Soaring to New Heights

The Economic Impacts of Building an American SAF Industry

IEc THIRD WAY EVOLVED ENERGY RESEARCH

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Executive Summary

$1.5 Trillion

Total SAF industry estimated expenditures to replace conventional jet fuel by 2050.

Top 5 States for SAF Production

1. Texas
2. Oklahoma
3. Nebraska
4. South Dakota
5. North Dakota

Nearly 400,000 jobs

Total estimated employment impact of the industry at its peak.

Sustainable aviation fuel (SAF) holds significant promise as a long-term alternative to conventional jet fuel. As the aviation sector looks to increase its reliance on SAF over the coming decades, it is important to assess the economic impacts that will be associated with this energy transition, including both positive economic gains from building a new SAF industry as well as negative economic activity resulting from reducing our reliance on conventional fossil jet fuel.

To provide insights into these effects, this report assesses the potential economic and employment impacts of building a new domestic SAF industry in the US. It provides an overview of the level of investment in SAF technology and infrastructure needed to deploy enough SAF to replace all conventional jet fuel by mid-century, and examines the geographic distribution of that investment and the impacts of that investment on employment across all 50 states.

This report finds that national SAF expenditures could total nearly $1.5 trillion between 2025 and 2050. The majority of these investments are likely to be concentrated in Great Plains states due to these states' competitive advantage in producing renewable energy and the availability of biomass feedstocks, generating up to $78 billion in net gross domestic product (GDP) gains per year nationwide.

These investments result in a net increase in jobs in nearly every state. This report finds that the industry could support up to 153,000 direct jobs and more than 240,000 additional indirect and induced jobs in the broader economy at the industry's peak, net of job losses associated with conventional jet fuel. By 2050, the SAF industry could support nearly 90,000 direct jobs and roughly 30,000 indirect and induced jobs across the United States. **These results show that the transition to increased reliance on SAF would have a positive impact on US employment, even after accounting for employment losses related to conventional aviation fuel production.**

Introduction

Civil aviation comprised nearly three percent of total US greenhouse gas (GHG) emissions in 2019, with over 97 percent of aviation emissions related to jet fuel production and use. The aviation sector has already made substantial gains in fuel efficiency due to changes in business practices and technological improvements. From 1991 to 2019, US air travel increased by 89 percent, while fuel consumption increased by only 27 percent. However, further improvements in fuel efficiency will only address part of the sector's emissions problem. To decarbonize air travel completely, the US needs to rapidly scale SAF as an alternative to conventional jet fuel.

While the climate benefits of SAF are well documented, relatively little attention has been given to the potential economic impacts of the increased development, production, distribution, and use of SAF at the national scale. This report provides an overview of how the transition to SAF could shape the US economy if the aviation sector is successful in meeting its climate goals. It examines the states that are most likely to see the largest levels of SAF investment, the potential for SAF to create jobs, and how job opportunities may change in the coming decades as this industry grows.

Background

What is SAF?

Sustainable aviation fuel (SAF) is a drop-in fuel, meaning that it can be blended with conventional jet fuel and used in today's aircraft without requiring any modifications to the aircraft or engine itself. SAF can be produced from a variety of feedstocks, including biomass like purpose-grown crops and forestry residues as well as non-biomass materials like green hydrogen and carbon captured directly from the air. By definition, SAF is generally required to emit at least 50% fewer GHG emissions than fossil jet fuel.

State of the SAF Industry Today

Although the aviation industry has been developing and testing SAF technologies for almost two decades, production volumes have been limited to date. In 2023, the global SAF industry produced just 158 million gallons of SAF, accounting for less than 1% of all jet fuel consumed worldwide.

The largest barrier to scaling production is the relatively high cost of SAF compared to conventional jet fuel, as SAF can cost anywhere from 2-4 times more than the fossil alternative. Fuel generally accounts for about 30% of an airline's operating expenses, making SAF an uneconomic choice for airlines competing with razor-thin margins. While many airlines have voluntarily committed to purchase limited quantities of SAF despite its higher cost, the industry's reliance on small voluntary purchase commitments to date has largely made private investors hesitant to deploy the capital needed to build large-scale production infrastructure.

Different jurisdictions have taken a variety of approaches to help increase SAF production and use. The European Union and the United Kingdom, for example, have begun to require producers to blend small amounts of SAF into the fuel supply. This has created more market certainty for investors and helped level the playing field for commercial airlines by eliminating the need for individual airlines to choose between making the environmentally conscious decision of purchasing SAF or maintaining strong operating margins.

In the US, policymakers have thus far relied on incentives to help bring down the cost of SAF. The Inflation Reduction Act (IRA) included two new tax credits for SAF to make SAF more cost competitive with conventional jet fuel, though the relative transience of these credits – with the longest expiring in 2027 – will only subsidize existing production. Longer-term tax credits for hydrogen and renewable energy generation will help subsidize some of the infrastructure needed to produce SAF, but these credits still fall short of addressing the overarching demand-side challenges facing this industry.

Outlook for a Net-Zero Aviation Sector

Despite the challenges associated with scaling SAF production, the aviation industry has widely recognized that SAF is essential for decarbonizing this sector. The US biofuel industry has also started looking toward SAF as a key market opportunity as ground transportation begins to electrify and reduce demand for feedstocks like ethanol.

In 2022, the Biden Administration announced the "SAF Grand Challenge" calling for 3 billion gallons of SAF to be produced annually by 2030 and enough to replace all conventional jet fuel with SAF by 2050. The International Civil Aviation Organization (ICAO) has also adopted an aspirational goal targeting global net-zero aviation emissions by 2050, a goal that will require significantly scaling up SAF production.

Reaching these levels of production will be critical to achieving our climate goals, but they also present a lucrative market opportunity for the United States, with the potential to generate thousands of American jobs, add billions of dollars to our GDP, and transform rural economies. This report is intended to offer a snapshot of what these economic benefits could look like if the US can successfully build out this industry.

Analytic Approach for Assessing the Economic Impact of the SAF Transition

Our Approach

Third Way partnered with Evolved Energy Research (EER) and Industrial Economics (IEc) to assess the economic and employment impacts associated with SAF deployment over the coming decades. To determine these impacts, EER conducted energy systems modeling to develop a net-zero trajectory for the aviation sector by 2050 within the context of a broader economy-wide decarbonization transition. Using this modeling, IEc conducted an assessment of the economic impacts of deploying SAF along this net-zero trajectory, focusing on the total employment impacts associated with the up-front investments in facilities and equipment and the ongoing operations of those facilities to help achieve SAF adoption targets.

