proposed or under development in Louisiana and Texas, and currently there are 32 Class VI sequestration projects, encompassing more than 100 individual wells, under review by the Louisiana Department of Conservation and Energy (LDCE); many of these applications include both EPA and LDCE review, but 10 were started under LDCE in the wake of Louisiana's successful application to the EPA for state "primacy" over Class VI well regulation. Two storage projects, the Hackberry Sequestration Hub in Cameron Parish and the first of seven Class VI injection wells of the River Parish Sequestration Hub in Ascension Parish, have been granted finalized permits as of May

198 On November 14, 2025, local advocates represented by Earthjustice submitted comments to the Louisiana Department of Conservation and Energy and the US Army Corps of Engineers opposing Air Products' Joint Application for a Coastal Use Permit and a Clean Water Act permit. The comments were supported by a technical simulation study prepared by pipeline modeling expert John Gorman: Gorman, J. (2025). *Modeling Report: Simulated Rupture of a Carbon Dioxide Pipeline Near Sorrento Primary School / Orange Grove Subdivision in Ascension Parish, Louisiana*. Earthjustice.

199 Meckel, T. A., Bump, A. P., Hovorka, S. D., & Trevino, R. H. (2021). Carbon capture, utilization, and storage hub development on the Gulf Coast. *Greenhouse Gases: Science and Technology*, *11*(4), 619-632.

2026.[200]

As seen in Figure 14, the River Parish Sequestration Hub (RPS), which is owned by Blue Sky Infrastructure (a Blackstone portfolio company) encompasses rights to inject and store CO_2 in saline aquifer pore spaces under 30,000 acres outside Donaldsonville on the western side of the Mississippi River. The RPS Hub, as proposed, will include six more wells in addition to the initial permitted well, each with capacity to store 2 million tons of CO_2 annually, 14 million tons in total annually, and as much as 400 million tons in aggregate over the operational life of the project.[201] The storage hub is connected to potential customers in the Geismar area via a 9-mile feeder pipeline, which has been permitted jointly by the US Army Corps of Engineers and LDCE.[202] The feeder pipeline will be routed under the Mississippi River to a pumping station near the first injection well, from which an 8-mile network of additional internal pipelines will interconnect the other six injection wells.[203]

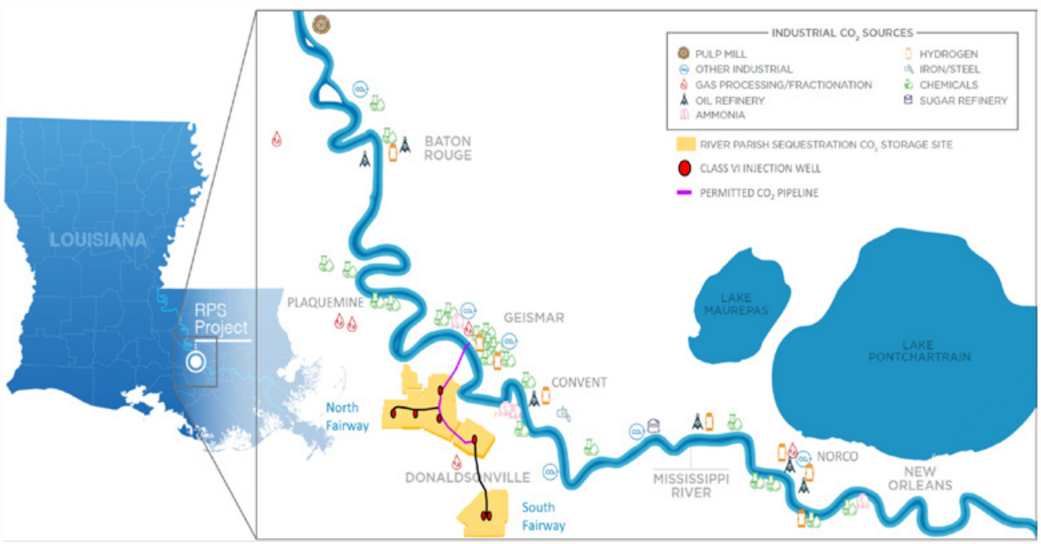
200 Louisiana Department of Conservation and Energy. (2026, May 13). Class VI Permits and Applications:
State of Louisiana, Office of Conservation. Order No. IMD 2025-04 GS (Hackberry), and State of Louisiana, Department of Conservation and Energy. Order No. UIC 2026-01 GS (River Parish).

