EXHIBIT
A

Economic Impacts of CO_2 Pipelines in South Dakota

PREPARED BY:

DAKOTA INSTITUTE

South Dakota Ethanol Producers Association

The South Dakota Ethanol Producers Association (SDEPA) serves as a strong, unified voice of advocacy for the expansion of ethanol production, greater access to the marketplace, and increased use and acceptance in South Dakota and the United States.

With diverse representation throughout the ethanol industry, the SDEPA will build consensus, cooperation, and collaboration for positive public policy, education, and expansion of goals for the ethanol industry through legislative outreach with elected officials and regulatory agencies, as well as like-minded organizations and the general public.

SDEPA strives for integrity, honesty, and relentless dedication in this mission of enriching the value of agriculture on the farm, increasing jobs in our state, and ultimately, bringing energy independence to our entire nation through the use of this readily available, clean, economical, home-grown fuel that is ethanol.

DISCLAIMER:

The following report and the services performed by the Dakota Institute (DI) in preparing this report for SDEPA were advisory in nature. The report evaluates the potential economic impact in South Dakota that may arise from the construction of the Navigator CO_2 and Summit Carbon Solutions pipelines.

The analyses and findings presented in the report are based on estimates and assumptions concerning several factors, including pipeline construction and operation costs, potential tax credits available to ethanol producers, and market conditions in local grain markets.
The findings and analyses contained in the report are based on data and information shared with DI by Navigator CO_2, Summit Carbon Solutions, and the SDEPA. DI does not guarantee the accuracy or completeness of the data used in the analysis or its interpretation.

It is important to note that additional relevant data or information that becomes available after the report's date may have a material impact on the findings in the report. DI has no obligation to update the report in the future.

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USEFUL ABBREVIATIONS & TERMS

Abbreviation	Definition
CAPEX	Capital Expenditures
CI	Carbon Intensity
CO_2	Carbon Dioxide
CCS	Carbon Capture and Sequestration
GREET	Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies
gCO_2e/MJ	Grams of CO_2 Equivalent per Megajoule of Energy
LUC	Land Use Change
LCFS	Low Carbon Fuel Standard
Mmgal/Yr	Million Gallons per Year
OPEX	Operational Expenditures

Terms	Definition
Employment	Employment estimates include of the number of jobs, full-time plus part-time, by place of work for all industries. Full-time and part-time jobs are counted at equal weight. Employees, sole proprietors, and active partners are included, but unpaid family workers and volunteers are not included.
GDP	The market value of final goods and services produced by labor and property in the region.
Gross Output	The amount of production, including all intermediate goods purchased as well as value added (compensation and profit). Gross output can also be thought of as industry sales.
Personal Income	Income received by persons from all sources. It includes income received from participation in production as well as from government and business transfer payments. It is the sum of compensation of employees (received), supplements to wages and salaries, proprietor's income, rental income, personal income receipts on assets, and personal current transfer receipts, less contributions for government social insurance.

EXECUTIVE SUMMARY

Introduction

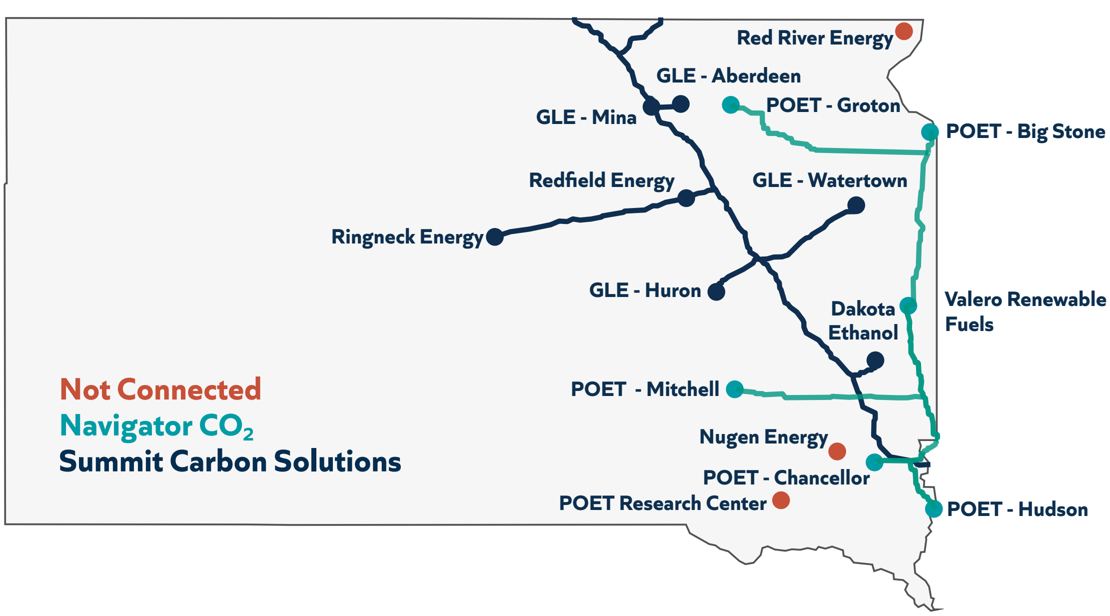
The South Dakota Ethanol Producers Association commissioned this report to analyze the potential economic impacts of two large CO_2 pipeline projects. The pipelines would collect CO_2 byproducts of corn-based ethanol production and transport the CO_2 gas for long-term underground storage through a process known as Carbon Capture and Sequestration (CCS).

The Navigator CO_2 (Navigator) pipeline will collect carbon dioxide from ethanol plants across five states, including Illinois, Iowa, Minnesota, Nebraska, and South Dakota, for storage underground at Mt. Simon sandstone formation in central Illinois. The Summit Carbon Solutions (Summit) pipeline will also collect carbon dioxide from biofuel plants in five states, including Iowa, Minnesota, Nebraska, North Dakota, and South Dakota, for deep underground storage in North Dakota.

Once completed, the Navigator and Summit pipelines will constitute the largest carbon dioxide pipeline networks in the United States. The two pipelines will stretch nearly 4,000 miles and transport carbon dioxide from 61 biorefineries across the Midwest for permanent underground storage. Nearly 361 miles of the Navigator pipeline (19% of its total length) would cross twelve South Dakota counties. The Summit pipeline will stretch 474 miles (24% of its full length) across eighteen South Dakota counties. The pipelines will provide access to CCS pipelines for 13 of South Dakota's 16 ethanol plants.

The Navigator and Summit CCS projects could significantly alter the landscape of ethanol production across the Midwest. They will also bring significant economic impacts to the South Dakota economy if they go forward. This report provides insights into the Navigator and Summit pipelines' potential economic impacts and the secondary impacts that they could unlock. First, this report analyzes the economic impacts arising from the construction and operation of the pipelines. Second, this analysis estimates the economic impact of tax credits available to ethanol producers adopting CCS. Finally, this report analyzes how increased ethanol production could impact the local corn basis and the economic impacts of a strengthened corn basis on farm incomes.

Figure ES1: CO_2 Pipelines and Connected Ethanol Plants



Key Findings

We report the estimated economic impacts of the Navigator and Summit pipelines along four dimensions, including employment, personal income, gross economic output, and state GDP. This study does not explore state and local tax revenue impacts. It does, however, include property tax payments to local governments when estimating the economic impacts of the pipelines' operational phase. Finally, this study only looks at economic impacts related to the CCS projects and traditional corn-based ethanol producers. It does not include impacts associated with the production of aviation fuels.

This analysis used the 70-sector Policy Insight dynamic model from Regional Economic Models, Inc (REMI) to assess the economic impacts of CO_2 pipeline construction and operation in South Dakota. The REMI model was also used to estimate the impacts of the 45Q and 45Z tax credits and the impacts of a higher corn basis driven by increased ethanol production.

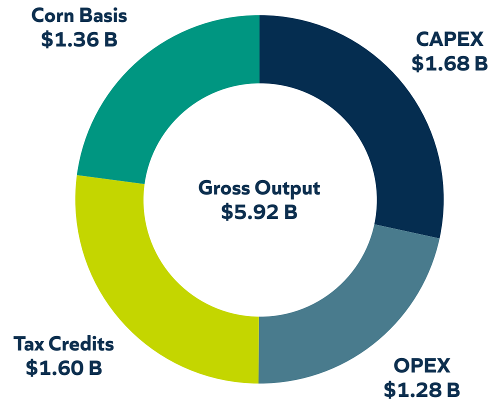
Like many other impact modeling approaches, REMI uses an Input-Output model to represent the inter-industry relationships found in the economy. The model captures the industry structure of a particular region and the transactions between industries. The REMI model also expands on traditional Input-Output models by incorporating General Equilibrium, Econometric, and Economic Geography techniques to provide more accurate economic impact estimates.

Total impacts

We report the estimated economic impacts of the CCS projects across two phases. First, a construction phase which takes place in 2024 and 2025. Second, we analyze the first ten years of pipeline operations occurring from 2025 through 2034. Our findings indicate that the CCS projects will have a pronounced effect on South Dakota's economy throughout the study period and beyond.

We estimate the total impact on state GDP will be $3.3 billion across both phases. The construction phase will increase state GDP by $952 million over 2024 and 2025, nearly 0.70% of state GDP each year.[1] We further estimate the operational phase will add another $2.35 billion to state GDP from the combined impacts of pipeline operations, clean fuel and CCS tax credits, and a stronger corn basis, representing a 0.35% increase in state GDP annually.

Figure ES2: Combined Economic Impacts on Gross Output



The impacts are even larger when looking at gross output which is broader measure of economic activity than GDP, which considers only final goods and services. The pipelines will generate and support an estimated $5.92 billion in gross output from 2024 through 2034. We estimate the largest impact will come from the CAPEX phase of the project, which will increase gross output in the state by an estimated $1.68 billion over the two-year construction period. The second largest impact on gross output will come from the clean fuel and CCS tax credits, which we estimate will increase gross output by $1.6 billion from 2025 through 2034. We further estimate that a stronger corn basis will boost gross output by nearly $1.36 billion and that the operating activities of the pipelines will increase gross output by slightly more than $1.28 billion over the ten-year period from 2025 through 2034.

Table ES1 – Total Economic Impacts[1]

Project Phase	GDP ($ millions)	Gross Output ($ millions)	Personal Income ($ millions)	Employment (Avg Annual)
2024-25				
CAPEX	952	1,683	904	5,353
2025-34				
OPEX	771	1,284	398	436
Tax Credits	956	1,600	2,046	1,025
Corn Basis[2]	627	1,356	192	291
Total	**$3,306**	**$5,923**	**$3,540**	**2,566**

[1] All dollar amounts are in 2022 nominal US dollars.
[2] Based on the 15% ethanol expansion scenario.

Pipeline Construction

Construction of the Navigator and Summit pipelines will generate the largest economic impacts. Figure ES3 shows that Navigator CO_2 and Summit Carbon Solutions will invest a combined $1.53 billion in South Dakota during the CAPEX phase of the CCS projects. These capital expenditures, which reflect the construction of pipelines, capture facilities, and pump stations, will support an estimated $1.6 billion in gross output spread over 2024 and 2025. The CAPEX phase of the project will also boost GDP by an estimated $952 million and generate $904 million in personal income over the two-year construction phase.

The CAPEX phase of the project will also generate substantial employment impacts as both companies assemble large workforces to complete the necessary construction projects. The largest employment impact will be in the construction industry, which is expected to support an average of 2,772 jobs annually in 2024 and 2025. Navigator and Summit were unable to provide estimates for the number of local workers to be employed during the project, but the REMI model estimates net economic migration of approximately 1,800 workers in 2024 and another 1,400 in 2025. Owing to the high levels of temporary economic migration, the model also anticipates the creation of several hundred jobs in the Retail and Accommodation and Food Service sectors.

Figure ES3: Gross Economic Output Relative to CAPEX

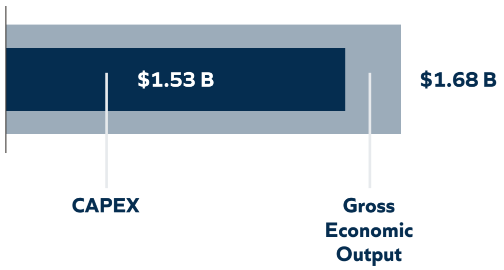
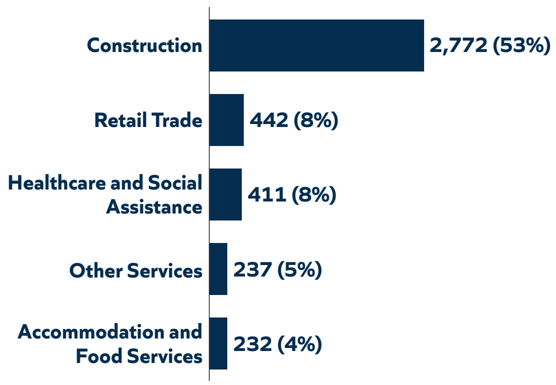


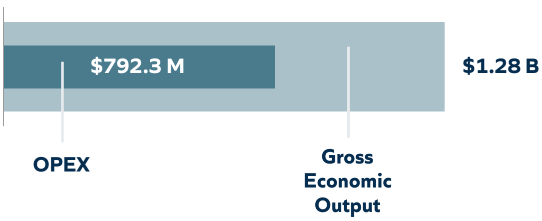
Figure ES4: Average Annual CAPEX Employment Impacts in Top 5 Private Industries



Pipeline Operations

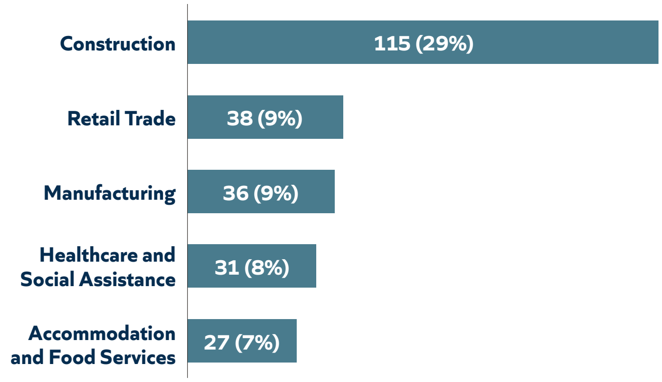
This report looks at the pipelines' first ten years of operations, from 2025 through 2034. Navigator and Summit shared their planned OPEX budgets for the operations phase of pipeline development, which reflected combined operating expenses of $82.7 million in the first year. Based on these planning budgets we estimate operating expenditures of $792.3 million over ten years. The budgets included planned expenditures for regular business expenses, high voltage power, personnel, and anticipated property taxes liabilities. We also included estimates for potential crop damage to capture the impact of lower crop yields along the pipeline routes.

