EASING THE ENERGY TRANSITION: THE UNEXPECTED ROLE THAT FOSSIL FUELS CAN PLAY IN THE EMISSIONS CRISIS

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I. INTRODUCTION 100
II. HISTORY OF THE INDUSTRY AND GREENHOUSE GASES 100
III. FEDERAL CLIMATE CHANGE POLICY 102
  A. The Clean Air Act 103
    1. Title I of CAA 103
    2. Title II of CAA 104
  B. Inflation Reduction Act 105
  C. Current Progress and Future Outlook 106
IV. THE INDUSTRY'S IMPACT ON THE ECONOMY AND SOCIETY 108
V. WEIGHING THE PROS AND CONS OF THE INDUSTRY 110
  A. Pros of the Fossil Fuel Industry 110
  B. Cons of the Fossil Fuel Industry 112
VI. PROPOSED SOLUTIONS 114
VII. CONCLUSION 116

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I. INTRODUCTION

Through decarbonization efforts by the fossil fuel industry, renewable energy advancements, and investments in affected communities, the fossil fuel industry will be essential in solving the greenhouse gas (GHG) emissions crisis. Although the Biden administration has addressed the crisis through various policies, it has not placed enough emphasis on the specific decarbonization methods that the fossil fuel industry can employ to minimize emissions, nor how renewables will replicate the positive impacts of the industry.[1] With increasing pressures to phase out the domestic fossil fuel industry as a whole, it is often overlooked that the trajectory of climate change can significantly improve by giving prominence to the industry's role in decarbonization.[2] The domestic industry supplies millions of jobs, economic benefits, and innovation in other industries, all of which cannot be ignored.[3] Thus, the fossil fuel industry should be utilized as a tool in decreasing emissions, rather than a nuisance to be eliminated.[4]

This paper argues that the fossil fuel industry, through various decarbonization methods, can play a monumental role in halting the emissions crisis in the United States. The first section of this article discusses how the industry has historically contributed to emissions. The second section analyzes federal climate change policy, introduces goals for emissions reduction, and demonstrates the complexity of regulating GHGs. The third section examines the impact the industry has on the economy, while the fourth section will weigh the pros and cons of eliminating the industry. Lastly, the final section proposes solutions that the industry can utilize to become a positive factor in the emissions crisis and become more collaborative with renewables within the energy sector.

II. HISTORY OF THE INDUSTRY AND GREENHOUSE GASES

During the Industrial Revolution, the fossil fuel industry was a source of energy for a modest market.[5] The energy demand was small,

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1. *See* WHITE HOUSE, BUILDING A CLEAN ENERGY ECONOMY: A GUIDEBOOK TO THE INFLATION REDUCTION ACT'S INVESTMENTS IN CLEAN ENERGY AND CLIMATE ACTION, (2023), https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/12/Inflation-Reduction-Act-Guidebook.pdf.

2. Seaver Wang, *How the Fossil Fuel Industry Could Help Drive Decarbonization*, BREAKTHROUGH INST. (Feb. 25, 2020), https://thebreakthrough.org/issues/energy/fossil-fuel-decarbonization.

3. Samantha Gross, *The United States Can Take Climate Change Seriously While Leading the World in Oil and Gas Production*, BROOKINGS (Jan. 27, 2020), https://www.brookings.edu/articles/the-united-states-can-take-climate-change-seriously-while-leading-the-world-in-oil-and-gas-production/.

4. Wang, *supra* note 2.

5. *A Short History of Energy*, UNION OF CONCERNED SCIENTISTS (Aug. 3, 2006), https://www.ucsusa.org/resources/short-history-energy.

and the use of energy was inefficient.[6] However, the energy demand has dramatically increased with society's progression over the years.[7] Currently, about 81% of primary energy in the United States comes from fossil fuels.[8] Americans use fossil fuels in everyday activities such as fueling vehicles and supplying homes and businesses with heat and electricity.[9] Unsurprisingly, the United States has become one of the global leaders in oil and gas production and utilization.[10] Thus, the domestic fossil fuel industry has become instrumental in furthering technological, social, and economic innovation.[11]