A full description of our methodology is available in the supplementary appendix to this report.

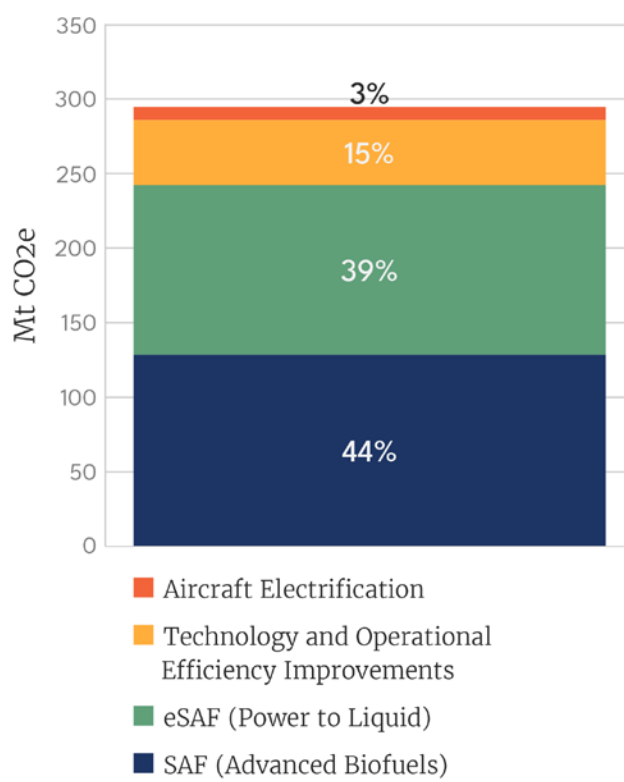
Modeling the Decarbonization Potential of SAF

To illustrate the potential economic benefits of scaling this industry, we modeled a scenario that estimates the amount of SAF required to achieve net-zero aviation emissions in 2050 and backcasted the investments needed to get there. We looked at SAF deployment down to the state level and assessed how this industry will interact with other sectors of the economy on the road to decarbonization to better inform the trade-offs that need to happen with other industries. For example, our model considers how current federal policies may offer greater near-term incentives to use biomass ground transportation fuels instead of SAF and how additional biomass feedstocks will become available for SAF production as ground transportation electrifies over the coming decades.

Our modeling takes a conservative estimate of the amount of SAF needed to decarbonize aviation, estimating that between 25-26 billion gallons would be needed by mid-century, accounting for over 80% of the in-sector emissions reductions for aviation. Other estimates suggest that the amount of SAF needed may be as high as 35 billion gallons, with the exact amount being dependent on the future growth of air traffic, efficiency improvements in aircraft technology and operations, and the rate of fleet renewals.

Thus, while this analysis is intended to represent an ambitious future for a net-zero aviation sector, it may ultimately underestimate the economic impacts occurring due to this industry's expansion over the coming decades.

Aviation Emissions Reduction Contributions in 2050



Source: Evolved Energy Research.

Assessing the Role of Different SAF Technologies

The American Society of Testing and Materials (ASTM) has approved seven production pathways for SAF to date, all of which use different feedstocks and methods to develop virtually identical drop-in fuels that can be blended with conventional jet fuel to reduce emissions.

Most SAF being produced today is produced from a pathway known as HEFA, which uses waste oils and fats as a feedstock, but the limited availability of these feedstocks mean that the industry will need to look toward other technologies to scale SAF production to larger volumes. This includes biogenic production pathways like alcohol-to-jet (AtJ), which involves converting biomass into ethanol, and gasification via the Fischer-Tropsch (Gas-FT) process, which involves converting biomass or municipal waste into a gas that can then be used to make jet fuel.

Another production process called power-to-liquids (PtL), also known as eSAF, involves using clean electricity to combine carbon captured from the air with clean hydrogen to produce an ultra-low carbon fuel. Unlike direct hydrogen, which also has longer-term potential as a clean aircraft fuel, eSAF can be used in today's aircraft just like other forms of SAF. Although eSAF is still a relatively nascent technology, this process has enormous potential as a longer-term source of SAF as the costs of the inputs required for eSAF production – including carbon capture, hydrogen electrolysis, and renewable energy – decline over time. Moreover, we find that the IRA's provisions supporting clean electricity, clean hydrogen, and carbon capture substantially reduce the cost of feedstocks used for eSAF production and create an attractive environment for their deployment during the 2030s.

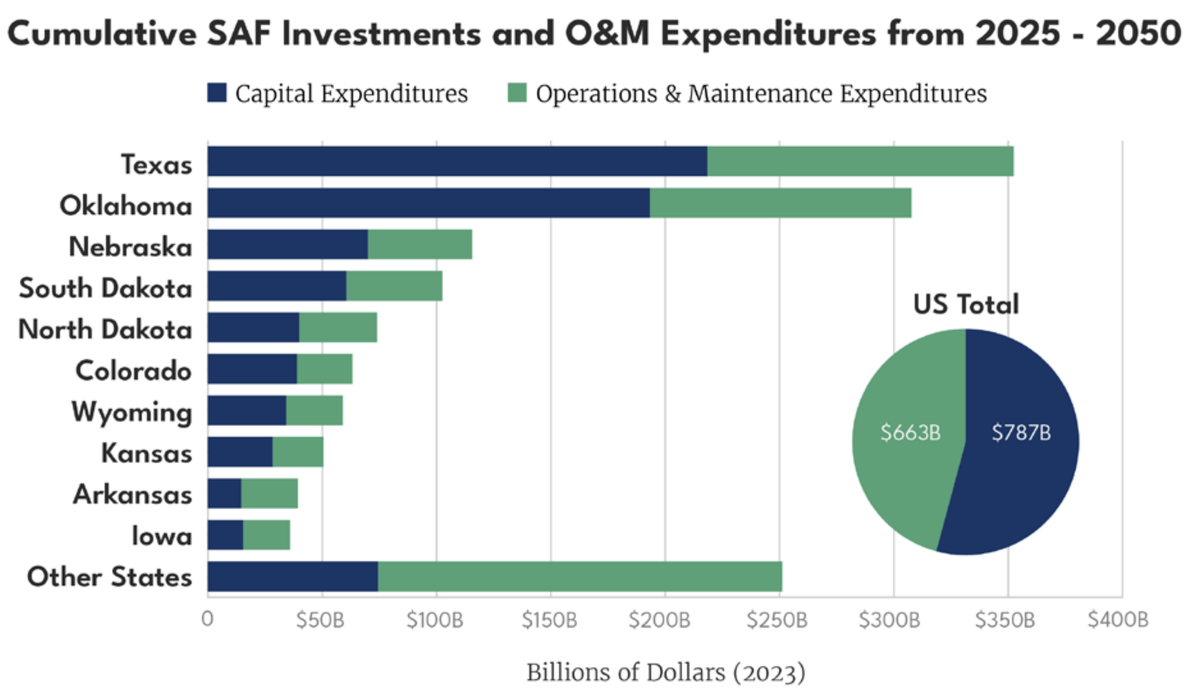
While other SAF pathways also have potential, we focus our analysis on the four pathways discussed above: HEFA, AtJ, Gas-FT, and PtL.