Figure ES5: Gross Economic Output Relative to OPEX 2025-2034



Based on the planning budgets provided by Summit and Navigator, we estimate that pipeline operations will contribute more than $1.28 billion in gross economic output between 2025 and 2034. Their ongoing operations will also increase state GDP by an estimated $771 million over the same period. The pipelines will also support an average of 436 jobs per year and generate $398 million in personal income. The Construction sector is expected to see the largest private sector employment impact, where OPEX spending will support an estimated 115 jobs annually from 2025 through 2034.

Figure ES6: Average Annual OPEX Employment Impacts in (Top 5 Private Industries)

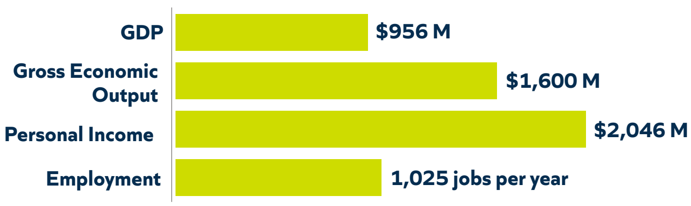


The 45Z and 45Q tax credits could have a net value of $1.56 billion to South Dakota's ethanol producers from 2025 through 2034.

CCS and Clean Fuel Tax Credits

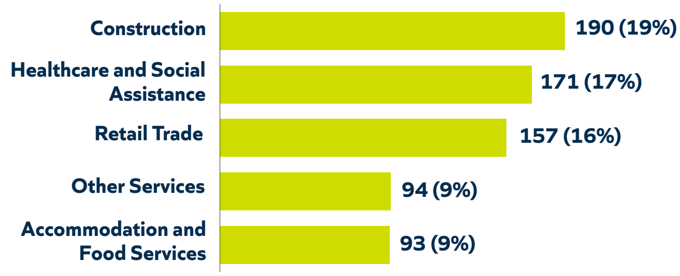
When operational, the Navigator and Summit pipelines will allow ethanol producers to utilize CCS technologies and access 45Q and 45Z tax credits for carbon sequestration and clean fuel production. The potential value of these credits was estimated using the best available public data on ethanol production in South Dakota and the 45Z and 45Q credits.

Figure ES7: Economic Impacts of 45Q and 45Z Tax Credits 2025-2034



The 45Q and 45Z tax credits could have a net value of $1.56 billion from 2025 through 2034. The tax credits will be worth approximately $239 million annually from 2025 through 2027 when producers are eligible for 45Z credits and $120 million annually from 2028 onward when producers move to 45Q credits. We modeled the economic impact of these tax credits as shocks to farm and proprietors' income, that would increase state GDP by an estimated $956 million over ten years. The tax credits could similarly support a $1.6 billion expansion in gross output along with a $2.05 billion increase in personal income. The 45Q and 45Z tax credits would also support strong employment growth throughout the ten years, though the impacts lessen over time along with the value of the tax credits. Once more, we estimate substantial employment impacts in the construction sector, which could support 190 jobs per year on average.

Figure ES8: Average Annual Employment Impacts of 45Q and 45Z Tax Credits (Top 5 Private Industries)



Corn Basis and Farm Incomes

South Dakota's inclusion in the Navigator and Summit CCS networks will allow ethanol producers to access 45Q and 45Z tax credits, providing powerful incentives to increase ethanol production and expand capacity. All South Dakota ethanol producers currently use corn as the primary feedstock for ethanol production. Consequently, the 45Q and 45Z tax credits will create additional demand for corn from ethanol producers, supporting higher regional corn prices and farm incomes. To estimate the magnitude of this effect, we simulated a series of ethanol expansion scenarios, each with a five-year phase-in period, and estimated their resulting economic impacts.

In consultation with SDEPA, this analysis reports three expansion scenarios, reflecting 10%, 15%, and 20% increases in ethanol production. Given current market conditions and corn availability, the 15% expansion scenario was ultimately identified as the most likely scenario. This scenario would see South Dakota's ethanol producers increasing output from 1.444 to 1.661 billion gallons per year, requiring an additional 77 million bushels of corn annually. Under this scenario, we estimate the local corn basis would increase by nearly $0.19 per bushel on average after five years, increasing the value of corn production in the state by $123.5 million. Over the entire ten-year period, we estimate the value of the corn harvest will increase by $938.3 million, based on 2022 corn prices and harvest size.

Figure ES9: Economic Impacts of Stronger Corn Basis 2025-2034

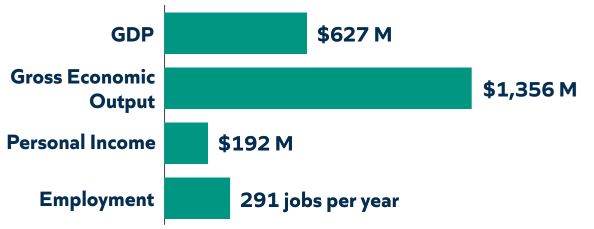
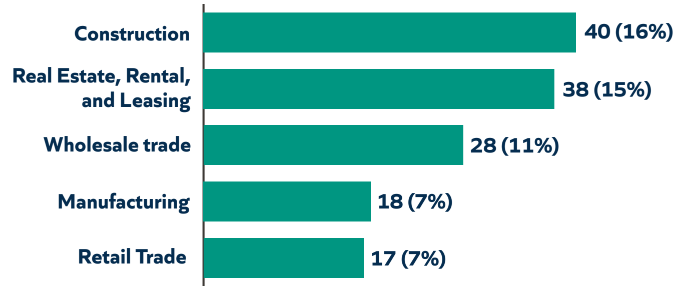


Figure ES10: Average Annual Employment Impacts of Stronger Corn Basis (Top 5 Private Industries)



Farmers, along with the agriculture sector in general, will be the primary beneficiaries of the stronger corn basis. We estimate that the stronger corn basis will increase gross economic output, or overall economic activity, by more than $1.35 billion over ten years. The estimated impact on gross output exceeds the impact from actual pipeline operations by nearly $72 million. The stronger corn basis will also increase state GDP by an estimated $627 million and personal income by $192 million while supporting an estimated 291 jobs annually.

Farmers**, along with the agricultural sector in general, **will be the primary beneficiaries of the stronger corn basis.

INTRODUCTION

Carbon Capture and Sequestration projects have the potential to greatly alter the landscape of ethanol production across the Midwest. They would also bring significant economic impacts to the South Dakota economy if they were to go forward.

This report was commissioned by the South Dakota Ethanol Producers Association (SDEPA). The purpose of this report is to analyze the potential economic impacts of two large pipeline projects that would collect CO_2 byproducts of corn-based ethanol production and transport the CO_2 for long-term underground storage through a process known as Carbon Capture and Sequestration (CCS). These CCS pipeline projects have the potential to greatly alter the landscape of ethanol production across the Midwest. They would also bring significant economic impacts to the South Dakota economy if they were to go forward.

The two pipeline networks seeking to cross South Dakota include the Heartland Greenway Pipeline under development by Navigator CO_2 (Navigator) and the Summit Carbon Solutions (Summit) pipeline. The Navigator pipeline project would collect carbon dioxide from ethanol plants across five states, including Illinois, Iowa, Minnesota, Nebraska, and South Dakota for storage underground at Mt. Simon sandstone formation in central Illinois.[2] The Summit pipeline would also collect carbon dioxide from ethanol plants in five states, including Iowa, Minnesota, Nebraska, North Dakota, and South Dakota for permanent underground storage in North Dakota.[3]

Navigator and Summit plan to begin construction in 2024 and to achieve operational readiness in 2025. The construction phase of each project will include the placement of thousands of miles of pipeline across their combined footprints, along with the construction of pump stations and capture facilities. The capture facilities will be co-located with ethanol plants, also called biorefineries. They will capture the CO_2 produced during fermentation, dehydrate it, compress it, and pump it into the pipeline networks, transporting it to deep geologic storage sites for permanent sequestration. The pipeline networks will allow ethanol producers to cost-effectively decrease their carbon footprints and improve the long-term economic sustainability of the agriculture sector in general and specifically the ethanol industry.

The Navigator and Summit pipelines have the potential to dramatically impact South Dakota's ethanol industry and economy in the coming years. This report provides insights into the Navigator and Summit pipelines' potential economic impacts during their construction and operational phases. This analysis also investigates the potential economic impact of tax credits available to ethanol producers after the construction of the Navigator and Summit pipelines. Finally, we explore the economic impacts of a strengthened corn basis on farm incomes.

BACKGROUND

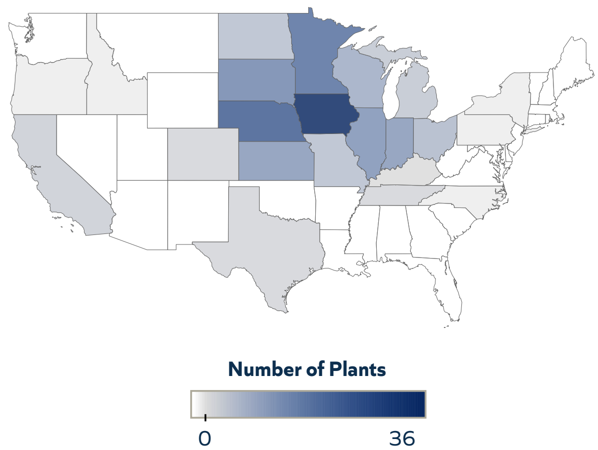
> Corn-based ethanol is a biofuel derived from renewable corn resources with several advantages over traditional fuels.

Ethanol Production in the United States

Corn-based ethanol is a biofuel derived from renewable corn resources with several advantages over traditional fuels. Ethanol has lower carbon dioxide emissions than gasoline, making it a cleaner fuel option. The United States produces around 15 billion gallons of corn-based ethanol each year, which has the potential to offset greenhouse gas emissions by up to 43.5 million metric tons annually.[4] Additionally, it can be blended with gasoline to reduce emissions from transportation sources and contribute to a cleaner environment.

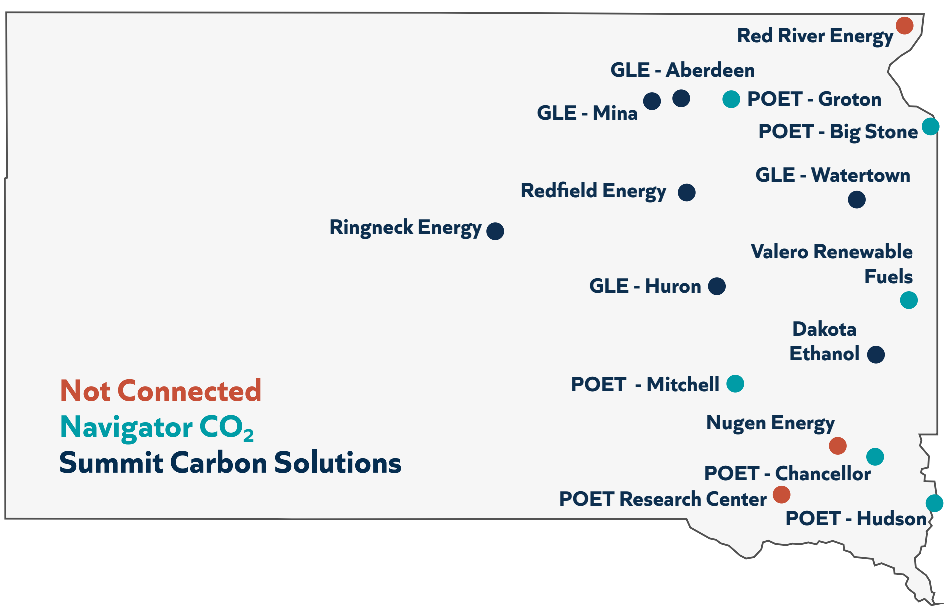
Furthermore, corn-based ethanol production benefits farmers and rural communities. It provides an expanded market for corn, which has become a critical source of income for farmers, particularly in the Midwest. Ethanol production has contributed to the creation of more than 400,000 jobs across the country and has generated billions of dollars in economic activity in rural areas.[5] As a result, ethanol production has become an essential source of income for farmers and has helped promote sustainable agricultural practices.

Figure 1: US States with Ethanol Biorefineries



*Ethanol production has contributed to the creation of nearly **400,000 jobs across the country** and has generated billions of dollars in economic activity in rural areas.[3]*

Figure 2: South Dakota Ethanol Plant Locations



Ethanol Production in South Dakota

South Dakota is the fourth leading state in the US for ethanol production. There are currently sixteen ethanol plants in the state, with the capacity to produce 1,444 million gallons of ethanol per year. According to current route and connection plans provided by Navigator and Summit pipeline developers, 13 of South Dakota's 16 ethanol production facilities will connect with either the Summit or Navigator CCS pipeline. These 13 ethanol plants have the capacity to produce 1,250 Million Gallons per Year (Mmgal/yr) of ethanol, 87% of the state's capacity. Participating ethanol producers will enable the capture and sequestration of 3.4 million metric tons of CO_2 annually.