As the industry develops, so does its impact on the climate crisis.[12] Burning fossil fuels for energy largely contributes to the anthropogenic emissions of GHG in the United States.[13] In 2021, fossil fuel combustion made up approximately 73% of the United States' GHG emissions.[14] These emissions are gases that are based on human activity and trap heat in the atmosphere, thereby increasing the temperature.[15] The greenhouse gases consist of carbon dioxide, methane, nitrous oxide, and fluorinated gases.[16]

Carbon dioxide is the primary GHG and accounted for 79% of all anthropogenic emissions in 2022.[17] Carbon dioxide is emitted through the combustion of fossil fuels used for transportation, electricity, and industrial processes.[18] When fossil fuels are burned, they release carbon dioxide, water, and heat.[19] The heat is used for energy while the carbon dioxide is released into the air, which traps heat in the atmosphere.[20] This is known as the greenhouse effect, which gradually increases the temperature of the planet.[21]

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6. *Id.*

7. *Id.*

8. Hannah Ritchie & Pablo Rosado, *Energy: Fossil Fuels*, OUR WORLD IN DATA (Oct. 2022), https://ourworldindata.org/fossil-fuels.

9. Melissa Denchak, *Fossil Fuels: The Dirty Facts*, NRDC (Jan. 2024), https://www.nrdc.org/stories/fossil-fuels-dirty-facts#sec-whatis.

10. *Id.*

11. *Id.*

12. *See A Short History of Energy*, *supra* note 5.

13. *Energy and the Environment Explained: Where Greenhouse Gases Come From*, U.S. ENERGY INFO. ADMIN. (Aug. 22, 2023), https://www.eia.gov/energyexplained/energy-and-the-environment/where-greenhouse-gases-come-from.php.

14. *Id.*

15. *Overview of Greenhouse Gases*, U.S. ENV'T PROT. AGENCY (Jan. 16, 2025), https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

16. *Id.*

17. *Id.*

18. *Id.*

19. *Id.*

20. *Id.*; Denchak, *supra* note 9.

21. Ariel Mobius & Jesse Kroll, *How Do Greenhouse Gases Trap Heat in the Atmosphere?*, MIT CLIMATE (Feb. 19, 2021), https://climate.mit.edu/ask-mit/how-do-greenhouse-gases-trap-heat-atmosphere.

In addition to carbon dioxide, methane is a large emission of the fossil fuel industry during the production and transport of oil and natural gas.[22] Methane can enter the atmosphere from the flaring of natural gas, leaks from equipment failures, and seeping from coal mines.[23] In 2021, methane contributed to 12% of all anthropogenic GHG emissions.[24] Despite its relatively short lifespan in the atmosphere, methane is a powerful greenhouse gas because of its ability to trap heat in the atmosphere.[25] Controlling methane emissions will play a key role in slowing the effects of climate change.[26]

Greenhouse gases have lifespans ranging from "a few years to thousands of years" and their accumulation is a major concern for global warming.[27] Thus, the effects of GHG emissions on global warming can persist over a long period of time.[28] This highlights the significance of how collective actions taken now to minimize emissions are crucial for the future of the environment.[29] The emissions crisis is a serious issue that needs to be addressed by all industries, including one as innovative and lucrative as the domestic fossil fuel industry.[30]

III. FEDERAL CLIMATE CHANGE POLICY

Climate change is a topic of significant federal policy.[31] There are many policies proposed and implemented at the federal level.[32] Of the many legislative actions on climate change, this section will analyze the Clean Air Act which best demonstrates the complexity of regulating GHG emissions. Next, this section looks at the Inflation Reduction Act which shows goals that the federal government seeks to achieve for emissions. Finally, this section will look at recent developments and the progression toward decarbonization under the Biden Administration.

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22. .*Climate Change Indicators: Greenhouse Gases*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/climate-indicators/greenhouse-gases.

23. *Fossil Fuels Sector Solutions*, CCACOALITION.ORG, https://www.ccacoalition.org/content/fossil-fuels-sector-solutions (last visited Feb. 13, 2025).

24. *Overview of Greenhouse Gases*, *supra* note 15.

25. *Id.*; *Methane Emissions,* U.S. ENV'T PROT. AGENCY (Jan. 16, 2025), https://www.epa.gov/ghgemissions/methane-emissions.