Economic Impacts of Scaling the SAF Industry

We find the US will need to spend up to $1.5 trillion over the coming decades to build and operate fuel production facilities to serve the aviation sector in order to fully replace fossil jet fuel with SAF by 2050. This includes investments in SAF production infrastructure itself, as well as related investments in renewable energy infrastructure; biomass production, transport, and cultivation; and ongoing operations and maintenance expenditures for these facilities.

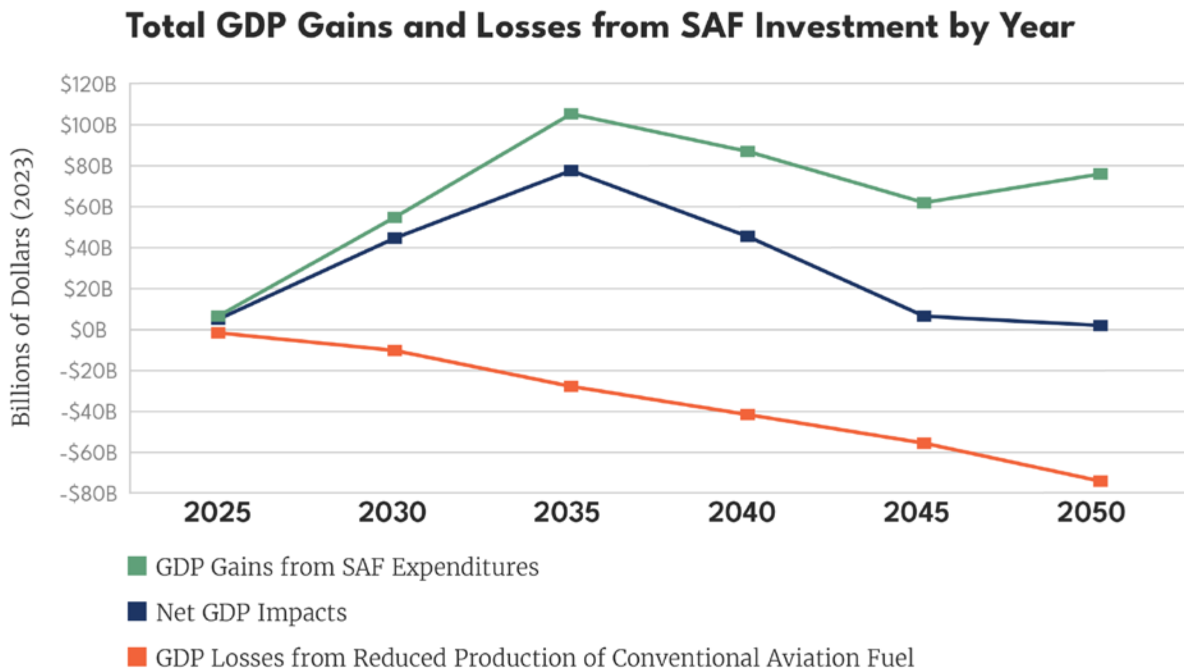
Because SAF production can be a very energy-intensive process, scaling production will require a significant amount of renewable energy to ensure that these fuels meaningfully reduce upstream GHG emissions. This is particularly true for eSAF, which relies on using large amounts of electricity to combine clean hydrogen with captured carbon to produce fuel. As a result, our modeling finds that investments in renewable energy infrastructure account for more than half of the nearly $1.5 trillion in SAF-related expenditures between 2025 and 2050. This includes capital expenditures to deploy technologies like onshore wind, solar power, and hydrogen electrolysis, as well as supporting infrastructure like transmission lines.

The requirement for affordable and accessible renewable energy leads much of this investment to states in the wind belt, where biomass resources and high-quality renewables have significant overlap. As a result, we find many of the Great Plains states, especially Texas and Oklahoma, being best positioned to lead the country in SAF production given their competitive advantages in generating electricity from onshore wind and solar. The Midwest and Southeast also have significant potential for SAF production given the availability of low-cost biomass resources and existing infrastructure that could be retrofitted to produce SAF.



Economic Growth from the SAF Industry Eclipses Losses from Fossil Jet Fuel Production

The total gross domestic product (GDP) impacts of these expenditures nationwide are positive for the full time horizon of this analysis even after accounting for negative GDP impacts associated with the reduced production of conventional jet fuel. Our analysis finds net GDP impacts peaking at approximately $78 billion in 2035 as a result of increased investment in production infrastructure before declining to about $2 billion in 2050 as new capital investments decrease.