Table 1 – South Dakota Ethanol Biorefineries and Capacity[1]

Ethanol Plant	City	Pipeline Network	Nameplate Capacity Mmgal/yr	Tons of Capturable CO_2[2]
Dakota Ethanol	Wentworth	Summit	92	249,714
Glacial Lakes Energy	Watertown	Summit	148	401,714
Glacial Lakes Energy	Mina	Summit	162	439,714
Glacial Lakes Energy	Aberdeen	Summit	61	165,571
Glacial Lakes Energy	Huron	Summit	38	103,143
Redfield Energy	Redfield	Summit	65	176,429
Ringneck Energy	Onida	Summit	80	217,143
Valero Renewable Fuels	Aurora	Navigator	105	285,000
POET Biorefining	Big Stone	Navigator	125	339,286
POET Biorefining	Chancellor	Navigator	68	184,571
POET Biorefining	Groton	Navigator	80	217,143
POET Biorefining	Hudson	Navigator	86	233,429
POET Biorefining	Mitchell	Navigator	140	380,000
POET Research Center	Scotland		12	32,571
Red River Energy	Rosholt		32	86,857
Nugen Energy	Marion		150	407,143
Total			**1,444**	**3,919,429**

Source: Energy Information Agency 2022
[1] Plant capacity based on publicly published nameplate capacity. True production capacity may be greater or less than the stated nameplate capacity.
[2] The table assumes the production facility can capture 95% of CO_2 emissions but the true amount may be higher in practice.

Table 2 – Top Ethanol Producing States

State	Mmgal/Yr	Share of U.S. Capacity
Iowa	4,694	27.0%
Nebraska	2,244	12.9%
Illinois	1,743	10.0%
South Dakota	1,444	8.3%
Minnesota	1,424	8.2%
North Dakota	547	3.2%
Total	**12,096**	**69.6%**

Source: Energy Information Agency 2022

CCS OPPORTUNITIES IN THE ETHANOL INDUSTRY

Ethanol production provides a unique opportunity to capture and sequester CO_2 before it enters the atmosphere.

Ethanol production provides a unique opportunity to capture and sequester CO_2 before it enters the atmosphere. According to the Energy Information Administration (EIA), there were 167 ethanol biorefineries across the US in 2022, with a capacity to produce 17.4 billion gallons of ethanol annually.

US Ethanol biorefineries also produce an estimated 45 million metric tons of CO_2 annually from fermentation, which could be captured before entering the atmosphere using CCS technologies.[6] Previously, CCS was not viable for biorefineries because the costs of capturing and transporting CO_2 from individual biorefineries to a centralized storage site were prohibitively high.

CCS infrastructure projects like the Navigator and Summit pipelines offer a solution to the transportation problem through economies of scale. Once built, a CCS pipeline can collect CO_2 from multiple smaller capture sources and transport the CO_2 for storage at a lower cost than other means of transportation, such as rail or truck. As shown in Table 2, nearly 70% of the nation's ethanol production capacity is located in Iowa, Nebraska, Illinois, South Dakota, Minnesota, and North Dakota. The Navigator and Summit CCS projects would serve this region and enable the capture and sequestration of carbon dioxide for much of ethanol production in the US. The projects would also generate significant economic impacts for ethanol producers and the farmers that supply their necessary biomass.

The United States and Canada have used CCS technologies since the 1960s.[7] The first CCS projects were in Texas, where captured CO_2 was used for enhanced oil recovery.

Table 3 – Overview of CCS Tax Credits

	Base Credit		Bonus Credit[1]	
	Per Metric Ton of CO_2e	Per Gallon of Ethanol	Per Metric Ton of CO_2e	Per Gallon of Ethanol
45Q Credit for CCS	$17	$0.0485	$85	$0.2423
45Z Clean Fuel - Transportation		Up to $0.20		Up to $1.00
45Z Clean Fuel - Aviation		Up to $0.35		Up to $1.75

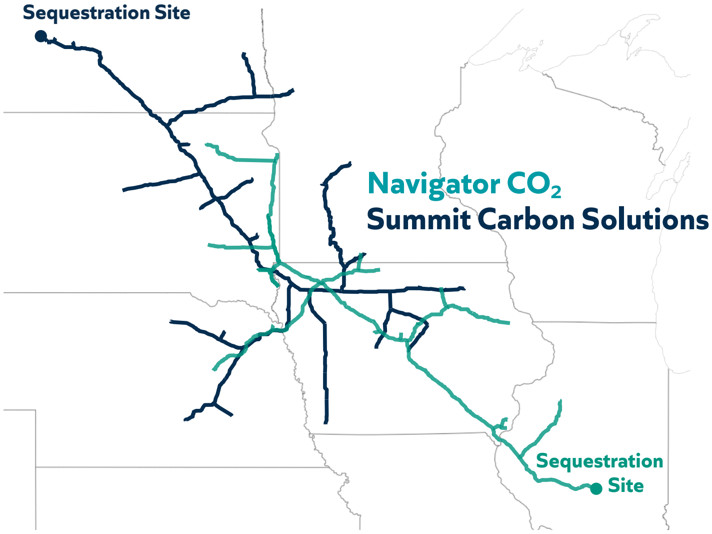
[1] Bonus credits are available if the project meets apprenticeship and prevailing wage requirements.

Current CCS projects involving permanent CO_2 storage in underground rock formations began in the late 1990s with the 1996 Sleipner project in Norway and the Weyburn project launched in 2000. The Weyburn project, in particular, demonstrated the feasibility and safety of CCS pipeline projects by collecting CO_2 from a coal powerplant in North Dakota and pumping the carbon dioxide via 200 miles of pipeline for enhanced oil recovery and permanent storage at the Weyburn field in southern Saskatchewan, Canada.

Following the success of the Weyburn project, the United States created a new tax credit, called 45Q tax credits, to incentivize the adoption of CCS. Introduced in 2008, the 45Q tax credits were available for projects that utilized captured carbon for enhanced oil recovery or permanent storage. Historically, the 45Q tax credits were unsuccessful in fostering the adoption of CCS because the costs of capturing and transporting CO_2 remained prohibitively high, but recent developments may change that.

First, policy changes in Washington have dramatically increased the financial incentives for ethanol producers to adopt CCS. The Inflation Reduction Act of 2022 (IRA) expanded existing 45Q tax credits by raising their value from $50 to $85 per ton of CO_2 captured and stored, extending the window of availability, and allowing for direct pay during the first 5 years and transferability for 12 years. Second, the IRA introduced a new tax credit called 45Z credits which are available to producers of clean fuel, such as ethanol, if they meet certain Carbon Intensity (CI) targets.[8] Table 3 summarizes the portions of the 45Q and 45Z tax credits relevant to ethanol producers.

Figure 3: Navigator and Summit Pipeline Routes



The existing 45Q and the new 45Z tax credits create significant market incentives to adopt CCS by Midwest ethanol producers. On their own, the 45Q and 45Z tax credits would likely be insufficient to induce large-scale CCS adoption by individual plants in the face of prohibitively high CO_2 transportation costs. The key to successfully implementing CCS projects in the Midwest ethanol industry are large pipeline networks that lower CO_2 transportation costs.

NAVIGATOR AND SUMMIT PIPELINE NETWORKS

> Once completed, the Navigator and Summit pipelines will constitute the largest carbon dioxide pipeline networks in the United States.

Once completed, the Navigator and Summit pipelines will constitute the largest carbon dioxide pipeline networks in the United States. Figure 3 shows the proposed Navigator and Summit pipeline routes. The two networks will collect carbon dioxide captured from 61 biorefineries across the Midwest and transport it for permanent underground storage. The combined length of these pipelines will be almost 4,000 miles.

Table 4 provides a detailed breakdown of the two pipeline networks by the number of pipeline miles in each state. The Navigator pipeline will collect CO_2 emissions from ethanol production in Iowa, Illinois, Minnesota, Nebraska, and South Dakota. The pipeline will transport the CO_2 from these plants for long-term underground sequestration in Illinois. The Navigator pipeline would stretch roughly 1,944 miles across its five-state catchment area, with nearly 361 miles of the route (19% of total miles) crossing twelve South Dakota counties.

The Summit pipeline will collect CO_2 emissions from ethanol plants in Iowa, Minnesota, Nebraska, South Dakota, and North Dakota. CO_2 from these plants will be piped for permanent underground sequestration in North Dakota. The Summit pipeline would stretch roughly 1,958 miles, also across five states, with nearly 474 miles of the pipeline (24% of total miles) crossing eighteen South Dakota counties.

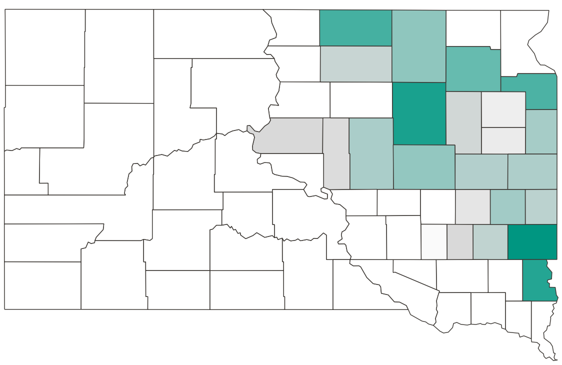
Table 4 – CCS Pipeline Miles by State

	Navigator Pipeline		Summit Pipeline	
State	**Pipeline Miles[1]**	**Share of Pipeline Miles**	**Pipeline Miles[1]**	**Share of Pipeline Miles**
Illinois	273	14%		
Iowa	1,066	55%	683	35%
Minnesota	47	2%	155	8%
Nebraska	197	10%	317	16%
South Dakota	361	19%	474	24%
North Dakota			329	17%
Total	**1,944**		**1,958**	

Source: Navigator CO_2, Summit Carbon Solutions
[1] Pipeline miles may not sum due to rounding.

Figure 4: South Dakota Pipeline Counties

Pipeline Counties in South Dakota



Pipeline Miles by County

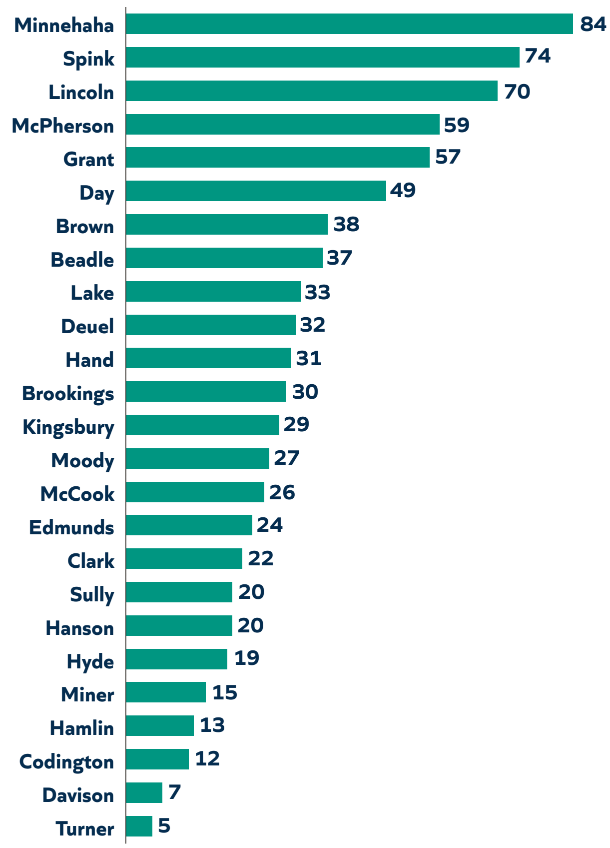


Figure 4 shows the South Dakota counties that will be part of the pipeline networks. The counties are shaded according to the number of pipeline miles planned for the county. Minnehaha County has the greatest number of planned pipeline miles at 84. Turner County, located just southwest of Minnehaha County, has the fewest, with only five planned pipeline miles. The Navigator and Summit pipelines are currently in the pre-construction stage, but both companies plan to begin construction in 2024 and reach completion in 2025. Both companies also plan to commission their pipeline networks and begin operations in the latter half of 2025.

PIPELINE CONSTRUCTION AND OPERATIONS DATA

This analysis aims to model and understand the potential economic impacts of CO_2 pipelines in South Dakota. It does not compare the relative impacts of one pipeline versus another or draw conclusions regarding the same. With this purpose in mind, we present all data and impacts in aggregate with no discussion of findings for individual pipeline projects. All data regarding pipeline routes, miles, and cost estimates were provided by Navigator CO_2 and Summit Carbon Solutions. Dakota Institute makes no claims regarding the validity of the provided data.

Table 5 – Combined Pipeline Construction Costs ($1,000s)

CAPEX Category	Pipeline	Capture	Pump Station	Total
Engineering	3,707	9,949	1,192	14,847
Environmental & Permitting	18,135	140	132	18,407
Survey	18,873	59	57	18,988
High Voltage Power	-	11,382	3,373	14,755
Equipment & Materials	253,261	175,060	21,391	449,713
Construction + Construction Management	686,280	70,031	11,231	767,541
ROW & Land Services	36,375	-	137	36,512
ROW Easements & Damages	211,188	-	210	211,398
Total CAPEX + ROW	**$1,227,818**	**$266,620**	**$37,723**	**$1,532,162**

Source: Navigator CO_2, Summit Carbon Solutions

Pipeline Construction

Construction of the combined 835-mile pipeline network in South Dakota will begin in 2024 and continue through mid-2025. The construction phase includes developing the pipelines and pump stations necessary for moving the compressed CO_2 through the network. The construction phase also includes the development of thirteen capture facilities which will be adjacent to participating ethanol plants. These capture facilities will capture, cool, dehydrate, and compress the CO_2 byproduct of ethanol production and transfer them into the pipeline networks for sequestration.

The Capital Expenditure (CAPEX) budgets provided by Navigator and Summit reported an estimated investment of $1.53 billion in South Dakota during the construction phase. The largest CAPEX categories are those of Construction and Construction Management ($768 million), Equipment & Materials ($450 million), and Right of Way (ROW) payments for easements and crop damages ($211 million). All CAPEX and ROW expenditures are assumed to occur during 2024 and 2025.

PIPELINE OPERATIONS

> The 45Q and 45Z tax credits could have a net value of $1.56 billion to South Dakota's ethanol producers from 2025 through 2034.

Navigator and Summit also provided Dakota Institute with estimated annual operating expenditures (OPEX) for their pipelines, capture facilities, and pump stations. In consultation with Navigator and Summit, we harmonized their expense categories and calculated the combined operating costs for projects. Table 6 summarizes this effort and reports the estimated operating expenses for the pipelines, pump stations, and capture facilities during the first year of pipeline operations. We assume all operating expenditures other than crop damages and property taxes grow at 2% annually over the ten-year operations phase from 2025 through 2034.