26. Michelle McEachern & Sheel Bansal, *Climate Warming is Likely to Cause Large Increases in Wetland Methane Emissions,* U.S. GEOLOGY SURVEY (Mar. 2, 2023), https://www.usgs.gov/news/featured-story/climate-warming-likely-cause-large-increases-wetland-methane-emissions.

27. *Climate Change Indicators: Greenhouse Gases*, *supra* note 22.

28. *Id.*

29. *Id.*

30. *See* Scott Foster & David Elzinga, *The Role of Fossil Fuels in a Sustainable Energy System*, UNITED NATIONS CHRON. (Dec. 3, 2015), https://www.un.org/en/chronicle/article/role-fossil-fuels-sustainable-energy-system.

31. *See Federal Action on Climate*, CTR. FOR CLIMATE & ENERGY SOLS., https://www.c2es.org/content/federal-action-on-climate.

32. *See id.*

A. The Clean Air Act

The Clean Air Act (CAA) was first enacted in 1955 and is considered the foundation for many existing climate change policies.[33] The CAA authorizes entities to conduct activities that impact air quality through a permitting program.[34] Various permits under the Act regulate sources of air pollution that are new or existing, in addition to sources that do not meet pollution standards.[35] These entities must obtain the applicable permits for their source and comply with the regulations of the CAA to legally emit air pollutants.[36] The CAA consists of six titles, each addressing air quality concerns.[37] Of those titles, only I and II pertain to GHG emissions.[38]

1. Title I of CAA

Title I requires the Environmental Protection Agency (EPA) to set health-based national ambient air quality standards (NAAQS)for six air pollutants.[39] These pollutants are particulate matter, ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead.[40] The EPA determines the amount at which each pollutant can be emitted safely.[41] This gives the EPA authority to regulate and monitor stationary sources, such as factories, that emit these pollutants.[42] Under Title I, the Supreme Court determined that greenhouse gases cannot be defined as a pollutant to trigger the permit requirement of the CAA.[43] The Court found that including GHGs would dramatically increase the number of sources that would be subject to regulation, which was not Congress' intent.[44] Therefore, Title I regulates stationary sources that emit the six regulable pollutants.[45]

While this means greenhouse gases cannot be directly regulated under Title I, they can be indirectly regulated in various ways.[46] One

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33. Richard K. Lattanzio, *Clean Air Act: A Summary of the Act and Its Major Requirements*, CONG. RSCH. SERV. (Sept. 13, 2022), https://crsreports.congress.gov/product/pdf/RL/RL30853.

34. *Id.* at 1.

35. *Id.*

36. *Id.* at 16.

37. Clean Air Act, Pub. L. No. 84-159 §§ 7401-7671q (1970) (codified as amended at 42 U.S.C. Ch. 85), https://www.govinfo.gov/content/pkg/USCODE-2017-title42/html/USCODE-2017-title42-chap85.htm.

38. *Clean Air Act Permitting for Greenhouse Gases*, U.S. ENV'T PROT. AGENCY(Dec. 30, 2022), https://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases.

39. Lattanzio, *supra* note 33 at 3.

40. *Id.*

41. *Id.*

42. *Id.*

43. Util. Air Regul. Grp. v. EPA, 573 U.S. 302, 334 (2014).

44. *Id.*

45. *Id.* at 309.

46. *Clean Air Act Permitting for Greenhouse Gases*, *supra* note 38 at 2.

such way is the Prevention of Significant Deterioration (PSD) permit of Title I.[47] PSD permits apply to sources in areas where the air quality for the six pollutants is better than the NAAQS set by EPA.[48] The primary purpose is to maintain good air quality by using the best available control technology for that specific pollutant.[49] This technology can be more strict than other technology requirements under the CAA.[50] Thus, this gives the EPA the authority to require more advanced technology that limits the specific NAAQS pollutant and GHG emissions.[51] Similarly, the EPA has the authority to develop technology-based standards for new and existing sources.[52] This requires these sources to implement the best technology for reducing NAAQS pollutants and GHG emissions.[53]