201 Blue Sky Infrastructure. (n.d.) *River Parish Sequestration*. Retrieved on June 10, 2026.

202 State of Louisiana, Department of Natural Resources, Office of Coastal Management. (2023, August 11). CUP No. P20230510. Geismar is home to multiple chemical plants (Shell, OxyChem, BASF) in addition to the two plants, discussed above, with proposed (currently suspended) CCUS expansion projects—Nutrien/PCS Nitrogen and Methanex Methanol.

203 See also River Parish Sequestration LLC. (2024). *RPS Presentation August 2024*. The project received a $32 million Phase III CarbonSAFE grant from the US Department of Energy: US Department of Energy, National Energy Technology Laboratory. (n.d.). *Bipartisan Infrastructure Law (BIL): River Parish Sequestration - A Critical Carbon Storage Hub for the Louisiana Chemical Corridor*.

Figure 14. River Parish Sequestration Hub, Connected to Industrial CO2 Sources in Geismar, Ascension Parish.



Source: Blue Sky Infrastructure. (n.d.). River Parish Sequestration.

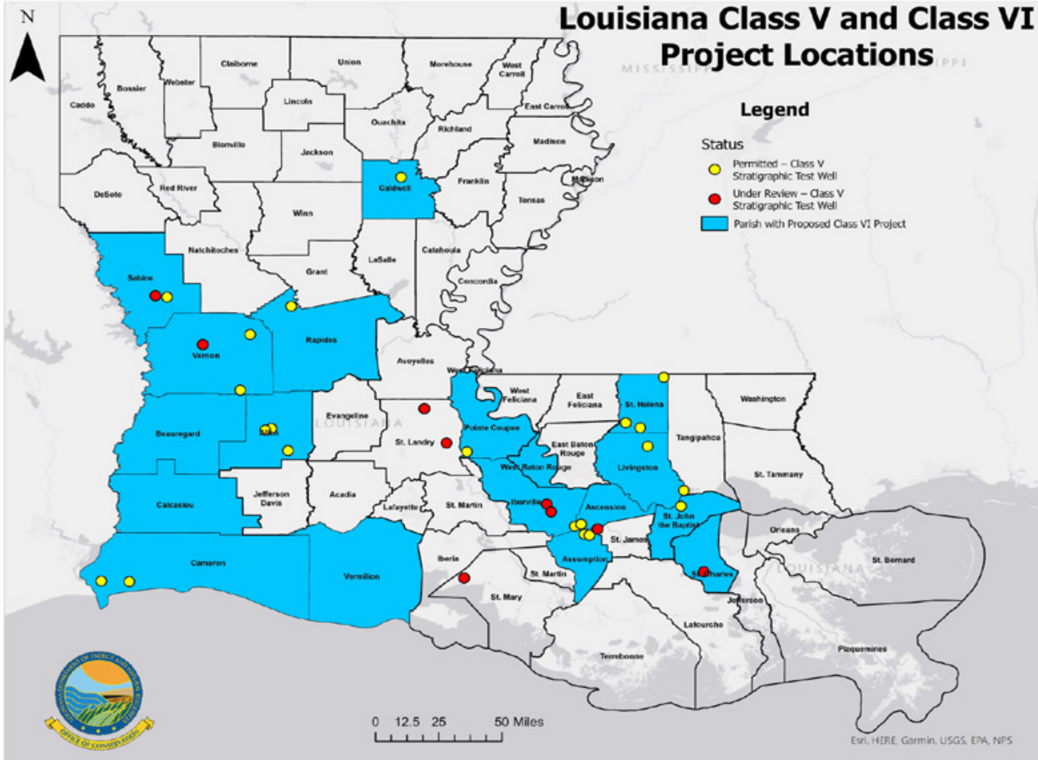
Advocates have expressed concerns about public safety along the pipeline route, which intersects a residential area with only a 1000-foot buffer as well as a church (1200 feet) and a primary school (1 mile).[204] Blue Sky Infrastructure issued a sketch of a Community Engagement Plan at the end of 2025, including a list of about three dozen local, state, and federal officials it has already "engaged" with in "two-way communications." The list, headed by Governor Jeff Landry, does not include a single unelected community leader or any residents representing affected communities. The Plan indicates that a community benefits fund will be established, with a community advisory board to oversee how the money is spent. However, the company notes that "any future tax, fee, assessment, charge, or other cost or financial obligation imposed on RPS or its affiliates by the State of Louisiana and/or any local government, whether related to carbon storage, transport, or any other aspect of the RPS Project, may result in a reduction, delay, or elimination of the Community Benefit Fund planned by RPS."[205]

Overall, as seen in Figure 15, Class VI well projects are proposed in 18 parishes, including 5 parishes of the SE industrial corridor, and 30 stratigraphic test wells are either permitted or under review.