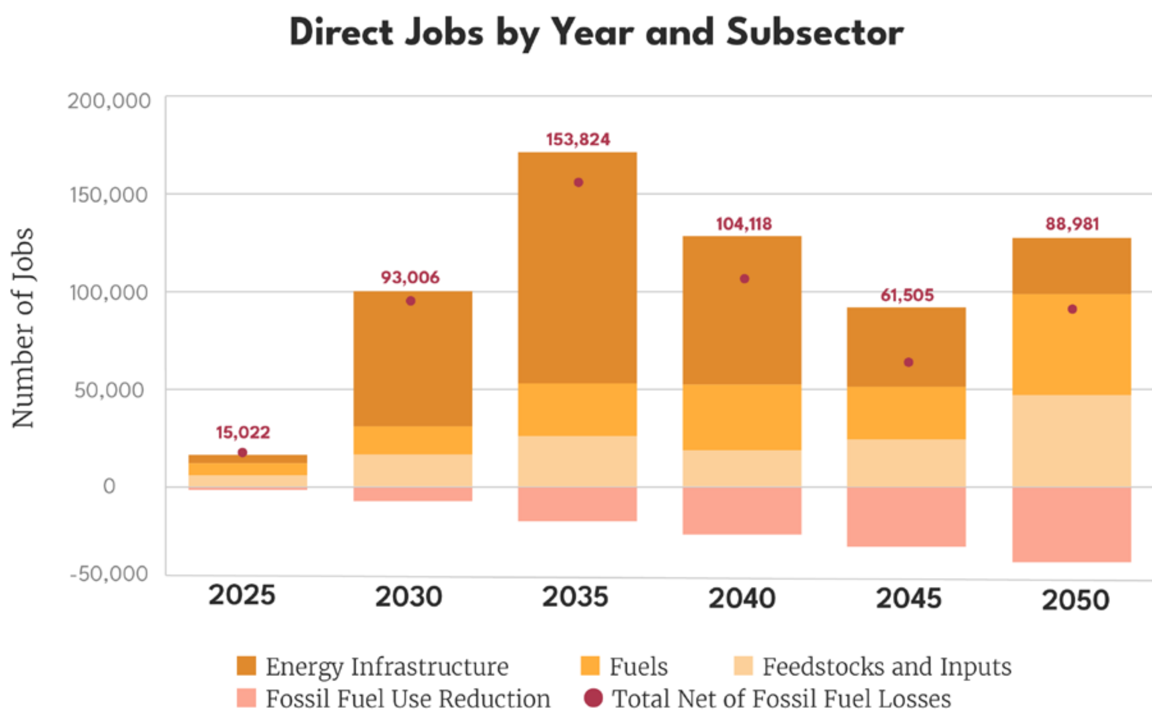


Top 5 States - Total GDP Impacts from 2025-2050

State	Average GDP Contribution Per Year (Millions of Dollars)
Oklahoma	$5,180
Texas	$4,290
California	$3,290
New York	$2,010
Nebraska	$1,400
Other States	**$15,800**

Workforce Opportunities in the SAF Industry

The SAF industry has the potential to generate tens of thousands of jobs associated with building SAF-related infrastructure and operating and maintaining those facilities. The jobs directly supported by this industry will fluctuate over time, initially being driven by large upfront investments in new energy infrastructure to supply ongoing SAF production with low carbon power, which is ultimately essential for SAF to achieve the emissions reductions required to reach net-zero by 2050. This includes jobs associated with the installation, operation, and maintenance of technologies like onshore wind, utility-scale solar, and hydrogen electrolysis in particular. Jobs directly associated with SAF production and feedstock production also grow over time, and as this infrastructure comes online, we find that the industry has the potential to support roughly 89,000 ongoing jobs once it reaches net-zero in 2050.



Breaking Down the Channels of Economic Impact

These numbers are inclusive of any job losses related to fossil jet fuel. Though the SAF transition will inevitably result in some job losses associated with conventional fossil jet fuel production, our analysis finds SAF-related jobs far exceeding those losses nationally. In fact, many SAF-related jobs should have a high degree of transferability with jobs related to fossil jet fuel, including many jobs related to construction and engineering, feedstock production, and facility operations and maintenance.

The following table provides some insights into the quality of the jobs associated with the employment impacts outlined in this report. The values in this table reflect average incomes in the industry sectors that would be involved in the design, construction, and operations of SAF production facilities, as well as the average incomes for industries involved in fossil fuel production that are displaced by SAF.

Average Annual Income and Benefits per Worker by Subsector

Category	Subsector	Average Income and Benefits per Worker (2023)	Percentage of Direct SAF Industry Jobs	
			2035	2050
Energy Infrastructure	Biomass Power Allam (with Carbon Capture)	$107,900	<1%	<1%
	Hydrogen Electrolysis	$92,600	25.3%	6.0%
	Underground Hydrogen Storage	$118,000	<1%	<1%
	Offshore Wind	$135,800	<1%	<1%
	Onshore Wind	$135,300	26.2%	11.2%
	Transmission Lines	$132,000	3.2%	1.0%
	Utility-Scale Photovoltaic Solar	$134,800	14.4%	4.6%
Fuels	HEFA	$112,000	1.5%	2.3%
	Alcohol-to-Jet Fuel	$159,900	<1%	4.6%
	Bio Gasification F-T	$123,900	<1%	17.7%
	Fischer-Tropsch (F-T) Power to Liquids	$83,900	14.3%	14.9%
Feedstocks and Inputs	Residue Feedstocks	$54,800	8.5%	22.7%
	Direct Air Carbon Capture	$115,000	6.5%	<1%
	Purpose Grown Feedstocks	$56,500	<1%	14.4%
Fossil Fuel Use Reduction	Crude Oil Extraction	$264,300	N/A	N/A
	Jet Fuel	$198,000	N/A	N/A

Note: The values reported here reflect income and wages associated with direct employment impacts. In addition, these values reflect annual wages and income as of the first year when impacts are realized for a technology, which is 2025 for most technologies.

Of the sixteen subsectors we analyze, fourteen have average incomes in excess of the US median household income of $75,000[1], with many well in excess of $100,000. The annual salary per worker is most consistently high for the various forms of energy infrastructure, reflecting the technical skills required for both the development and operation of these facilities. The lowest incomes are for positions related to biomass feedstock production, which is consistent with the relatively lower incomes of agricultural workers.

Many of these jobs will be located in predominantly rural areas, allowing positions in this sector to help reduce the gap in median incomes between urban and rural communities. Nevertheless, incomes in these subsectors still struggle to compete against those in oil and gas due to the comparably higher profit margins associated with fossil fuel projects, but that gap may narrow as clean energy technologies scale up and become more profitable over time.

[1] Median household income in the US was $74,580. See Gloria Guzman and Melissa Kollar, Income in the United States: 2022, US Census Bureau, September 2023.

Breaking Down SAF Jobs by State

Our analysis shows nearly all states experiencing net employment growth as a result of building the SAF industry, even after accounting for job losses due to reduced fossil jet fuel production. These jobs follow a similar trajectory to investment in most of the largest SAF producing states, with energy infrastructure driving early job growth before leveling out with more consistent long-term jobs in feedstock production, fuel production, and operations and maintenance.