2. Title II of CAA

On the other hand, Title II gives the EPA the authority to regulate mobile sources such as cars, trucks, trains, planes, and ships.[54] In *Massachusetts v. EPA*, the Supreme Court decided GHGs are pollutants that can be regulated under Title II if they endanger public health and welfare.[55] Thus, the EPA can directly regulate GHG emissions from mobile sources.[56] These sources must meet the national standards set by the EPA through the implementation of cleaner engines, fuels, and other programs.[57]

Ultimately, the Clean Air Act emphasizes the challenges of greenhouse gas regulation.[58] Following the impact of the CAA, there have been new concerns and scientific advancements that have led to further policy implementations to combat climate change.[59] However, regulating GHG emissions has become burdened with complex litigation and polarizing views on the issue.[60]

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47. *Id.* at 1.
48. Lattanzio, *supra* note 33 at 13.
49. *Id.* at 14.
50. *Id.*
51. *Util. Air Regul. Grp.*, 573 U.S. 302, 332-33.
52. Lattanzio, *supra* note 33 at 12.
53. *Id.*
54. *Id.* at 10.
55. Massachusetts v. EPA, 549 U.S. 497, 533 (2007).
56. *Clean Air Act*, TRANSP. ENV'T RES. CTR., https://www.tercenter.org/regulations/caa.php (last visited Feb. 14, 2025).
57. *Id.*
58. *United States: Clean Air Act (1970)*, AIR QUALITY LIFE INDEX, (Aug. 28, 2023), https://aqli.epic.uchicago.edu/policy-impacts/united-states-clean-air-act/.
59. *Id.*
60. Gross, *supra* note 3.

B. Inflation Reduction Act

The Inflation Reduction Act (IRA) was signed into law in 2022 by President Biden with the "commitment to build a new clean energy economy" and reduce the emissions crisis.[61] This legislation is historic because it is the largest investment in clean energy ever.[62] The IRA consists of tax provisions that promote clean energy in various industries.[63] The IRA is structured to achieve these results through grants, loans, rebates, incentives, and other investments.[64]

The IRA contains several ambitious goals regarding greenhouse gas emissions.[65] President Biden set goals of achieving 100% carbon pollution-free electricity by 2035, a 50-52% reduction in economy-wide GHG emissions below 2005 levels by 2030, and net zero emissions economy-wide by 2050.[66] Additionally, the IRA creates several incentive programs and provides funding to reduce GHG emissions across various industries.[67] Examples relevant to the fossil fuel industry include: providing tax credits for carbon capture, providing a $7,500 credit for purchasing a new qualifying clean vehicle, providing funds of $1.55 billion to cut methane pollution from the oil and gas industry operations, and providing tax credits to industrial facilities that implement decarbonization technologies.[68]

The IRA also has consequential effects on the domestic fossil fuel industry.[69] In general, such large incentives for clean energy will create harsh competition for the oil and gas industry.[70] More specifically, the IRA includes a fee that penalizes certain oil and gas facilities that emit methane.[71] The IRA also increases royalty fees for offshore drilling sites, which will continue increasing for the next 10 years. This will require oil companies to give more of their profit from oil and gas development

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61. WHITE HOUSE, *supra* note 1 at 2.

62. *Fact Sheet: One Year In, President Biden's Inflation Reduction Act is Driving Historic Climate Action and Investing in America to Create Good Paying Jobs and Reduce Costs* , WHITE HOUSE(Aug. 16, 2023), https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2023/08/16/fact-sheet-one-year-in-president-bidens-inflation-reduction-act-is-driving-historic-climate-action-and-investing-in-america-to-create-good-paying-jobs-and-reduce-costs/.

63. WHITE HOUSE, *supra* note 1 at 2.

64. *Id.*

65. *Id.* at 9.

66. *Id.*

67. *Id.* at 2.

68. *Id.* at 67.

69. Joseph Webster, *The Inflation Reduction Act's Impact on the US Oil and Gas Industry*, ATL. COUNS. (October 31, 2022), https://www.atlanticcouncil.org/blogs/energysource/the-inflation-reduction-acts-impact-on-the-us-oil-and-gas-industry/.