The largest traditional OPEX categories are High Voltage Power and Operations & Maintenance. In general, capture facilities are responsible for nearly all electricity costs, while maintenance costs were split more evenly across the pipeline network and capture facilities. Table 6 also reports a negative value of -$1.9 million for crop damages. This value represents a negative shock to farm incomes due to lower crop yields in ROW areas for the first ten years following the completion of the pipelines. Appendix A provides a detailed discussion of how we estimated the crop damages reported in Table 6.

Finally, Table 6 reports an annual expense of nearly $19.7 million for estimated property tax liabilities. The Navigator and Summit pipeline operators provided this combined estimate, representing a good faith estimate of their property tax liabilities once the pipelines become operational.

Table 6 – Combined Annual Operating Costs ($1,000s)

OPEX Category	Total
Labor costs	5,497
High Voltage Power	38,768
Operations & Maintenance	16,072
Other	874
SG&A	3,626
Crop Damages[1]	-1,947
Property Tax Liability	19,660
Total OPEX and Property Tax	**$82,809**

[1] Average annual estimated crop damages are entered into the impact simulation as a negative shock to farm incomes. Here they are shown a reduction in the annual OPEX budget.

CCS AND CLEAN FUEL TAX CREDITS

When operational, the Navigator and Summit pipelines will allow ethanol producers to utilize CCS and unlock lucrative 45Q and 45Z tax credits for carbon sequestration and clean fuel production.

The potential value of these credits was estimated using the best available public data on ethanol production in South Dakota and the 45Q and 45Z credits.

Table 7 – Estimated Value of 45Q and 45Z Tax Credits

Ethanol Producer[1]	Mmgal per Yr	CA-CI Score	Adjusted CI Score[2]	CI Score w/CCS[3]	Potential 45Z Credit ($1,000s)	Potential 45Q Credit[4] ($1,000s)
Dakota Ethanol - Wentworth	92	69.3	57.5	27.5	41,423	21,226
Glacial Lakes Energy - Watertown	148	72.7	60.9	30.9	56,573	34,146
Glacial Lakes Energy - Mina	162	71.0	59.2	29.2	67,368	37,376
Glacial Lakes Energy - Aberdeen	61	71.8	60.0	30.0	24,403	14,074
Glacial Lakes Energy - Huron	38	70.8	59.0	29.0	15,939	8,767
POET Biorefining - Big Stone	105	74.5	62.7	32.7	36,272	24,225
POET Biorefining - Chancellor	125	64.1	52.3	22.3	69,281	28,839
POET Biorefining - Groton	68	71.4	59.6	29.6	27,734	15,689
POET Biorefining - Hudson	80	73.3	61.5	31.5	29,540	18,457
POET Biorefining - Mitchell	86	74.0	62.2	32.2	30,638	19,841
Redfield Energy - Redfield	65	69.1	57.3	27.3	29,461	14,996
Ringneck Energy - Onida	80	69.1	57.4	27.4	36,212	18,457
Valero Renewable Fuels - Aurora	140	70.2	58.4	28.4	60,417	32,300
Average	**96**	**70.9**	**59.1**	**29.1**	**$40,405**	**$22,184**
Total	**1,250**				**$525,261**	**$288,393**

Source: CARB, IRS, and Dakota Institute
[1] No CA-CI score was available for GLE Mina. The statewide average for ethanol via corn feedstock was imputed as a proxy for that plant's CA-CI score.
[2] Reflects alternate scoring of Land Use Changes in GREET 3.0 vs CA-CI and differing units between 2022 IRA and GREET 3.0.
[3] Adoption of CCS by ethanol producers reduces the fuel's pathway CI score by 30 points on average.
[4] Maximum credit value assumes the plant can capture and sequester 95% of plant emissions.

Importantly, ethanol producers are not eligible to receive both tax credits in a given year and are only eligible for tax credits during a 12-year window that begins counting down once the producer first files for either the 45Z or 45Q credits. In general, 45Z credits are more valuable and are only available to producers between 2025 and 2027. For this reason, we assume ethanol producers will elect to receive 45Z credits beginning in 2025 and will switch to 45Q credits when they have exhausted their eligibility for 45Z credits. Table 7 summarizes the maximum possible tax credit achievable for an ethanol producer based on the plant's publicly reported nameplate capacity and available IRS guidance regarding tax credit eligibility requirements.

Eligibility for 45Z clean fuel tax credits is based on the fuel's Carbon Intensity (CI) score, and each ethanol plant's production process yields different CI scores. We estimated each plant's potential 45Z tax credit by starting with publicly available certified Low Carbon Fuel Source (LCFS) pathway scores published by the California Air Resources Board (CARB). We refer to these CARB-certified LCFS pathway scores as CA-CI scores in Table 7.

We adjusted the CA-CI score to account for differences in scoring between the CARB's methodology and that adopted by the 2022 IRA, which created the 45Z tax credits.[10,11] Next, we deducted 30 points from the adjusted CI Score due to CCS adoption, which yielded the CI Score with CCS.[12] The CI Score with CCS was then used to estimate each ethanol producers maximum potential 45Z tax credit, which is worth $0.02 per gallon of ethanol for each CI point reduction a plant can achieve below a threshold score of 50.

The calculation for the value of 45Q credits is more straightforward in comparison. Ethanol producers are awarded a credit of $85 per metric ton of CO_2 sequestered. The fermentation process produces one metric ton of CO_2 for every 350 gallons of ethanol produced. Table 7 assumes plants will capture 95% of these emissions for sequestration.

The economic impact of the 45Q and 45Z tax credits depends on the dollar amount of the net credit CO_2 capture and transportation costs, though. We estimated the net tax credit value in consultation with ethanol producers and the Navigator and Summit pipeline operators. The exact terms governing these business relationships were not shared with Dakota Institute. Still, the pipeline operators described the methodology discussed below as generally accurate and representative of the business arrangements prevailing in the marketplace. Consequently, the real-world tax credits South Dakota ethanol producers earn may be higher or lower than estimated here.

The primary operating cost for capture facilities is high voltage power, resulting in a linear relationship between the volume of CO_2 processed and the plant's operating costs. Here we model the capture facilities' operating expenses at a fixed $15 per ton of CO_2.

The second component to account for is the pipeline operators' cost of transport for the CO_2. In consultation with pipeline operators, we adopt a two-tiered cost structure to model CO_2 transport costs. During the three years of available 45Z tax credits, we model pipeline transmission fees as a fixed transport fee of $60 per ton of CO_2. During the later years, where we assume ethanol producers earn 45Q tax credits, we use a lower transport fee of $30 per ton. The two-tiered system mirrors the changing value of the 45Z and 45Q tax credits and reflects a sharing of the tax credit value at roughly 40-45% of the value retained by ethanol producers.

Table 8 reports our estimates for the average value of 45Z and 45Q tax credits to South Dakota ethanol producers. To avoid comparisons across ethanol plants or pipeline operators, Table 8 reports only the average net tax credit. We find the average ethanol producer could increase revenues by $20.8 million during 2025-27 through 45Z credits and $10.4 million annually during the subsequent nine years from 45Q tax credits.

Table 8 – Average Net Value of 45Q and 45Z Tax Credits

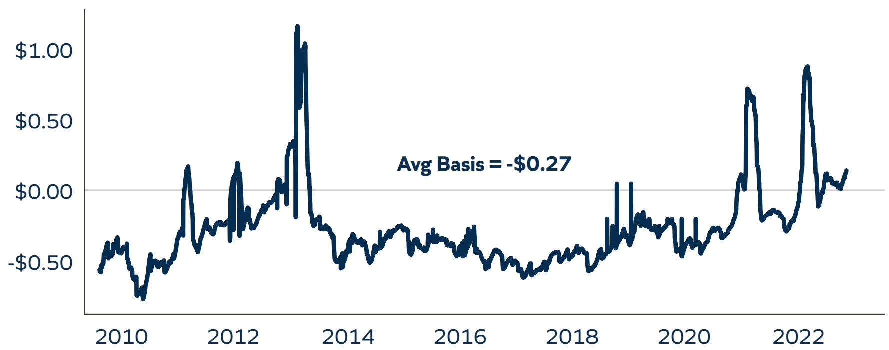
	2025 - 2027 45Z Credits ($1,000s)	2028 - 2034 45Q Credits ($1,000s)
CO_2 Sequestration Revenue		
Average Tax Credit[1]	40,405	22,184
CO_2 Sequestration Cost		
Capture OPEX[2]	3,915	15,659
Pipeline Transportation Cost	15,659	7,830
Potential Net Credit Value		
Tax Credits less OPEX and Transport Cost	$20,831	$10,440

[1] Average tax credit across all connected ethanol plants
[2] Operational expenses are estimated at $15 per ton of CO_2. Average CO_2 emissions across all plants is 260,989 tons per year.

CORN BASIS AND FARM INCOMES

The final step in understanding the potential impact of the Navigator and Summit CO_2 pipeline projects in South Dakota is to investigate how their operations might impact farm incomes through changes in regional corn prices. As discussed earlier, CO_2 pipelines will negatively affect farm incomes through lower yields in easement areas due to construction damages or soil compaction. However, these direct effects on farm incomes are highly localized, impacting only the farmland crossed by the pipeline. In contrast, the pipelines have a much more widespread potential impact on farm incomes through their affects on regional corn markets. South Dakota's inclusion in CCS pipeline networks will allow ethanol producers to access CO_2 sequestration tax credits. Consequently, regional ethanol producers will face powerful incentives to increase ethanol production and expand capacity. All ethanol producers in South Dakota currently use corn as the primary feedstock for ethanol production, which means that increased production would stimulate corn demand, increasing regional corn prices and farm incomes.

Figure 5: Average Daily Corn Basis



Average daily corn basis across SD, IA, MN, NE, ND as reported by individual grain elevators and ethanol plants. An average of 221 unique sites reporting each year.

Corn Pricing

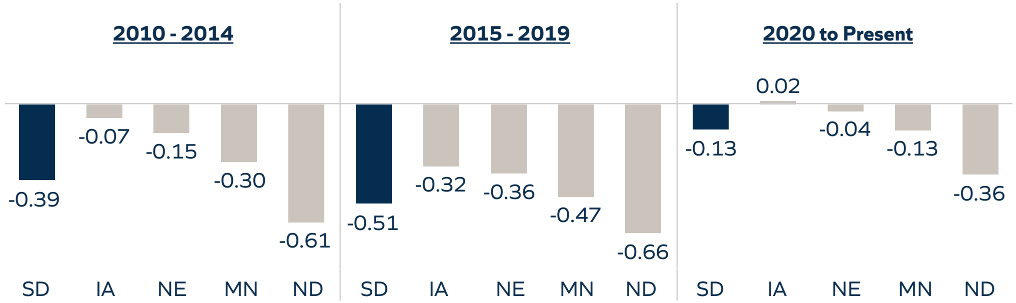
> Reporting ethanol plants offered an average $0.17 basis premium compared to elevators from January 2020 through April 2023.

Regional corn prices are typically discussed in terms of the "Corn Basis". The corn basis reports the difference between the cash price and the nearest futures contract price in a local market. For example, on March 7, 2023, the cash price for corn in Aurora, SD, was $6.53 per bushel, while the April futures contract was $6.34. The $0.19, or 19 cents, difference between the cash and futures contract prices was the basis on that day and in that local market.

The basis is a helpful indicator that summarizes local supply and demand conditions in the market and other factors such as storage and transportation costs. The corn basis is often negative, and a more negative basis, also known as a weaker basis, indicates that supply currently exceeds demand. Conversely, a less negative or even positive basis (e.g. a stronger basis) implies that demand exceeds supply.

The basis often weakens nearer to harvest as supply floods the market. The basis also tends to be higher the closer one is to demand sources, such as ethanol plants, partly due to lower transportation costs.

Figure 6: Average Corn Basis by Period and State



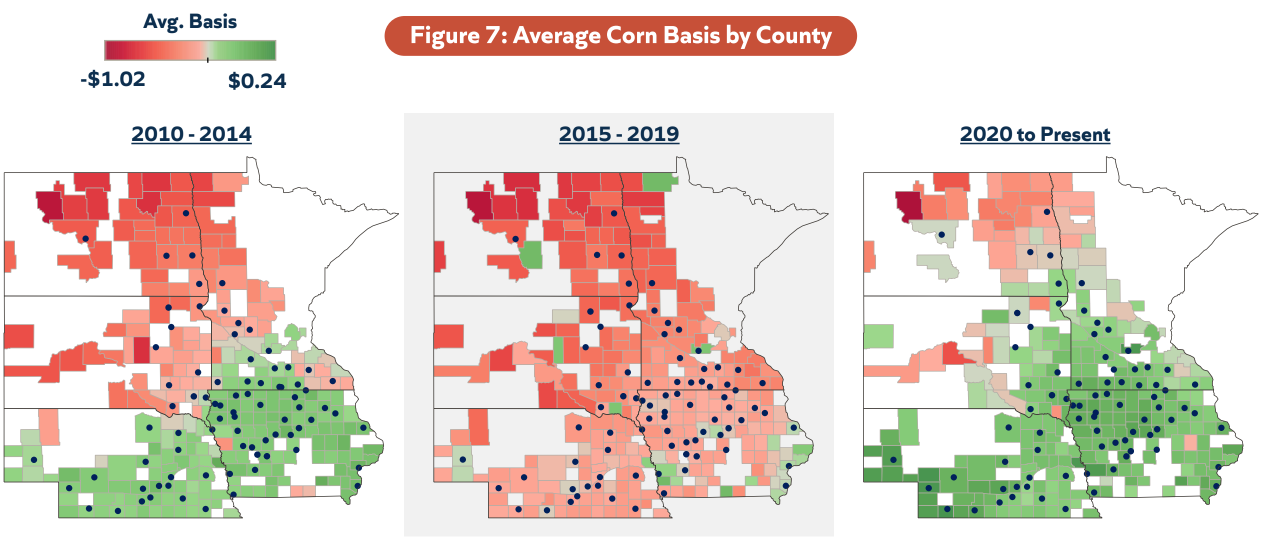
Regional Corn Basis Trends

Figure 5, on the previous page, displays the average daily corn basis at 261 individual elevators and ethanol plants across South Dakota, Iowa, Minnesota, Nebraska, and North Dakota. The stronger regional corn basis from 2011 through 2013 indicates high demand for corn, driven mainly by the expansion of ethanol production in the region. From 2014 through 2019, the Midwest saw a much weaker corn basis, but since the Covid-19 pandemic in 2020 and the Russian invasion of Ukraine in early 2022, the corn basis has strengthened considerably.