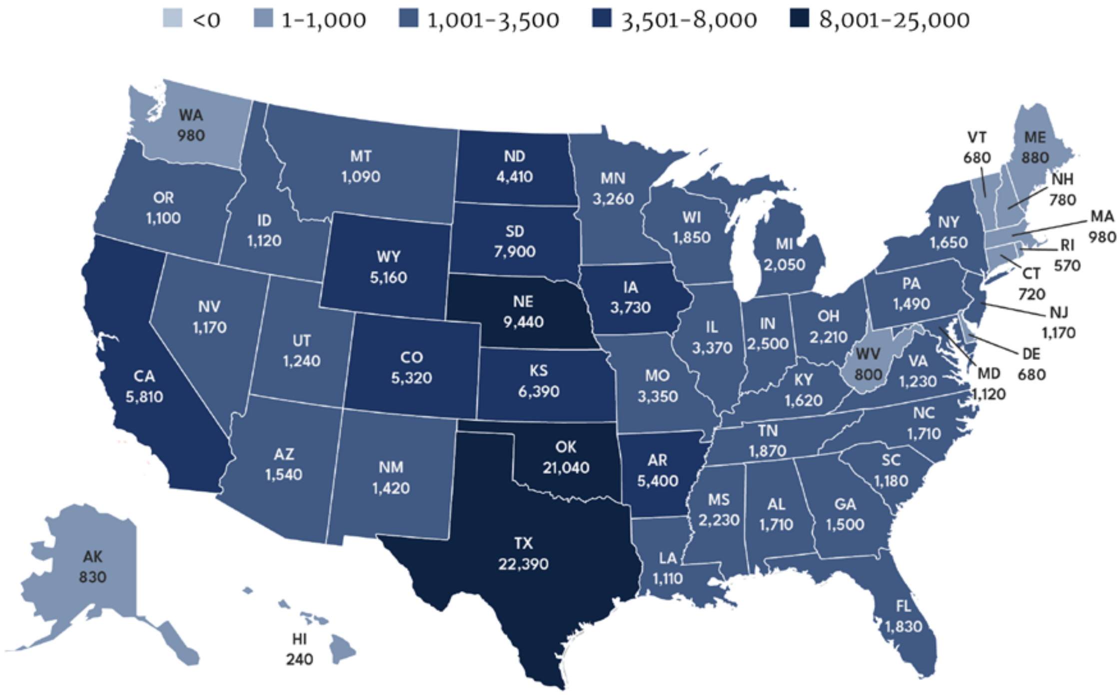
Top 10 States - Direct Job Impacts by Year

State	2035	2050	2025-2050 Average
Texas	22,400	8,600	13,800
Oklahoma	21,000	13,300	13,300
South Dakota	7,900	6,400	5,600
Nebraska	9,400	2,400	5,200
California	5,800	4,500	3,700
Kansas	6,400	2,000	3,700
Arkansas	5,400	3,200	3,000
Iowa	3,700	3,000	3,000
Illinois	3,400	3,400	2,800
Wyoming	5,200	1,200	2,600
Other States	**1,600**	**1,000**	**1,000**

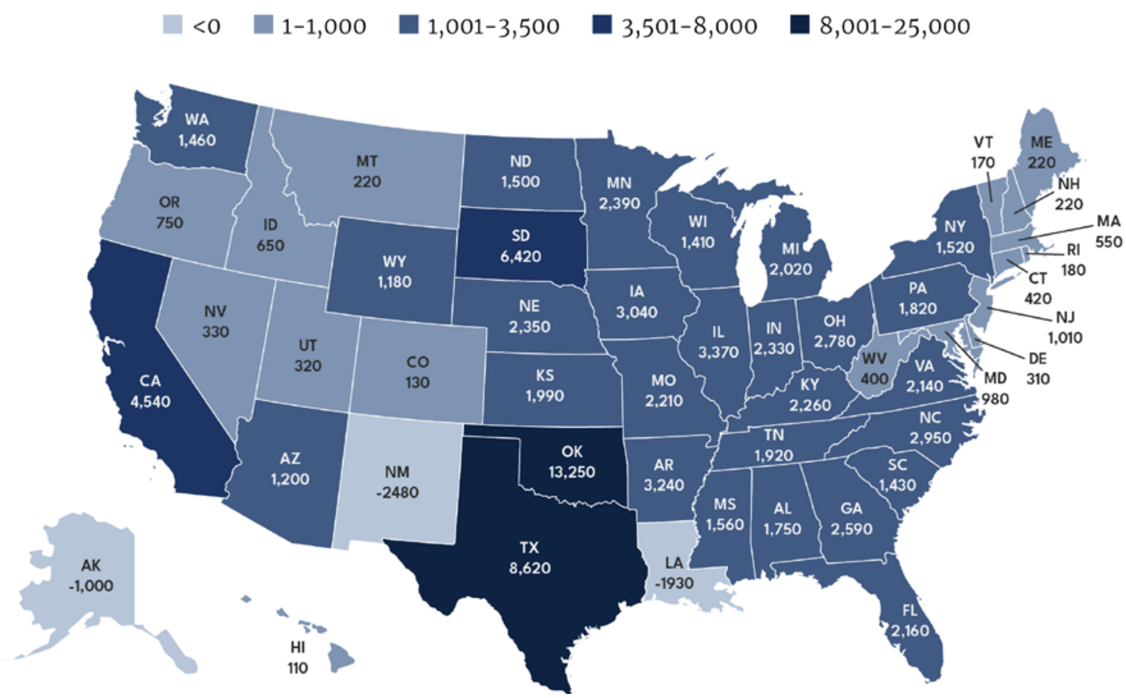
Only three states, Louisiana, Alaska, and New Mexico, are projected to have job losses associated with fossil jet fuel production that outweigh the job gains associated with the SAF industry. These are states that have relatively high employment in the oil and gas industry and which are not currently as well-suited as other states to provide the feedstocks and inputs needed for SAF production. However, new developments in clean energy production could change this. For example, development of offshore wind in the Gulf of Mexico could provide new job opportunities for former oil and gas workers in Louisiana producing clean electricity that could then be used to produce SAF. Future state-level polices could also make these states more attractive investment environments for SAF production.

The figures on the following page show the distribution of the direct employment gains by state at the industry's peak in 2035 and at the end of our analysis in 2050. As shown in these figures, the projected job gains are most significant in the Great Plains states, with relatively large direct employment gains extending from North Dakota south through Texas. Direct job losses are concentrated in many of the same states where SAF-related job gains are most significant. For example, some of the highest direct job losses are in the oil-producing states of Texas, Oklahoma, New Mexico, and North Dakota, states that also experience some of the highest job gains, particularly related to energy infrastructure.