70. *Id.*

71. Zainab Mirza & Mike Willaims, *The Inflation Reduction Act Will Help Boost Offshore Wind Production*, CTR. FOR AM. PROGRESS (Dec. 6, 2022), https://www.americanprogress.org/article/the-inflation-reduction-act-will-help-boost-offshore-wind-production.

to the federal government.[72] These are just a few of the negative impacts on the industry as a result of the federal government's push toward decarbonization.

With these goals and incentive programs in mind, it is important to recognize that the Biden Administration has done a good job of addressing emissions concerns.[73] However, taking a closer look into the fossil fuel industry's contributory role in decarbonization will make these ambitious goals more achievable.[74]

C. Current Progress and Future Outlook

As decarbonization efforts increase, it is important to analyze the progress the United States has made and what the future looks like for the fossil fuel industry.

In general, GHG emissions have gradually been decreasing in the United States since 2007.[75] In 2022, oil and gas facilities contributed the second most GHG emissions at 316.3 million metric tons, behind power plants.[76] This is a slight increase from 2021.[77] However, some increases are expected as GHG emissions and energy demand in the United States fluctuate with the effects of global disturbances. Unfortunately, due to the novelty of decarbonization, it will likely take longer to see its effects on the net GHG emissions.[78] Therefore, efforts should be focused on specific advancements that will cumulatively assist in decarbonization.

Thus far, the most significant advancement has been made in electric vehicles.[79] There has been notable progress in the push toward zero emissions for passenger cars.[80] The EPA has required all cars made

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72. *Id.*

73. Dan Lashof, *Tracking Progress: Climate Action Under the Biden Administration,* WORLD RES. INST. (Jan. 23, 2023), https://www.wri.org/insights/biden-administration-tracking-climate-action-progress.

74. Chantal Beck et al., *The Future is Now: How Oil and Gas Companies Can Decarbonize*, MCKINSEY & CO. (Jan. 7, 2020), https://www.mckinsey.com/industries/oil-and-gas/our-insights/the-future-is-now-how-oil-and-gas-companies-can-decarbonize.

75. Ian Tiseo, *Carbon Dioxide Emissions in the United States 1975-2022*, STATISTA (Sept. 12, 2023), https://www.statista.com/statistics/183943/us-carbon-dioxide-emissions-from-1999.

76. *GHGRP Reported Data*, U.S. ENV'T PROT. AGENCY (2022), https://www.epa.gov/ghgreporting/ghgrp-reported-data.

77. *GHGRP Petroleum and Natural Gas Systems*, U.S. ENV'T PROT. AGENCY (2022), https://www.epa.gov/ghgreporting/ghgrp-petroleum-and-natural-gas-systems.

78. *See* Benjamin Storrow & E&E News, *Will Global Emissions Plateau in 2023? Four Trends to Watch*, SCI. AM. (Jan. 6, 2023), https://www.scientificamerican.com/article/will-global-emissions-plateau-in-2023-four-trends-to-watch/.

79. *See Tracking Clean Energy Progress 2023*, INT'L ENERGY AGENCY (July 2023), https://www.iea.org/reports/tracking-clean-energy-progress-2023#overview.

80. *See* Javier Colato & Lindsey Ice, *Charging Into the Future: The Transition to Electric Vehicles*, U.S. BUREAU LAB. STATS.: BEYOND NOS. (Feb. 16, 2023), https://www.bls.gov/opub/btn/volume-12/charging-into-the-future-the-transition-to-electric-vehicles.htm.

between 2023 and 2026 to significantly reduce their emissions.[81] Meanwhile, California has finalized rules to require zero emissions for passenger cars beginning in 2035, and more states are looking into this possibility.[82] All fifty states have been approved to build a national electric vehicle charging network.[83] Although electric vehicles only comprised 5.8% of all new vehicles sold in 2022, sales are expected to continue increasing and become a strong competitor to internal combustion passenger vehicles.[84]

Removing carbon from the atmosphere is critically important to reduce emissions.[85] Although there is no direct federal regulation, the federal government has incentivized carbon removal and storage.[86] Incentivization is a great first step, but the federal government needs to prioritize implementing carbon capture requirements. Likewise, there has been some progress in shifting away from natural gas-powered commercial and residential establishments.[87] Many cities have banned the use of natural gas and require electrification in new buildings.[88] There is currently no federal ban on natural gas, but the IRA implemented tax credits for using electric heat pumps and solar batteries.[89] These steps to minimize emissions and shift away from fossil fuels will cause the industry to drastically repurpose.[90]