The corn basis varies significantly from one locality to another as well. Figure 6 shows that the corn basis in the region has traditionally been highest in Iowa and Nebraska. From January 2020 through April 2023, the average corn basis ranged from a low of -$0.36 per bushel in North Dakota to a high of $0.02 in Iowa. The average basis in South Dakota over this period was -$0.13 per bushel.

Further analysis shows that basis trends were not uniform within states either. Figure 7 presents a more detailed picture of the cross-time variation in the corn basis at the county level. Counties with a stronger basis are shaded green, while counties with a weaker basis are shaded red. As discussed above, the corn basis is sensitive to local supply and demand conditions along with other related factors, including storage capacity and transportation costs. The basis is often stronger in markets close to specific demand sources, such as ethanol plants. Figure 7 demonstrates this by showing the locations of regional ethanol plants as blue dots which are predominantly concentrated in northwest Iowa.

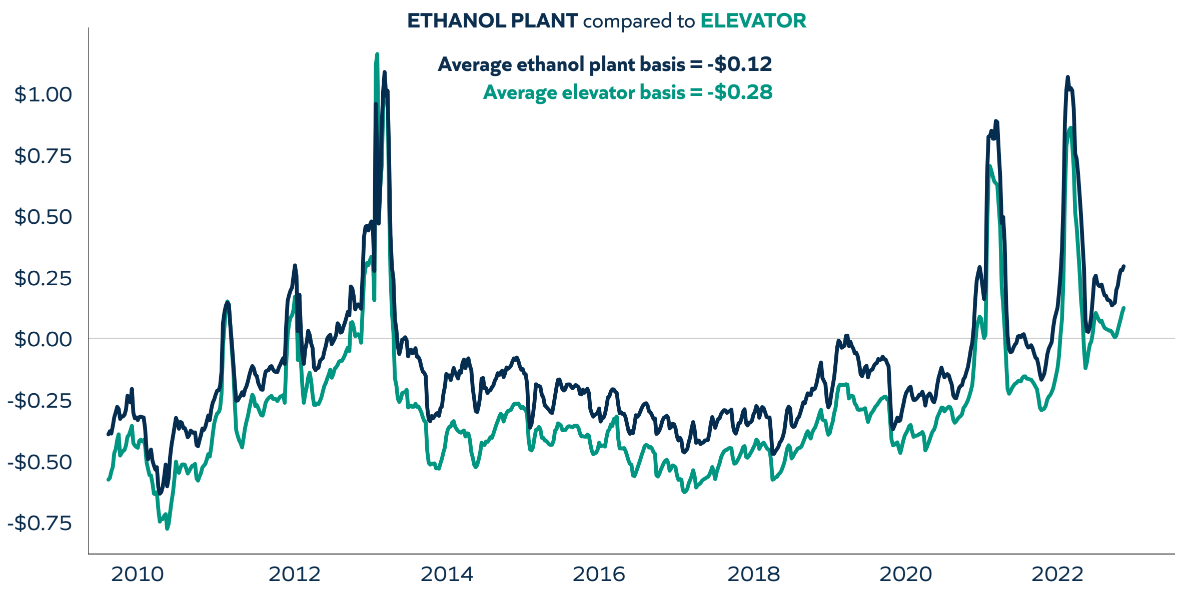
Figure 7: Average Corn Basis by County



Impact of Ethanol Production on Regional Corn Basis

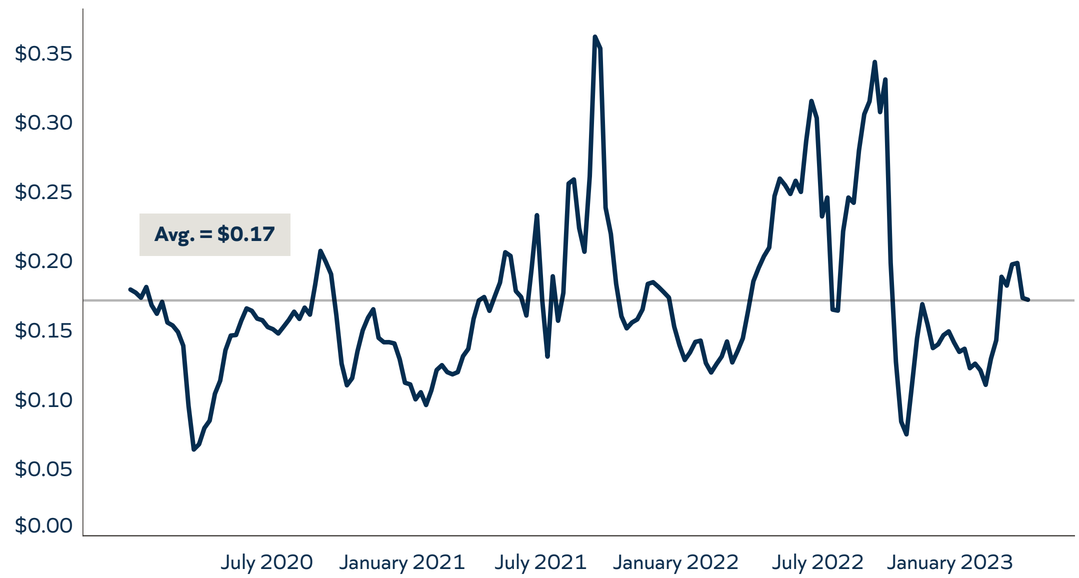
The geographic distribution of ethanol plants also provides evidence that ethanol production increases the corn basis. Figure 8 displays the difference in the daily corn basis reported across 230 individual grain elevators and 31 ethanol plants from January 2020 through April 3, 2023. The basis trend in Figure 9 shows the cash price for corn was consistently higher at ethanol plants than at grain elevators. The average basis at ethanol plants was -$0.12 compared to -$0.28 at elevators.

Figure 8: Average Corn Basis at Ethanol Plants and Grain Elevators



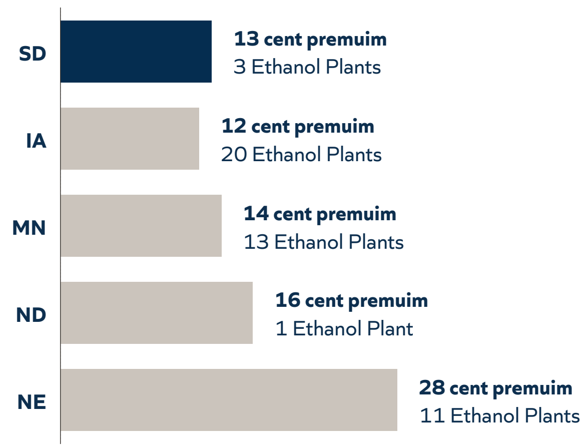
Looking more closely at the current period, Figure 9 shows that reporting ethanol plants offered an average $0.17 basis premium compared to elevators from January 2020 through April 2023. During this period, there was no point where the average basis at elevators exceeded the average basis at ethanol plants. Figure 10 shows the highest ethanol basis premium in Nebraska, where the average ethanol plant premium was $0.28.

Figure 9: Average Basis Premium at Reporting Ethanol Plants



Ethanol producers offer consistent premiums to secure necessary corn feedstocks. The principal beneficiaries of these purchases are regional corn farmers who can sell corn at higher prices than would likely prevail in the absence of ethanol production.

Figure 10: Average Basis Premium at Reporting Ethanol Plants by State



The lowest premiums were in Iowa and South Dakota, where the ethanol plant basis premiums were $0.12 and $0.13, respectively. The data shows that ethanol producers offer consistent premiums to secure necessary corn feedstocks. The principal beneficiaries of these purchases are regional corn farmers who can sell corn at higher prices than would likely prevail in the absence of ethanol production. The next question is, therefore, how the regional corn basis might improve under a scenario where South Dakota's ethanol producers have access to CCS and the production incentives it would create.

CCS Impacts on South Dakota Farm Incomes

> Navigator CO_2 and Summit Carbon Solutions will invest a combined $1.53 billion in South Dakota to construct their respective pipelines. These capital expenditures will support an estimated $1.6 billion in gross output spread over 2024 and 2025.

South Dakota's ethanol producers had a nameplate capacity of 1,444 million gallons per year in 2022.[13] Actual ethanol production varies with market conditions, and output was below capacity for several years between 2014 and 2020. However, market conditions have rebounded since mid-2020, and many plants are likely operating near capacity.[14] Additionally, ethanol production in the state will certainly meet or exceed capacity if South Dakota producers gain access to CCS-based tax credits. For these reasons, we adopt the baseline assumption that ethanol producers in the state are currently operating at capacity.

The primary feedstock of South Dakota's ethanol producers is corn, and one bushel of corn yields approximately 2.8 gallons of ethanol.[15] Ethanol producers in the state therefore require 516 million bushels of corn annually to produce at capacity.[16] The 2022 USDA annual report for South Dakota estimated the state's corn harvest at 661 million bushels.[17] Based on the 2022 plant capacity and harvest data, 78% of the state's corn production would be needed to sustain ethanol production.[18]

The Navigator and Summit CO_2 pipelines will dramatically increase ethanol producers' demand for corn feedstocks if they have access to the pipelines and the associated tax credit programs. South Dakota's farmers will benefit from this more robust demand as local prices rise in response.

Estimating the price response to rising demand from ethanol producers is complicated by the complexity of agricultural markets. Commodity markets, such as the corn market, constantly move in response to changes in supply and demand. They are also sensitive to many other factors, including geopolitical stability, weather, and local or regional transportation costs. It can be challenging to tease out the effect of changes in demand from ethanol production from other influences that might move grain markets.

Many academic papers have investigated the relationship between changes in ethanol production and corn prices. Condon, Klemick, and Wolverton (2015) provides a valuable meta-analysis of this research project.[19] The

Condon, Klemick, and Wolverton (2015) meta-analysis summarizes and normalizes much of the previous work to provide estimates of the supply and demand elasticities in corn markets. Elasticities are a useful economic concept because they provide a straightforward, yet powerful, description of how prices respond to changes in supply or demand. For example, a supply elasticity of 1 would indicate that a 1% increase in the price of corn would lead to a 1% increase in the quantity of corn supplied to the market. By combining supply and demand elasticities, we can model the complex interactions of ethanol producers and farmers as they make decisions that affect market conditions and prices.

We therefore take from Condon, Klemick, and Wolverton (2015) that a 1% increase in the corn demand will increase the local corn price, or basis, by 0.24%. Importantly, the demand increase is relative to total market demand, not just demand from ethanol producers. As discussed above, ethanol producers in South Dakota require 516 million bushels of corn to produce at capacity, 78% of the 662-million-bushel harvest in 2022. Therefore, a 10% increase in ethanol production requires an additional 516 million bushels of corn, an 8% increase in demand relative to the overall harvest. We estimate an 8% demand increase would push corn prices up by 1.9% and increase the local basis by $0.12 per bushel. Table 9 reports these estimates along with two other scenarios for ethanol production with CCS relative to a baseline with no CCS.

Table 9 – Change in Corn Basis and Harvest Value due to Expanded Ethanol Production

Ethanol Expansion Scenario	Ethanol Production (Mmgal/yr)	Corn Demand (Bushels)[1]	Estimated Basis Change per Bushel ($)	Change in Value of 2022 Harvest ($ Millions)[2]
Baseline	1,444	515,714,286	-	-
10% Increase	1,588	567,285,715	0.1245	82.31
15% Increase	1,661	593,071,429	0.1867	123.46
20% Increase	1,733	618,857,143	0.2489	164.62

Source: Dakota Institute

[1] Corn demand from ethanol producers. Each gallon of ethanol requires approximately .357 bushels of corn.

[2] The change in crop value is calculated using 2022 harvest of 661,320,000 bushels and assuming the basis change is a statewide average (e.g. 661,320,000 × $0.1245 = $82,308,000).