2035 Direct Net Employment Impacts by State



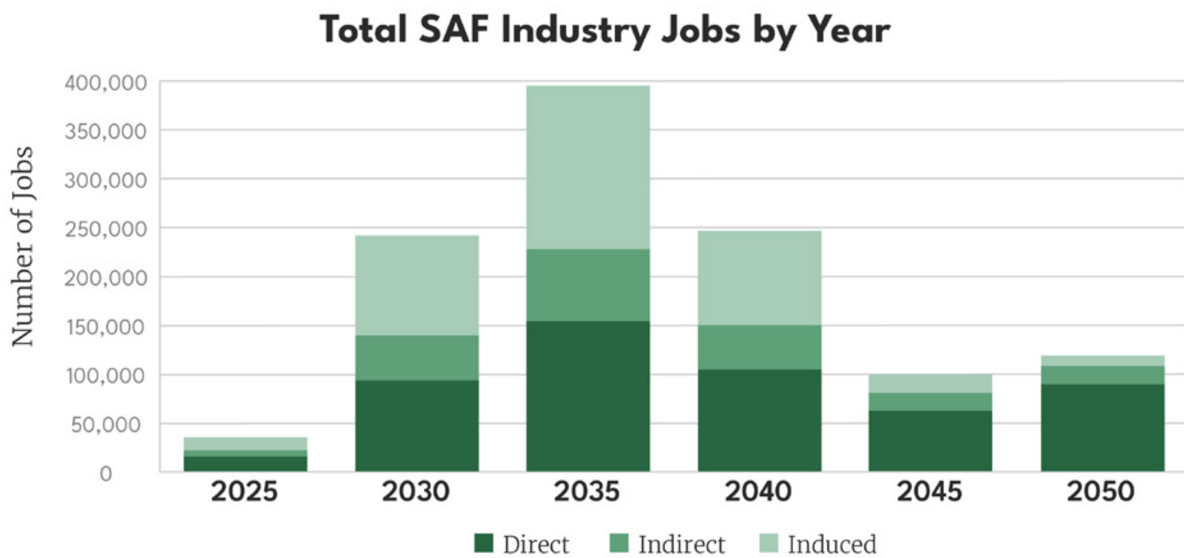
2050 Direct Net Employment Impacts by State

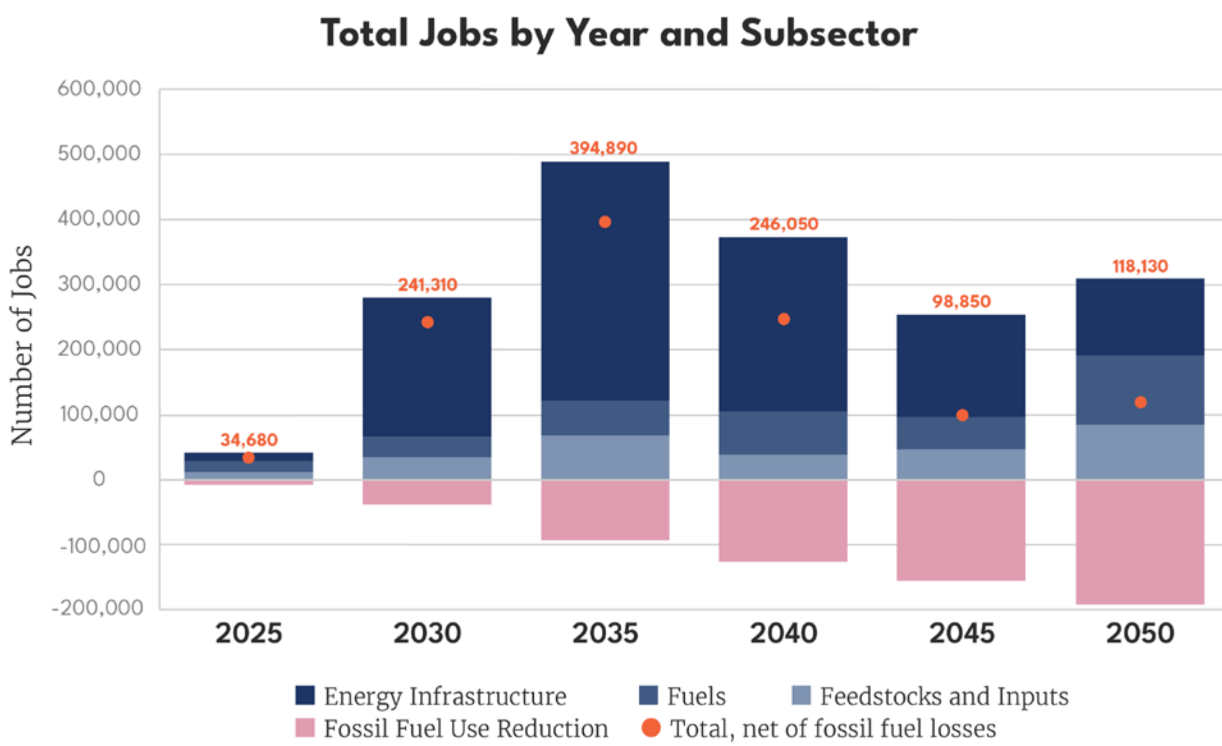


Employment Impacts on the Broader Economy

In addition to employing thousands of direct workers, the SAF industry will also support an even larger number of jobs in the broader economy. Our analysis finds that total employment impacts, inclusive of direct, indirect, and induced jobs, peaks at 395,000 jobs in 2035 during a period of substantial investments in renewable energy and SAF infrastructure. Overall, total employment impacts are as much as 157% higher than direct employment impacts in 2035, though this difference declines to 33% by 2050.

The employment impacts associated with each SAF-related technology reflect capital expenditures on those technologies as well as expenditures on their ongoing operations and maintenance. Similar to direct employment impacts, total job losses related to reduced reliance on conventional aviation fuel are relatively small at the beginning of the analysis time horizon but grow significantly by 2050, exceeding 190,000 in 2050. These losses offset more than 60% of the total job gains projected for 2050, compared to an offset of just 30% when focusing exclusively on direct job impacts.