The initiation of Biden's five-year plan for offshore oil and gas leasing began in 2024.[91] This plan did not allow any lease sales for offshore oil and gas sites in 2024.[92] Only three sales will be featured in the remaining four years.[93] However, because offshore drilling represents a much smaller portion of the fossil fuel infrastructure compared to the vast number of onshore operations, limiting offshore leases is unlikely

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81. Lashof, *supra* note 73.

82. *Id.*

83. *Id.*

84. *See* Sebastian Blanco, *Electric Vehicle Trends for 2023*, J.D. POWER (Feb. 1, 2023), https://www.jdpower.com/cars/shopping-guides/electric-vehicle-trends-for-2023.

85. *See* ANGELA C. JONES & ASHLEY J. LAWSON, CONG. RSCH. SERV., R44902, CARBON CAPTURE AND SEQUESTRATION (CCS) IN THE UNITED STATES 27 (2022).

86. *See* WHITE HOUSE, *supra* note 1 at 10.

87. *See* Lashof, *supra* note 73.

88. *Id.*

89. *Id.*

90. *See The Oil and Gas Industry in Energy Transitions*, INT'L ENERGY AGENCY 12 (Jan. 2020), https://iea.blob.core.windows.net/assets/4315f4ed-5cb2-4264-b0ee-2054fd34c118/The_Oil_and_Gas_Industry_in_Energy_Transitions.pdf.

91. Jarrett Renshaw & Nichola Groom, *Biden's 5-Year Offshore Oil Plan to Have Historically Few Lease Sales, None in 2024, Sources Say*, REUTERS (Sept. 28, 2023, 6:31 PM), https://www.reuters.com/business/energy/bidens-5-year-offshore-oil-plan-will-have-historically-low-lease-sales-no-sales-2023-09-28/.

92. *Id.*

93. *Id.*

to significantly reduce overall greenhouse gas emissions.[94] This plan was implemented to halt the expansion of offshore oil and gas and allow for the offshore wind industry to grow.[95] This illustrates one of many efforts to even out the playing field between the dominant fossil fuel industry and the rising renewables industry.

Subsequently, the domestic fossil fuel industry should anticipate its energy demand to shift due to current policy, incentives, and foreseeable future regulations.[96] The once dominating industry can expect to now share the market with cleaner energy sources.[97] Renewable energy will likely diminish the heavy reliance on the fossil fuel industry for heat, power, and fuel.[98] Nonetheless, renewables are not perfect replacements for fossil fuels, thus the benefits of fossil fuels cannot allow the industry to be eliminated.[99]

IV. THE INDUSTRY'S IMPACT ON THE ECONOMY AND SOCIETY

While fossil fuels are best known for meeting the energy needs of modern society, they have also played an integral role in job supply, economic prosperity, and useful byproducts.[100] According to the American Petroleum Institute, the oil and gas industry has supplied, directly and indirectly, 9.8 million jobs and makes up approximately 5.6% of the total employment in the United States.[101] Many communities are dependent on the domestic industry for their economies and occupations.[102] In fact, 55.7 million people, approximately 17% of the United States population, reside in fossil fuel "energy communities".[103]

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94. *See 2011-2023 Greenhouse Gas Reporting Program Industrial Profile: Petroleum and Natural Gas Systems*, ENV'T PROT. AGENCY 6, https://www.epa.gov/system/files/documents/2024-10/subpartw_profile_2023.pdf (last visited May 3, 2025).

95. Renshaw & Groom, *supra* note 91.

96. *See* Samantha Gross, *Why Are Fossil Fuels So Hard to Quit?*, BROOKINGS (June 2020), https://www.brookings.edu/articles/why-are-fossil-fuels-so-hard-to-quit.

97. *See id.*

98. *See* Clemens Kienzler et al., *How Oil and Gas Companies Can Be Successful in Renewable Power*, MCKINSEY & CO. (Feb. 27, 2023), https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/how-oil-and-gas-companies-can-be-successful-in-renewable-power.