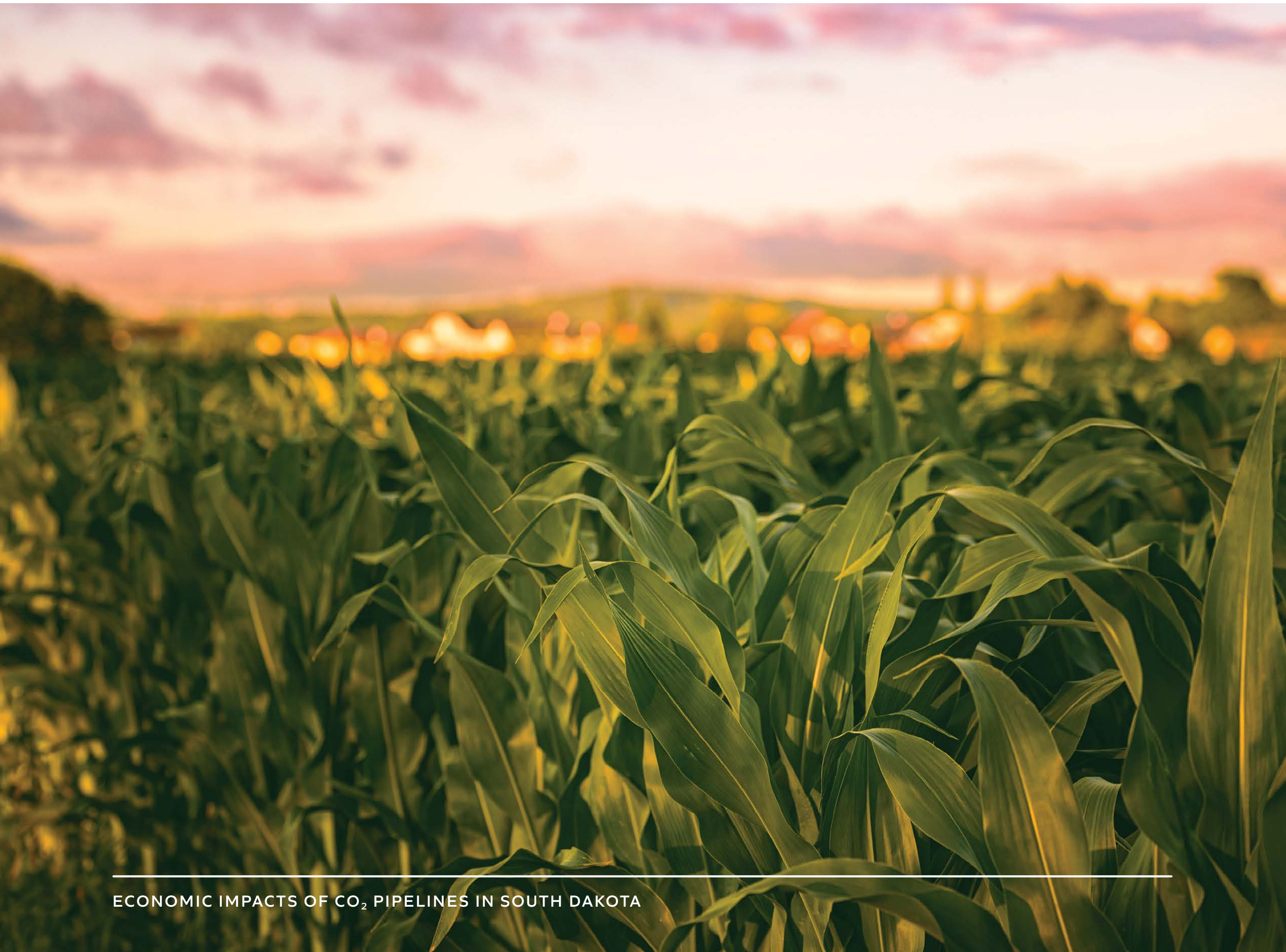
The first column of Table 9 details how much ethanol producers might expand production if they can access CCS and associated tax credits. The second and third columns report how many gallons of ethanol would be produced under each expansion scenario and the amount of corn needed to achieve that production level. The fourth column of Table 9 reports the expected basis change, assuming that overall corn prices remain fixed at their average 2022 price of $6.65.[20] The final column of Table 9 estimates the change in crop value, assuming the corn harvest remains constant at 661 million bushels annually.

The scenarios shown in Table 9 assume ethanol producers, in aggregate, will fully scale up production within five years. Similarly, the model expects the corn basis to increase linearly over the five-year expansion period before reaching its final value, as shown in Table 9. The estimates in Table 9 assume market conditions in the future remain consistent with those of 2022. Corn production is likely to rise, however, due to rising yields and farmers shifting from soybeans to corn as the relative value of corn increases. Changes in global markets for corn and oil, weather, or geopolitics would also affect regional corn markets with implications for the abovementioned estimates.

With these assumptions and caveats in mind, the 10% increase scenario assumes that ethanol production in South Dakota increases from 1.444 to 1.588 billion gallons. Increased demand for corn feedstocks would accompany the higher production level, and we estimate the local corn basis would increase by nearly $0.12 on average statewide in response. The $0.12 basis increase would apply to all corn sales, not just the marginal sale. Consequently, the value of the entire harvest would increase by the amount of the basis change, and the 10% increase in ethanol production would increase the value of corn production by an estimated $82.31 million annually.

The 15% scenario envisions ethanol producers increasing output from 1.444 to 1.661 billion gallons, requiring an additional 77 million bushels of corn annually. Under this scenario, we estimate the local corn basis would increase by nearly $0.19 and would increase the value of corn production in the state by $123.46 million. Finally, the 20% scenario would require an additional 103 million bushels of corn to increase ethanol production to 1,733 million gallons per year. Consequently, we estimate the corn basis would rise by almost $0.25 on average. The associated value of the corn harvest would rise by nearly $165 million.

we estimate the local corn basis would increase by nearly $0.19 and would increase the value of corn production in the state by $123.46 million.



ECONOMIC IMPACTS

The operational phase will add another $2.35 billion to state GDP from the combined impacts of pipeline operations, clean fuel tax credits, and increased corn basis, representing a 0.35% increase in annual state GDP.

Methodology

This analysis used the 70-sector Policy Insight dynamic model from Regional Economic Models, Inc (REMI) to estimate the economic impacts of CO_2 pipeline construction and operation in South Dakota. Like many other impact modeling approaches, REMI uses an Input-Output model to represent the inter-industry relationships found in the economy. The model captures the industry structure of a particular region and the transactions between industries. The REMI model expands on traditional Input-Output models by incorporating three other powerful techniques: General Equilibrium, Econometric, and Economic Geography to provide a more comprehensive understanding of the economy. More information on the REMI model can be found in Appendix B.

The General Equilibrium properties of the REMI model allow it to model evolving market conditions, such as changes in regional prices and competitiveness. For example, a large infrastructure project such as the CO_2 pipeline project studied here could dramatically alter market conditions in regional labor markets and supply chains. The REMI model can capture these dynamics and indicate how firms and industries may respond to changes in regional wage rates and prices by changing the timing of their investments or by making substitutions in their production processes.

Total Impacts

We report the estimated economic impacts of the pipeline projects across two phases, the construction phase, which takes place in 2024 and 2025, and the operational phase, lasting from 2025 through 2034. During these eleven years, the pipeline projects will have a pronounced effect on South Dakota's economy. Table 10, on the following page, summarizes our findings. We estimate the total impact on state GDP will be $3.3 billion across both phases. The construction phase will increase state GDP by $952 million throughout 2024 and 2025, nearly 0.70% of state GDP each year.[21] We further estimate the operational phase will add another $2.35 billion to state GDP from the combined impacts of pipeline operations, clean fuel and CCS tax credits, and increased corn basis, representing a 0.35% increase in annual state GDP.

The impacts are even larger when looking at gross output, a more general measure of economic activity than GDP, which looks only at final goods and services. The pipelines will generate and support an estimated $5.92 billion in gross output from 2024–34. We estimate the largest impact will come from the CAPEX phase of the project, which will increase gross output in the state by an estimated $1.68 billion over the two-year construction period. The second largest impact on gross output will come from the clean fuel tax credits, which we estimate will increase gross output by $1.6 billion from 2025 through 2034. Next, we estimate that a stronger corn basis will generate nearly $1.36 billion in economic activity by boosting farm incomes. Finally, we find that the operating activities of the pipelines will increase gross output by slightly more than $1.28 billion.

Table 10 – Total Economic Impacts[1]

Project Phase	GDP ($ millions)	Gross Output ($ millions)	Personal Income ($ millions)	Employment (Avg Annual)
2024-25				
CAPEX	952	1,683	904	5,353
2025-34				
OPEX	771	1,284	398	436
Tax Credits	956	1,600	2,046	1,025
Corn Basis[2]	627	1,356	192	291
Total	**$3,306**	**$5,923**	**$ 3,540**	**2,566**

[1] All dollar amounts are in 2022 nominal US dollars.
[2] Based on the 15% ethanol expansion scenario.

Construction Phase Impacts

We estimated the economic impacts of the construction phase using planning budgets provided by Navigator and Summit. We constructed a "bill of sale" simulation using the REMI model to direct planned expenditures into the appropriate sectors of the state economy. All capital expenditures were allocated to counties with planned pipeline routes, even though the findings reported below represent statewide impacts. The simulation also included ROW payments to landowners and modeled this as a shock to farm proprietors' income in the pipeline counties.

Construction of the Navigator and Summit pipelines will generate the largest economic impacts. Table 5, on page 19, showed that Navigator Summit plan to invest a combined $1.53 billion in South Dakota to construct their respective pipelines. Table 11 reports that these capital expenditures will generate an estimated $1.6 billion in gross output spread over 2024 and 2025. Table 11 also reports that the capital investment in building the pipelines, capture sites, and pump stations will boost GDP by $952 million and generate $904 million in personal income over the two-year construction phase.

Table 11 – Construction Phase Economic Impacts

Category	2024	2025	Total	Average
Total Employment	5,203	5,503	10,706	5,353
GDP[1]	461	491	952	476
Gross Output[1]	817	866	1,683	841
Personal Income[1]	439	465	904	452

[1] Millions of constant 2022 dollars.

Figure 11: Average Annual CAPEX Employment Impacts

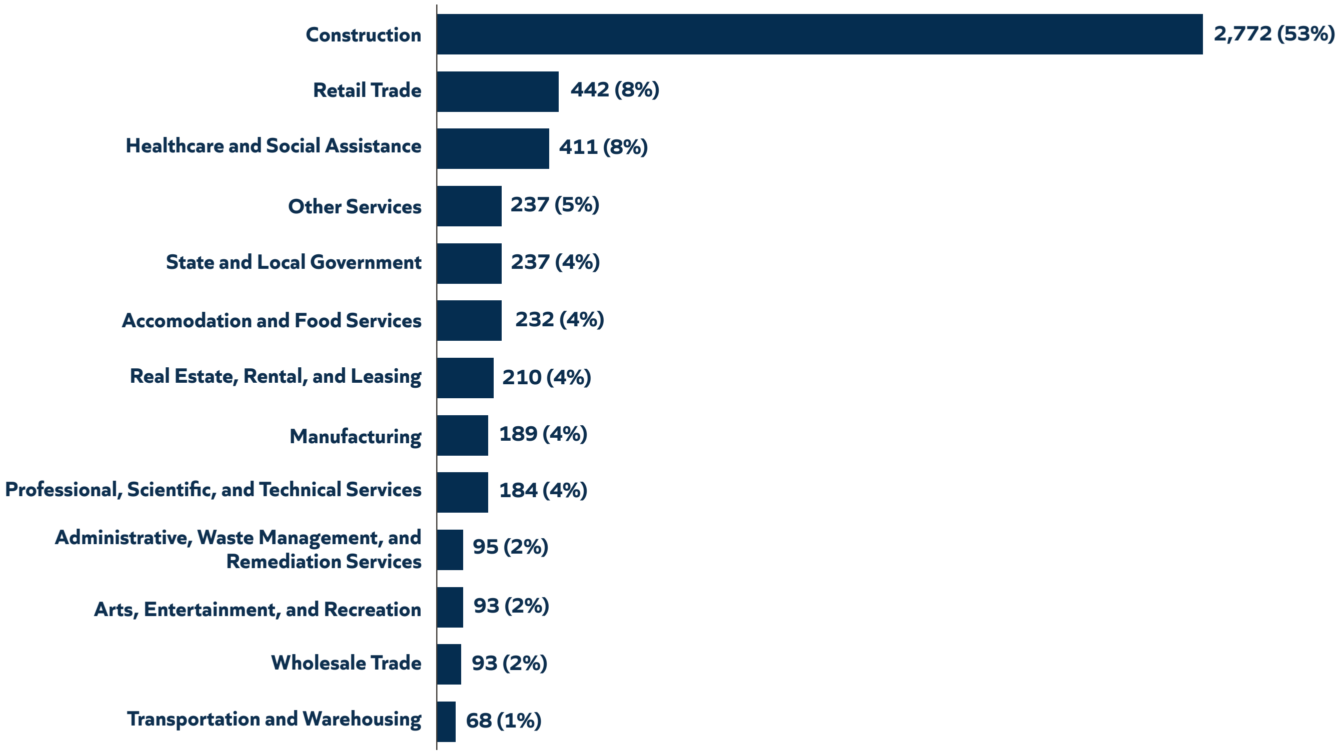


Figure 11 reports the substantial employment impacts arising during construction as both companies assemble large workforces to complete the necessary construction projects. The largest employment impact will be in the construction industry, which is expected to support an average of 2,772 jobs annually in 2024 and 2025. Navigator and Summit were unable to provide estimates for the number of local workers to be employed during the project, but the REMI model estimates net economic migration of approximately 1,800 workers in 2024 and another 1,400 in 2025. Owing to the high levels of temporary economic migration, the model also anticipates the creation of several hundred jobs in the Retail and Accommodation and Food Service sectors.

Operations Phase Impacts

Navigator and Summit shared their planned OPEX budgets and anticipated property tax liabilities for the operations phase of pipeline development. We used this information to construct a REMI model to estimate pipeline operations' economic impacts. Once more, we allocated all operating expenditures to counties with planned pipeline routes and capture facilities, though our impact estimates reflect statewide results.

Table 12 – Operational Phase Economic Impacts Including Crop Damages and Property Taxes

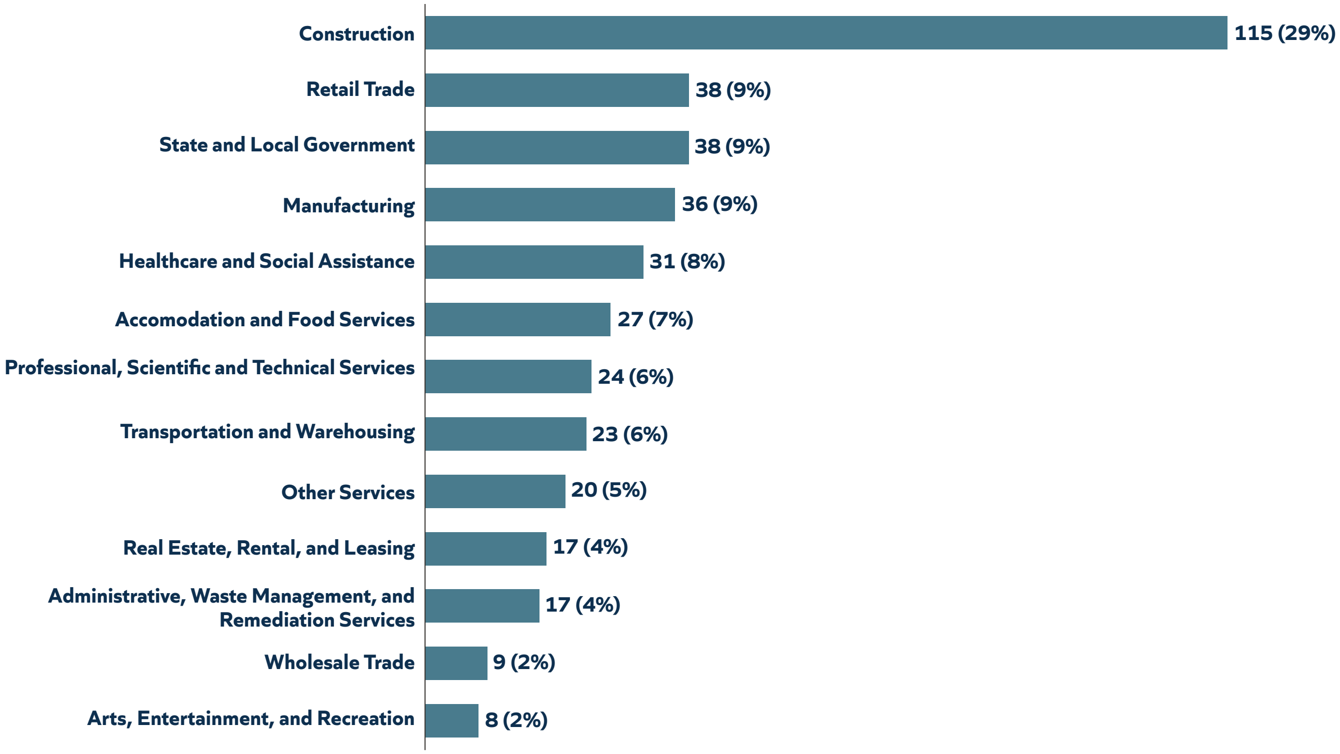
Category	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Average	Total
Total Employment	165	450	501	518	515	494	467	440	414	393	436	
GDP[1]	30	80	85	87	87	85	83	80	78	76	77	771
Gross Output[1]	49	135	143	146	145	142	137	133	129	126	128	1,284
Personal Income[1]	8	35	40	44	46	46	46	45	44	43	40	398

[1] Millions of constant 2022 dollars.