Summary: National Direct and Total Employment Impacts in 2035 and 2050 by Subsector

Category	Technology	2035		2050	
		Direct	Total	Direct	Total
Energy Infrastructure	**Subtotal – Energy Infrastructure**	**118,300**	**367,110**	**28,750**	**118,900**
	Biomass Power Allam (with Carbon Capture)	10	30	40	70
	Hydrogen Electrolysis	43,000	101,800	7,480	17,540
	Underground Hydrogen Storage	<10	30	180	510
	Offshore Wind	20	170	30	180
	Onshore Wind	44,870	157,980	14,030	72,410
	Transmission Lines	5,480	12,960	1,260	2,420
	Utility-Scale Photovoltaic Solar	24,610	94,150	5,740	25,800
Fuels	**Subtotal – Fuels**	**26,950**	**53,190**	**51,620**	**105,510**
	HEFA	2,530	4,380	2,900	4,760
	Alcohol-to-Jet Fuel	20	140	5,800	20,350
	Bio Gasification F-T (with Carbon Capture)	<10	<10	24,310	53,840
	Bio Gasification F-T (without Carbon Capture)	<10	<10	<10	<10
	Fischer-Tropsch (F-T) Power to Liquids	24,390	48,660	18,600	26,560
Feedstocks and Inputs	**Subtotal – Feedstocks and Inputs**	**25,730**	**67,040**	**46,680**	**84,880**
	Residue Feedstocks	14,550	26,590	28,390	47,010
	Direct Air Carbon Capture	11,100	40,280	370	4,280
	Purpose Grown Feedstocks	80	170	17,920	33,590
Fossil Fuels Use Reduction	**Subtotal – Fossil Fuels Use Reduction**	**-17,150**	**-92,450**	**-38,060**	**-191,150**
	Crude Oil	-14,000	-49,570	-31,090	-109,810
	Jet Fuel	-3,150	-42,880	-6,970	-81,340
NET TOTAL – All Technology Categories		**153,820**	**394,890**	**88,980**	**118,130**

The Runway Ahead

The United States' transition away from fossil fuels presents a powerful opportunity to build homegrown domestic industries for technologies like SAF. As the largest biofuels producer in the world, the US is well positioned to be a leader in the emerging global market for these cleaner fuels. As this report illustrates, successfully building that industry has the potential to generate tens of thousands of high-quality jobs across the country, particularly in the central United States, that greatly exceed job losses resulting from our transition away from fossil fuels. Moreover, investments in the emerging SAF industry can generate billions of dollars in economic output for state and local economies in rural America.

Realizing these benefits is not a forgone conclusion – in fact, the future landscape of SAF production in the US may ultimately look very different in the future as federal and state policies evolve over the coming decades. Any growth in this industry will ultimately depend on the ability of the US to enact policies that can facilitate investment and end-use. Federal and state governments have a wide array of tools at their disposal including funding for research, development, and demonstration (RD&D); loan guarantees; tax credits; fuel standards; and more to help increase SAF production. The passage of policies like the Inflation Reduction Act demonstrates that policymakers are interested in using these tools to promote SAF, but continued support is essential to the industry's future. The passage of policies like the Inflation Reduction Act demonstrates that policymakers are interested in using these tools to promote SAF, but their effectiveness will ultimately depend on how they are implemented. Regardless, continued federal and state support is essential to this industry's future and to making many of these economic benefits a reality.

Appendix: Summary of State-Level Impacts

Alabama	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,203	603	1,046	2,852
Average GDP Impact Per Year (thousands)	49,532	117,055	153,304	319,891
Total State Investments (thousands)	-	-	-	3,534,591
Alaska	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	(166)	61	173	68
Average GDP Impact Per Year (thousands)	(298,022)	4,624	35,044	(258,354)
Total State Investments (thousands)	-	-	-	4,089
Arizona	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,091	847	1,710	3,648
Average GDP Impact Per Year (thousands)	131,504	162,839	282,843	577,186
Total State Investments (thousands)	-	-	-	7,336,395
Arkansas	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	3,020	377	710	4,107
Average GDP Impact Per Year (thousands)	635,559	70,152	99,521	805,231
Total State Investments (thousands)	-	-	-	39,230,064
California	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	3,697	5,654	10,300	19,652
Average GDP Impact Per Year (thousands)	(267,838)	1,331,365	2,229,789	3,293,316
Total State Investments (thousands)	-	-	-	16,881,368
Colorado	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	2,138	723	1,565	4,426
Average GDP Impact Per Year (thousands)	53,229	135,331	286,107	474,667
Total State Investments (thousands)	-	-	-	63,216,106
Connecticut	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	456	427	982	1,865
Average GDP Impact Per Year (thousands)	3,907	105,006	216,355	325,268
Total State Investments (thousands)	-	-	-	256,287
Delaware	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	441	119	284	844
Average GDP Impact Per Year (thousands)	4,291	31,398	61,634	97,323
Total State Investments (thousands)	-	-	-	345,192
Florida	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,280	2,553	5,548	9,380
Average GDP Impact Per Year (thousands)	19,508	450,516	905,177	1,375,201
Total State Investments (thousands)	-	-	-	1,718,436

Georgia	Direct	Indirect	Induced	Total
Average Net Employment Impact Per Year	1,213	1,365	2,549	5,127
Average GDP Impact Per Year (thousands)	75,386	269,135	461,368	805,889
Total State Investments (thousands)	-	-	-	5,001,776
Hawaii	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	153	168	394	715
Average GDP Impact Per Year (thousands)	0	30,577	74,407	104,983
Total State Investments (thousands)	-	-	-	0
Idaho	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	845	222	425	1,493
Average GDP Impact Per Year (thousands)	152,377	38,253	62,119	252,749
Total State Investments (thousands)	-	-	-	8,017,133
Illinois	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	2,785	1,812	3,419	8,016
Average GDP Impact Per Year (thousands)	164,775	414,104	665,393	1,244,273
Total State Investments (thousands)	-	-	-	19,464,483
Indiana	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	2,011	1,026	1,719	4,755
Average GDP Impact Per Year (thousands)	156,933	230,508	271,907	659,348
Total State Investments (thousands)	-	-	-	13,090,186
Iowa	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	3,009	443	851	4,303
Average GDP Impact Per Year (thousands)	473,460	92,547	139,262	705,268
Total State Investments (thousands)	-	-	-	35,895,299
Kansas	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	3,682	382	735	4,799
Average GDP Impact Per Year (thousands)	744,056	72,715	119,277	936,047
Total State Investments (thousands)	-	-	-	50,546,722
Kentucky	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,397	633	1,061	3,091
Average GDP Impact Per Year (thousands)	117,948	111,720	153,307	382,975
Total State Investments (thousands)	-	-	-	8,082,831
Louisiana	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	(254)	483	1,103	1,332
Average GDP Impact Per Year (thousands)	(842,588)	120,142	187,318	(535,127)
Total State Investments (thousands)	-	-	-	22,986,812