204 Mapping of local population hazards is not provided in permitting documents, but Rise Saint James has created its own maps based on the proposed pipeline route: Rise St. James. (n.d.). RIVER PARISH SEQUESTRATION COMMENT TEMPLATE.

205 See River Parish Sequestration LLC. (2025, December). Community Engagement Plan: River Parish Sequestration Project.

Figure 15. Louisiana Class V and Class VI Project Locations.



Source: Louisiana Department of Conservation and Energy. (2025, June 26). Class VI Permits and Applications.

As noted in the Introduction, there was significant community opposition to Air Products' proposed CO_2 storage system under Lake Maurepas, and this may exemplify some of the critical challenges facing CCUS developers, including legal impediments such as property rights and local ordinances, public health and safety concerns of residents in surrounding communities, and grassroots opposition to impingements on recreation and natural amenities during construction and operations of storage facilities.

In this light, the vast potential CO_2 storage capacity under the Gulf of Mexico looms large for CCUS development. In one study, researchers estimated a storage capacity of 4.7 billion tons in offshore depleted oil fields and more than 20 billion tons combined in both depleted and active oil fields.[206] As noted earlier, ExxonMobil has already leased roughly 271,000 acres in Texas state waters for CO_2 storage, and huge tracts of oil and gas leases in Western Gulf federal waters are poised for conversion to CO_2 injection wells, albeit contingent on a

206 Agartan, E., Gaddipati, M., Yip, Y., Savage, B., & Ozgen, C. (2018). CO2 storage in depleted oil and gas fields in the Gulf of Mexico. *International Journal of Greenhouse Gas Control*, 72, 38-48.

long-overdue rulemaking of the Bureau of Ocean Energy Management.[207] Although more costly to build and operate, offshore CO_2 storage is advantageous for many reasons, including, primarily, storage rights unencumbered by private property rights or local ordinances, relative diminution of public health and safety risks, and relative simplicity and predictability of leasing and permitting under a single jurisdiction, BOEM-managed program.

Conclusion: What's in Store for Carbon Capture and the Gulf South?

The Big Picture Threatens but Is Blurred

In the five decades since CCUS was first developed as an injectant supply business for enhanced oil recovery, little progress has been made beyond this prototype for commodifying CO_2 in the energy system. ExxonMobil's Shute Creek Treating Facility in Southwest Wyoming, the gas processing hub with the third oldest CCUS-EOR operation in the US, was launched in 1986; decades later it is still the largest such operation in the world,[208] despite a sharp rise in pro-CCUS federal investments and subsidies starting in the late 2000s, as climate change and clean energy development began to gain more traction in national politics.

With CCUS-EOR still essentially a niche business in the larger energy system all these years later, it may be surprising to look at the plethora of new CCUS projects under development today, most of which are proposed for secure sequestration. In that case, the commercial viability of CCUS is not primarily dependent on global oil prices, as with CCUS-EOR; rather, it depends almost entirely on government subsidies, as if having the character of a public good. With that said, the business of ramping up carbon capture and secure storage operations to generate serious cash flow from the federal government clearly lends itself to larger, multi-actor projects that can spread financial risks while effectively winning and maintaining political support.

Although a number of such megaprojects are being developed, it cannot be ignored that CCUS expansion in the Gulf South, or anywhere else, rests precariously on a free lunch of massive taxpayer subsidies. This is why the incumbent

207 Johnson, L. (2024, October 24). ExxonMobil, Texas ink deal for nation's largest offshore CO2 storage site. ESGDive.

208 Jones, A. C., & Lawson, A. J. (2022). Carbon Capture and Sequestration (CCS) in the United States. Congressional Research Service; Robertson, B., & Mousavian, M. (2022). Carbon Capture-to Serve Enhanced Oil Recovery: Overpromise and Underperformance. Institute for Energy Economics and Financial Analysis.

fossil fuel companies and chemical producers may be looking at CCUS primarily as a way to expand their footprint in the growing global marketplace for cleaner fuels and chemical products, as exemplified in the comparatively rapid buildout of blue ammonia production. Naturally, the incumbents will gravitate toward where a large supply of CO_2 emissions, if captured and stored, can yield value in two forms—namely, the clean energy attributes of decarbonized fuels and chemicals and the subsidy value of sequestered CO_2.