The planning budgets indicated annual expenditures of $82.7 million per year. We assumed a yearly cost escalation of 2% for all expenses except property taxes, which we held fixed, resulting in total OPEX of $792.3 million after the first ten years. Holding property taxes constant reduces their effect on the model simulation and produces more conservative impact estimates.

Additionally, because the pipelines will become fully operational in the second half of 2025, we modeled 2025 OPEX as half that of 2026. The model also assumes counties will begin to receive property tax payments in 2027, so the model excluded property taxes during 2025 or 2026. Finally, the model included crop damages as a negative shock to farm proprietors' incomes. Appendix A discusses this in more detail.

Figure 12: Average Annual OPEX Employment Impacts



Based on the planning budgets provided by Summit and Navigator, we estimate that pipeline operations will contribute more than $1.28 billion in gross economic output between 2025 and 2034. Their ongoing operations will also increase state GDP by an estimated $711 million over the same period. The pipelines will also support an average of 436 jobs per year and generate $398 million in personal income. The Construction sector is again expected to see the largest private sector employment impact at 115 jobs each year from 2025 through 2034.

45Z and 45Q Tax Credits Impacts

Access to CCS pipelines will enable the average ethanol biorefinery to earn 45Z tax credits estimated at $20.8 million annually from 2025 through 2027. CCS will also allow producers to switch from 45Z to 45Q tax credits in 2028, which we estimate to be worth $10.4 million annually for the average ethanol plant. In order to estimate the economic impact of these credits, we imposed several assumptions describing how the tax credit income would enter the economy. In consultation with REMI, we allocated tax credit revenues to owners or shareholders as dividends. Full pass-through of tax credits is an unlikely real-world outcome as plant managers are likely to invest in upgrades and capacity expansion, but alternative approaches would have required imposing even more assumptions regarding the business plans of plant operators.

Modeling the 45Q and 45Z credits as dividend income allows the tax credit revenue to be spent within the region according to historical spending patterns through the REMI model's regional purchasing coefficients. Imposing full pass-through of tax credits also allowed a fraction of the credit revenues to remain as savings. The remaining credit revenues enter the economy and create new economic activity as they fund the purchase of new goods and services across many industries, according to REMI's regional consumption and investment equations.

Having elected to pass tax credit revenues to owners and shareholders as dividends, we employed a simplified test to determine how to allocate the dividends. For Co-Op plants, we modeled the tax credit revenue as a shock to farm proprietors' income because most shareholders likely reside in South Dakota. Similarly, because POET Biorefining is a South Dakota corporation headquartered in Sioux Falls, SD, we modeled the tax credits earned by POET Biorefining plants as a stimulus to chemical manufacturing proprietors' income.[22] The net tax credit earned by Valero Renewable Fuels was excluded from this analysis because it is not a South Dakota corporation. The real-world economic impacts would be smaller than estimated to the extent that Co-Op or corporate shareholders and owners do not reside in South Dakota.

The 45Z and 45Q tax credits could have a net value of $1.56 billion to South Dakota's ethanol producers from 2025 through 2034. The tax credits will be worth approximately $239 million annually from 2025 through 2027 when producers are eligible for 45Z credits and $120 million annually from 2028 onward when producers move to 45Q credits. We modeled the economic impact of these tax credits as shocks to farm and proprietors' income and estimated that the clean fuel and carbon sequestration tax credits would increase state GDP by $956 million over ten years. The tax credits will similarly support a $1.6 billion expansion in gross output along with a $2.05 billion increase in personal income.

Table 13 – Economic Impacts of 45Z and 45Q Tax Credits

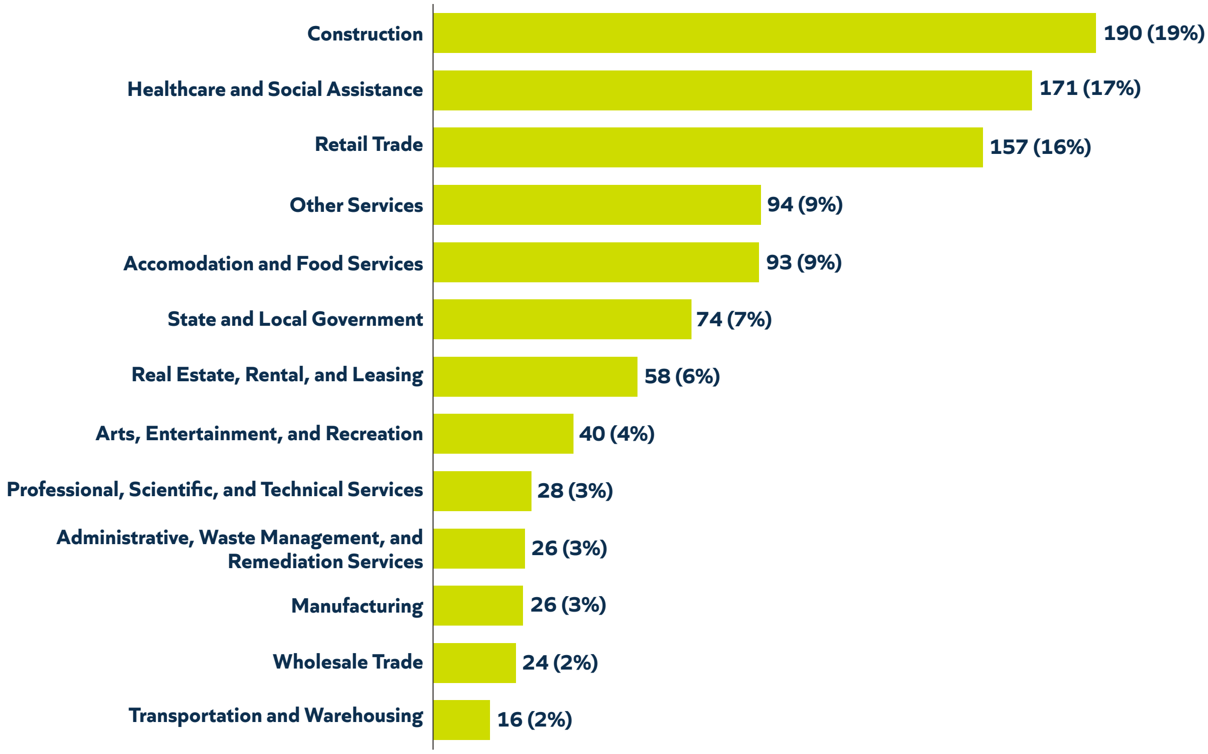
Category	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Average	Total
Total Employment	1,832	2,082	2,103	1,161	866	636	487	398	353	336	1,025	
GDP[1]	166	191	195	108	81	60	46	39	35	35	96	956
Gross Output[1]	281	324	330	182	135	99	75	62	56	55	160	1,600
Personal Income[1]	323	338	344	189	171	154	142	133	127	124	205	2,046

[1] Millions of constant 2022 dollars.

The tax credits will also support strong employment growth throughout the ten years, though the impacts lessen over time as producers switch from the 45Z to 45Q tax credits. Once more, we see substantial employment impacts in the construction sector, which we estimate will support 190 jobs per year on average.

***The tax credits will also support strong employment growth throughout the ten years**, though the impacts lessen over time as the relative value of the tax credits declines.*

Figure 13: Average Annual Employment Impacts of 45Q and 45Z Tax Credit



Stronger Corn Basis Impacts

Finally, we estimated the economic impacts of a stronger corn basis if South Dakota's ethanol producers increase production after construction of the Navigator and Summit pipelines. The findings reported in this section estimate the economic impacts of increased sales from the farm sector to ethanol producers. All results are reported relative to the baseline scenario with no expansion in ethanol production.

The results ignore any potential impacts arising from capital investments made by ethanol producers to expand their capacity, and any such investments only add to the estimated economic impacts presented in Tables 14, 15, and 16. In all cases, we assume a 5-year ramp-up period for production increases. We increased corn sales linearly during the 5-year expansion period, with the full impact felt in 2029. Starting in 2030, we allow the basis to decrease by five percent in year six and by another five percent in year eight in recognition that corn production will increase and that demand and supply elasticities are generally lower in the long run than they are in the short run.

In consultation with SDEPA, we identified the 15% increase in ethanol production as the most likely scenario given current market conditions and corn availability. This scenario would see South Dakota's ethanol producers increasing output from 1.444 to 1.661 billion gallons per year, requiring an additional 77 million bushels of corn annually. Under this scenario, we estimate the local corn basis would increase by nearly $0.1867 on average after five years, increasing the value of corn production in the state by $123.46 million. Over the entire ten-year period, we estimate the value of the corn harvest will increase by $938.3 million, based on 2022 corn prices and harvest size.

We allocated $79.016 million (64%) to pipeline counties and the remaining $44.446 million to the rest of the state following historic county-level corn production. We also nullified any own-industry effects on employment, investment, and compensation typically arising from a change in industry sales. This step ensured that the model would conservatively estimate the impacts of the basis change and not overestimate investments in the farm sector.

Table 14 – Economic Impacts of Corn Basis Change – 15% Ethanol Expansion Scenario

Category	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Average	Total
Total Employment	90	179	263	339	407	376	358	321	300	281	291	
GDP[1]	18	36	54	70	85	80	78	71	69	67	63	627
Gross Output[1]	40	79	117	152	185	172	167	153	148	143	136	1,356
Personal Income[1]	5	10	15	20	25	24	25	23	23	22	19	192

[1] Millions of constant 2022 dollars.

Table 14 reports the results of the corn basis analysis. We estimate that the stronger corn basis will increase gross economic output, or overall economic activity, by more than $1.35 billion over ten years. The estimated impact on gross output exceeds the impact from actual pipeline operations by nearly $72 million. The stronger corn basis will also increase state GDP by an estimated $627 and personal income by $192 million while supporting an estimated 291 jobs annually.

The impact estimates in Table 14 do not include economic impacts from potential capital investments needed to support expanding South Dakota's ethanol production. Dakota Institute did not have access to the necessary data to model the capital investments of individual ethanol plants. Consequently, the impact estimates presented here derive only from increased corn sales. Any impacts stemming from capital investments by ethanol producers would be in addition to the estimated impacts in Table 14.

Figure 14: Average Annual Employment Impacts of a Stronger Corn Basis

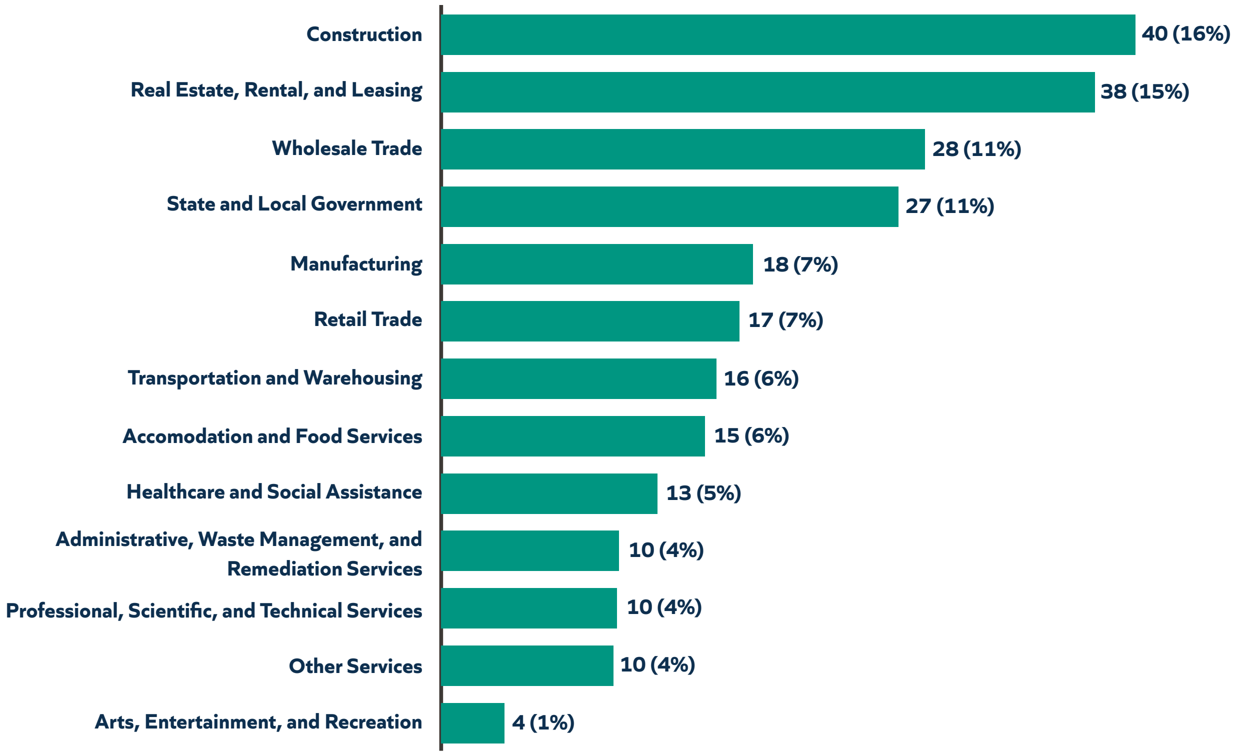


Table 15 – Economic Impacts of Corn Basis Change – 10% Ethanol Expansion Scenario

Category	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Average	Total
Total Employment	60	119	175	226	272	251	239	214	200	187	194	
GDP[1]	14	29	44	58	73	70	70	66	65	63	55	551
Gross Output[1]	27	53	78	101	123	114	111	102	99	96	90	904
Personal Income[1]	3	7	10	14	17	16	16	16	15	15	13	128

[1] Millions of constant 2022 dollars.