Maine	Direct	Indirect	Induced	Total
Average Net Employment Impact Per Year	483	151	353	987
Average GDP Impact Per Year (thousands)	30,626,637	25,940,938	51,147,930	107,716
Total State Investments (thousands)	-	-	-	1,706,000
Maryland	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	779	779	1,722	3,281
Average GDP Impact Per Year (thousands)	14,149	171,452	334,436	520,038
Total State Investments (thousands)	-	-	-	1,250,437
Massachusetts	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	598	920	2,293	3,812
Average GDP Impact Per Year (thousands)	16,241	241,839	460,203	718,284
Total State Investments (thousands)	-	-	-	987,250
Michigan	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,432	1,325	2,372	5,129
Average GDP Impact Per Year (thousands)	42,843	257,860	380,640	681,343
Total State Investments (thousands)	-	-	-	4,668,408
Minnesota	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	2,391	794	1,701	4,886
Average GDP Impact Per Year (thousands)	260,187	174,187	290,691	725,065
Total State Investments (thousands)	-	-	-	19,697,321
Mississippi	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,526	321	610	2,457
Average GDP Impact Per Year (thousands)	112,244	53,801	81,375	247,419
Total State Investments (thousands)	-	-	-	9,208,916
Missouri	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	2,446	771	1,601	4,817
Average GDP Impact Per Year (thousands)	227,604	147,838	243,139	618,580
Total State Investments (thousands)	-	-	-	16,897,370
Montana	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	665	120	272	1,057
Average GDP Impact Per Year (thousands)	59,082	25,202	40,380	124,664
Total State Investments (thousands)	-	-	-	6,113,822
Nebraska	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	5,236	278	549	6,064
Average GDP Impact Per Year (thousands)	1,251,795	53,357	91,732	1,396,883
Total State Investments (thousands)	-	-	-	35,895,299

New Hampshire	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	443	178	384	1,005
Average GDP Impact Per Year (thousands)	8,457	36,691	66,255	111,403
Total State Investments (thousands)	-	-	-	466,848
New Jersey	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	753	1,169	2,418	4,340
Average GDP Impact Per Year (thousands)	10,216	280,062	489,274	779,551
Total State Investments (thousands)	-	-	-	803,367
New Mexico	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	213	173	436	823
Average GDP Impact Per Year (thousands)	(499,861)	35,211	64,871	(399,779)
Total State Investments (thousands)	-	-	-	32,078,819
New York	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	999	2,271	5,735	9,006
Average GDP Impact Per Year (thousands)	11,752	633,925	1,366,071	2,011,748
Total State Investments (thousands)	-	-	-	927,852
North Carolina	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,474	1,292	2,534	5,299
Average GDP Impact Per Year (thousands)	101,412	276,485	426,245	804,142
Total State Investments (thousands)	-	-	-	7,488,739
North Dakota	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	2,402	91	227	2,720
Average GDP Impact Per Year (thousands)	413,482	19,448	39,940	472,870
Total State Investments (thousands)	-	-	-	74,064,786
Ohio	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,844	1,630	3,047	6,522
Average GDP Impact Per Year (thousands)	71,571	330,045	504,603	906,219
Total State Investments (thousands)	-	-	-	9,887,168
Oklahoma	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	13,327	397	832	14,556
Average GDP Impact Per Year (thousands)	4,998,347	47,352	132,077	5,177,776
Total State Investments (thousands)	-	-	-	307,554,719
Oregon	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	727	605	1,124	2,457
Average GDP Impact Per Year (thousands)	42,582	120,851	183,285	346,718
Total State Investments (thousands)	-	-	-	3,156,710

Pennsylvania	Direct	Indirect	Induced	Total
Average Net Employment Impact Per Year	1,086	1,678	3,595	6,359
Average GDP Impact Per Year (thousands)	25,995	320,757	595,940	942,693
Total State Investments (thousands)	-	-	-	2,685,385
Rhode Island	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	373	121	296	790
Average GDP Impact Per Year (thousands)	5,425	22,358	46,450	74,233
Total State Investments (thousands)	-	-	-	316,423
South Carolina	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	917	669	1,177	2,764
Average GDP Impact Per Year (thousands)	36,642	119,775	169,819	326,235
Total State Investments (thousands)	-	-	-	2,754,169
South Dakota	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	5,593	108	251	5,952
Average GDP Impact Per Year (thousands)	1,315,560	23,163	44,525	1,383,249
Total State Investments (thousands)	-	-	-	102,506,703
Tennessee	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,450	985	1,769	4,204
Average GDP Impact Per Year (thousands)	97,124	176,985	293,394	567,504
Total State Investments (thousands)	-	-	-	6,392,017
Texas	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	13,836	3,501	7,188	24,525
Average GDP Impact Per Year (thousands)	2,149,738	809,779	1,327,037	4,286,554
Total State Investments (thousands)	-	-	-	352,380,019
Utah	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	729	432	866	2,027
Average GDP Impact Per Year (thousands)	(24,548)	83,794	140,148	199,394
Total State Investments (thousands)	-	-	-	3,424,928
Vermont	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	418	71	185	674
Average GDP Impact Per Year (thousands)	4,583	12,691	26,244	43,518
Total State Investments (thousands)	-	-	-	264,460
Virginia	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,054	1,199	2,392	4,645
Average GDP Impact Per Year (thousands)	56,990	232,684	426,487	716,162
Total State Investments (thousands)	-	-	-	4,220,554

Washington	Direct	Indirect	Induced	Total
Average Net Employment Impact Per Year	827	972	1,930	3,730
Average GDP Impact Per Year (thousands)	43,707	214,684	418,828	677,219
Total State Investments (thousands)	-	-	-	3,428,274
West Virginia	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	516	180	365	1,061
Average GDP Impact Per Year (thousands)	(17,865)	46,275	54,218	82,627
Total State Investments (thousands)	-	-	-	591,368
Wisconsin	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	1,322	879	1,594	3,795
Average GDP Impact Per Year (thousands)	56,718	169,454	248,292	474,465
Total State Investments (thousands)	-	-	-	4,580,020
Wyoming	**Direct**	**Indirect**	**Induced**	**Total**
Average Net Employment Impact Per Year	2,573	65	129	2,767
Average GDP Impact Per Year (thousands)	954,516	19,241	24,144	997,901
Total State Investments (thousands)	-	-	-	58,932,707