As the project data clearly show, 45Q subsidies potentially costing taxpayers hundreds of billions of dollars will flow in large measure to incumbent fossil fuel giants such as ExxonMobil, Occidental,[209] and Chevron,[210] as well as chemical behemoths such as Air Products and CF Industries, along with a small group of large pipeline companies and a somewhat more diverse group of storage engineering firms. One project alone, the ExxonMobil-led, fourteen-party Houston CCS Innovation Zone, projects annual emissions capture of 100 million tons by 2040, which could draw down more than $100 billion in federal subsidies, in total, from the 45Q program under current law.[211] Among the projects for which CO_2 capture potential has been estimated, however, the average scale, while smaller, is still sizeable—about 7 million tons annually, which corresponds to a total potential subsidy of roughly $7 billion per project and possibly double that amount or more if the 45Q program is extended in keeping with the 20-30 year life-cycle that is typical of large energy projects and their off-take agreements.

On any considerable scale, it should be clear that 45Q, as currently designed, could lead to net increases in GHG emissions when considering the full life-cycle emissions of CCUS projects. This seems very likely to be the case with CCUS-EOR, which may finally begin to expand again because of the 40-percent subsidy boost from the OBBBA (although rising or falling oil prices are undoubtedly the most determinative factor). But the perverse incentives at the heart of CCUS should also be clear beyond the obvious case of EOR. The problem, to reiterate, is that CCUS subsidies are not designed to incentivize gross emissions reductions; rather, by crediting emissions on a per-ton basis, as long as they are stored or utilized, fossil fuel usage and CO_2 emissions increases are actually encouraged and rewarded, not penalized as they would be under an enforceable clean energy standard or a carbon pricing system. Emissions that are bad for the climate but otherwise have limited, uncertain, or zero value to the polluters have now become a valuable, flexible asset in the energy econ-

209 Yu, J. (2025, March 26). Occidental's Billion-Dollar Carbon Credit Plan Takes Shape. MarketBeat.

210 Bush, T. (2025, August 21). Chevron Doubles Down on Carbon Capture with Massive Bayou Bend Hub. decarbonfuse.

211 Martinez, C. (2025, May 31). ExxonMobil eyes Houston for $100 billion carbon capture plan. WORLD PORTS ORG.

omy; to put the question more directly, since GHG emissions reductions are not mandated at the federal level—or in the states where nearly all of the new CCUS projects are being developed—why would energy companies adopt CCUS unless it serves their economic interests? At least among the lower-cost scenarios for carbon capture—biofuels, natural gas processing, some chemical plants—adapting with CCUS in exchange for large public subsidies is essentially a way to lower the costs of producing what these CO_2 emitters (and now owners) would be trying to sell in any case.[212]

Judging by the recent upsurge in CCUS project development, current policy arrangements and market developments seem to be making sense to some commercial stakeholders in the field. But serious doubts about commercial viability remain, even as the timeline for getting projects under construction is starting to narrow and community opposition is growing. Certainly, the collapse of Air Products' Louisiana Clean Energy Complex indicates financial challenges for the much-hyped prospect of a cleaner future for chemical and fuel manufacturing, but it also underscores the risks of counting on a subsidy-dependent, logistically complicated, and largely unproven technology like CCUS for any kind of enterprise, whatever the net results in terms of climate change.

As emphasized in this report, however, CCUS is more than just a risky bet for taxpayers and investors. It is also a public health and safety threat multiplier for the communities in its path. So it should matter greatly if 1) the climate impacts of CCUS are only marginally beneficial at best and clearly negative when accounting for realistic operations and life-cycle emissions; and 2) the opportunity costs of heavily subsidizing such a technology and approach could have a serious fiscal impact of limiting other, much more beneficial investments, including investments that could benefit the very communities most at risk of further harm with the buildout of CCUS. Ultimately, the most reasonable solution is to take a precautionary approach, and this can only mean that those already hardest hit by hydrocarbon dominion, especially in the Gulf South, should have veto power over what comes next. Whether law or policy can ever be made to bend to such a principle may not seem plausible to ask today, given current political circumstances. But it is already clear that frontline communities can and will continue to create their own veto power by organizing on the ground, and the CCUS case, which strains common sense and even basic credulity—whether in fiscal or climate terms, or in any other meaningful respect—may be a breaking point that tips the balance of power in favor of preventing any further harm.

212 For a general technical discussion of the perverse incentives driving the development of CCUS, see Olmstead, S. M., Leibowicz, B. D., Mason, C. F., Waxman, A. R., Grubert, E., Huber-Rodriguez, H. R., & Stemmler, J. (2025). How to design better incentives for carbon capture and storage in the United States. *Proceedings of the National Academy of Sciences*, *122*(29), e2404677122.