The second scenario analyzed a 10% increase in ethanol production. We modeled this scenario in the REMI model as an $82.31 million increase in farm sales supported by a $0.1245 basis increase that comes into full effect after a five-year phase-in period. Once again, we ignored any potential capital investments by ethanol producers. Table 15 reports that a 10% expansion in ethanol production could increase gross economic output by $905 million over ten years. A stronger corn basis could also increase state GDP by an estimated $551 million and personal income by $128 million. The 10% scenario would also support an estimated 194 jobs annually.

Table 16 – Economic Impacts of Corn Basis Change – 20% Ethanol Expansion Scenario

Category	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Average	Total
Total Employment	120	238	351	452	543	502	478	428	400	375	389	
GDP[1]	24	48	71	93	114	106	103	95	92	89	84	836
Gross Output[1]	54	106	156	203	247	229	222	204	197	191	181	1,808
Personal Income[1]	7	13	20	27	34	33	33	31	30	29	26	257

[1] Millions of constant 2022 dollars.

Finally, Table 16 reports the estimated economic impacts of a 20% expansion in ethanol production. This scenario used a $0.37 basis increase associated with an additional $164.62 million in farm sales after the five-year phase-in. This model allocated 64% ($105.354 million) to pipeline counties and the other 36% ($59.262 million) to the rest of the state. The additional farm sales would increase gross economic output by nearly $1.81 billion over ten years. A stronger corn basis would also increase state GDP by an estimated $836 million and personal income by $257 million. The 20% scenario could also support an estimated 389 jobs annually.

APPENDIX A – ESTIMATING CROP DAMAGES

In addition to the stimulative effects of pipeline operations, this analysis also considers ongoing crop damage suffered by farmers due to reduced yields resulting from pipeline construction and resulting soil compaction Takeste et al (2021).[23] Both pipelines will pass through non-agricultural land in addition to agricultural land, but the majority of the pipeline miles cross rural farmland and thus any damages related to pipeline construction are assumed to be borne by farm producers.

Following the Muller (2022) Heartland Greenway Pipeline Regional Economic Impact Study, we model crop damages as a reduction in farm income resulting from lower yields in an assumed 150-foot-wide easement area surrounding the CO_2 pipeline.[24] Public filings for the Summit pipeline, in contrast, indicate that the Summit pipeline may only require 100-foot construction easements, which would result in less crop damage and yield loss.[25] In light of the conflicting estimates for necessary construction easements, this report adopts the more conservative approach and follows Muller (2022).

Given this assumption, the 150-foot-wide easement and the 834 miles of combined pipeline will affect an estimated 15,062 combined acres.

Based on USDA data, we assumed a planting mix of 59% corn and 41% soybeans in the affected counties and, by extension, the easement areas. Historical harvest data from USDA showed average yields since 2007 were 117.6 bushels per acre for corn and 36.9 bushels per acre for soybeans. We, therefore, constructed a weighted average for crop yields in easement areas equal to 84.54 bushels per acre. Using the same method, we used a weighted average price for the corn/soy mix of $8.60 per bushel based on an average corn price of $5.53 per bushel and an average soybean price of $13.01 per bushel. We additionally assume crop yields in the affected area grow at 1% annually.

Following Muller (2022), we model the damages as a complete loss in yield during the first year following the pipelines' construction. Crop yields are assumed to return quickly, reaching 80% in year two, 90% in year four, 95% in year five, and full recovery by 2035.

Table A1 – Estimated Crop Damages

Year	Yield / Acre (Weighted Corn/Soy Avg)	Price / Bushel (Weighted Corn/Soy Avg)	Yield loss	Damages ($1,000s)
2025	84.54	$8.60	100%	-10,948
2026	85.38	$8.60	20%	-2,212
2027	86.24	$8.60	15%	-1,675
2028	87.10	$8.60	10%	-1,128
2029	87.97	$8.60	5%	-570
2030	88.85	$8.60	5%	-575
2031	89.74	$8.60	5%	-581
2032	90.64	$8.60	5%	-587
2033	91.54	$8.60	5%	-593
2034	92.46	$8.60	5%	-599
2035	93.38	$8.60	0%	0
Total Estimated Damages				**-$19,467**
Average Annual Damages				**-$1,946**

APPENDIX B – ABOUT REMI

Additional information about the REMI model can be found at the REMI website, www.remi.com. The following description of the REMI model is provided by its authors.

The REMI model incorporates aspects of four major modeling approaches: Input-Output, General Equilibrium, Econometric, and Economic Geography. Each of these methodologies has distinct advantages as well as limitations when used alone. The REMI integrated modeling approach builds on the strengths of each of these approaches.

The REMI model at its core has the inter-industry relationships found in Input-Output models. As a result, the industry structure of a particular region is captured within the model, as well as transactions between industries. Changes that affect industry sectors that are highly interconnected to the rest of the economy will often have a greater economic impact than those for industries that are not closely linked to the regional economy.

General Equilibrium is reached when supply and demand are balanced. This tends to occur in the long run, as prices, production, consumption, imports, exports, and other changes occur to stabilize the economic system. For example, if real wages in a region rise relative to the US, this will tend to attract economic migrants to the region until relative real wage rates equalize. The general equilibrium properties are necessary to evaluate changes such as tax policies that may have an effect on regional prices and competitiveness.

REMI is sometimes called an "Econometric model," as the underlying equations and responses are estimated using advanced statistical techniques. The estimates are used to quantify the structural relationships in the model. The speed of economic responses is also estimated since different adjustment periods will result in different policy recommendations and even different economic outcomes.

The New Economic Geography features represent the spatial dimension of the economy. Transportation costs and accessibility are important economic determinants of interregional trade and the productivity benefits that occur due to industry clustering and labor market access. Firms benefit from having access to a large, specialized labor pool and from having access to specialized intermediate inputs from supplying firms. The productivity and competitiveness benefits of labor and industry concentrations are called agglomeration economies and are modeled in the economic geography equations.

ENDNOTES

1 South Dakota's nominal GDP was $67.570 billion in 2022. U.S. Bureau of Economic Analysis, Gross Domestic Product: All Industry Total in South Dakota [SDNGSP], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SDNGSP, April 3, 2023.

2 Navigator CO_2 (n.d.). About Heartland Greenway. Heartlandgreenway.com. Retrieved April 3, 2023, from https://heartlandgreenway.com/about-us/#

3 Summit Carbon Solutions (n.d.). Project Footprint. Summitcarbonsolutions.com. Retrieved April 3, 2023, from https://summitcarbonsolutions.com/project-footprint/

4 Lee, U., Kwon, H., Wu, M. and Wang, M. (2021), Retrospective analysis of the U.S. corn ethanol industry for 2005–2019: implications for greenhouse gas emission reductions. Biofuels, Bioprod. Bioref., 15: 1318-1331. https://doi.org/10.1002/bbb.2225

5 Renewable Fuels Association (n.d.). Ready Set Go 2023 Ethanol Industry Outlook. https://Ethanolrfa.org. Retrieved April 3, 2023, from https://d35t1syewk4d42.cloudfront.net/upload/files/Resources/2023%20RFA%20Outlook%20FINAL.pdf

6 Decarbonization Status, Challenges, and Policy Options for Carbon Capture, Utilization, and Storage. (2022). In https://www.gao.gov (GAO-22-105274). United States Government Accountability Office. Retrieved April 3, 2023, from https://www.gao.gov/assets/gao-22-105274.pdf

7 Jinfeng Ma, Lin Li, Haofan Wang, Yi Du, Junjie Ma, Xiaoli Zhang, and Zhenliang Wang. Carbon Capture and Storage: History and the Road Ahead. Engineering. 2022, Volume 14. P 33-43.

8 Section 45Q of the Internal Revenue Code (26 USC §45Q) creates tax credits for the capture and storage of CO_2. Section 45Z (26 USC § 45Q) of the Internal Revenue Code creates tax credits for the production of clean fuels that meet defined emission standards.

9 LCFS Pathway Certified Carbon Intensities. (n.d.). California Air Resources Board. Retrieved April 3, 2023, from https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities

10 The 2022 IRA creates eligibility for 45Z tax credits based on the GREET 3.0 pathway scoring methodology rather than the methodology adopted by the California Air Resources Board (see endnote 8). There are several differences between the two methodologies, but the most important difference for this analysis is how the CARB method penalizes a fuel source's pathway score due to land use changes (e.g. prairie land converted to farmland). The GREET 3.0 method applies a lower penalty land use change penalty than does CARB, 7.38 g/MJ vs 13.2 g/MJ. Converting the CARB scores to align with GREET 3.0 scoring lowers a plant's CI score by 12.42 points for ethanol produced from corn feedstocks.

11 CARB and GREET 3.0 measure CO_2 emissions in g/MJ whereas the IRA enabling legislation uses tCO_2e/mmBtu. The conversion factor is 1 g/MJ = 1.055 tCO_2e/mmBTU.

12 CCS adoption will have a plant level impacts on CI Scores due to unique processes used in ethanol production and CO_2 capture. It is not possible to determine an across the board CCS impact on CI Scores, but a 2020 report from the Office of the Chief Economist at the US Department of Agriculture estimated CCS could reduce carbon intensity by up to 35 gCO_2/MJ. Rosenfeld, J., M. Kaffel, J. Lewandrowski, D. Pape, 2020. The California Low Carbon Fuel Standard: Incentivizing Greenhouse Gas Mitigation in the Ethanol Industry. USDA, Office of the Chief Economist. November 2020. Additionally, Red Trail Energy LLC, a North Dakota based ethanol producer, has a CARB approved LCFS pathway which includes CCS. In this case, CCS adoption reduced the plants CI score by 31 points. Low Carbon Fuel Standard Design-Based Pathway Application. (2020). In CARB LCFS Pathway Certified Carbon Intensities (Application No. D0005). California Air Resouces Board. https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/d0005_report.pdf.

13 See Table 1 for a detailed breakdown of production capacities by individual plant.

ENDNOTES

[14] Pfankuch, B. (2020, April 6). Ethanol industry and corn growers in SD facing economic 'bloodbath' due to COVID-19. South Dakota News Watch. Retrieved April 3, 2023, from https://www.sdnewswatch.org/stories/s-d-ethanol-industry-facing-economic-bloodbath-due-to-covid-19/

[15] Mosier, N., & Ileleji, K. (2006, December). How Fuel Ethanol is Made from Corn. Purdue University Extension. Retrieved April 3, 2023, from https://www.extension.purdue.edu/extmedia/id/id-328.pdf

[16] One bushel of corn yields 2.8 gallons of ethanol. Applying this conversion factor, 1,444 Mmgal per year / 2.8 gallons per bushel results in corn demand of 515,714,286 bushels of corn annually.

[17] 2022 State Agriculture Overview - South Dakota. (2023). In USDA Quick Stats. US Department of Agriculture. Retrieved April 3, 2023, from https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=SOUTH%20DAKOTA

[18] According to the 2022 South Dakota Agricultural Overview (see Endnote 15), South Dakota farmers harvested 661,320,000 bushels of corn in 2022. During that same year SD ethanol producers would need 515,714,286 bushels of corn to produce 1,444 Mmgal of ethanol (see Endnote 16). Based on these figures, annual corn demand for ethanol production was 78% of the total harvest that year (515,714,286 / 661,320,000 = 0.7798 or 78%).

[19] Condon, N., Klemick, H., & Wolverton, A. (2015). Impacts of ethanol policy on corn prices: A review and meta-analysis of recent evidence. Food Policy, 51, 63-73. https://doi.org/10.1016/j.foodpol.2014.12.007. We employ a slightly modified long-run estimate for the impact of ethanol production on corn prices provided by Conden, Klemick, and Wolverton (2015) in Table 3 on page 26. Conden, Klemick, and Wolverton (2015) reports its price elasticity in direct relation to changes in ethanol production whereas we apply the elasticity to changes in corn demand. Our method slightly attenuates the price impact relative to that in Conden, Klemick, and Wolverton (2015).

20 See Endnote 17.

21 See Endnote 1.

22 The industrial classification of ethanol production in the REMI model falls under the umbrella of chemical manufacturing.

23 Tekeste, MZ, Ebrahimi, E, Hanna, MH, Neideigh, ER, Horton, R. Effect of subsoil tillage during pipeline construction activities on near-term soil physical properties and crop yields in the right-of-way. Soil Use and Management. 2021; 37: 545– 555. https://doi.org/10.1111/sum.12623

24 Muller, John. (2022). Heartland Greenway Pipeline – Regional Economic Impact Study.

25 Planning documents submitted to the South Dakota Public Utilities Commission indicate that the actual easement area may be closer to 100 feet along much of the pipeline routes, but this analysis adopts the larger and more easement size in so far as it yields more conservative economic impact estimates. SCS Carbon Transport LLC's Letter regarding its Application for a Permit to Construct a Carbon Dioxide Transmission Pipeline - Appendix 3. (2022). In https://puc.sd.gov/ (PUC Docket HP22-001). SD Public Utilities Commission. Retrieved April 3, 2023, from https://puc.sd.gov/commission/dockets/HydrocarbonPipeline/2022/HP22-001/Append3.pdf