99. *See* Gross, *supra* note 96.

100. Rinkesh Kukreja, *Various Pros and Cons of Fossil Fuels*, CONSERVE ENERGY FUTURE, https://www.conserve-energy-future.com/pros-and-cons-of-fossil-fuels.php (last visited Feb. 21, 2025).

101. *How Many Jobs Has the Oil and Natural Gas Industry Created?*, AM. PETROL. INST., https://www.api.org/oil-and-natural-gas/energy-primers/hydraulic-fracturing/how-many-jobs-has-the-oil-and-natural-gas-industry-created (last visited Feb. 21, 2025)[hereinafter *Oil & Natural Gas Industry Jobs*].

102. WHITE HOUSE COUNCIL OF ECON. ADVISORS, EXEC. OFF. OF THE PRESIDENT, ECONOMIC REPORT OF THE PRESIDENT 240–42 (2022), https://www.whitehouse.gov/wp-content/up loads/2022 /04/Chapter-7-new.pdf.

103. Rajat Shrestha et al., *Redefining America's 'Energy Communities' Can Boost Clean Energy Investment Where It's Needed Most*, WORLD RES. COUNCIL (July 31, 2023),

The fossil fuel industry has been known to transform relatively poor regions into an area of rich economic development.[104] Specifically, communities in North Dakota and Texas have experienced significant increases in high-paying jobs due to their shale formations.[105] These formations allow for complex hydraulic fracturing and horizontal drilling which supply specialized jobs.[106] On the other hand, communities like Big Horn County, Montana have faced the consequences of renewables shutting down their coal mines.[107] Due to these closures, the mining company in Big Horn was forced to file for bankruptcy, causing the loss of millions of dollars in workers' pensions and taxes owed to the state.[108] Montana also lost a portion of coal royalty checks it would have received from the United States government, resulting in layoffs, increased taxes, and loss of funds for school districts and infrastructure.[109] The situation in Big Horn illustrates the significance the fossil fuel industry has on the economy and the detriment that communities could face if fossil fuels are phased out completely.

Due to the vast expansion into other job sectors, the fossil fuel industry creates a domino effect.[110] When the industry is doing well, the community, economy, and job stability thrive.[111] However, when the operations are disturbed, the effects are felt within the fossil fuel sector and trickle into other sectors such as construction, finance, technology, administration, and government.[112] Although the rise of renewable energy is inevitable, phasing out fossil fuels as the primary source of energy should be approached delicately to avoid the harsh consequences for the communities involved.

Beyond the fuel and natural gas needed to power cars and homes, fossil fuels are responsible for generating many materials and products

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https://www.wri.org/insights/redefining-americas-energy-communities (describing energy communities as special locations categorized by the Inflation Reduction Act under which energy investment is encouraged).

104. *Id.*; *see* Johan Gars & Conny Olovsson, *Fuel for Economic Growth?*, 184 J. ECON. THEORY 2-3, 5-6, 26 (Sept. 2019).

105. *Oil & Natural Gas Industry Jobs, supra* note 101.

106. *Id.*

107. Mark Haggerty & Nicole Gentile, *Quitting Fossil Fuels and Reviving Rural America*, CTR. FOR AMERICAN PROGRESS (Sept. 1, 2022), https://www.americanprogress.org/article/quitting-fossil-fuels-and-reviving-rural-america/.

108. *Id.*

109. *Id.*

110. Noah Kaufman et al., *Economic Performance in US Fossil Fuel Communities*, COLUM. UNIV. 7, 27-8 (Dec. 2024), https://www.energypolicy.columbia.edu/publications/economic-performance-in-us-fossil-fuel-communities/.

111. *Id.*

112. *See* Michaël Aklin & Johannes Urpelainen, *Enable a Just Transition for American Fossil Fuel Workers Through Federal Action*, BROOKINGS (Aug. 2, 2022), https://www.brookings.edu/articles/enable-a-just-transition-for-american-fossil-fuel-workers-through-federal-action/.

that society uses daily.[113] Fossil fuels assist in manufacturing over 6,000 products.[114] Some of these consumer products include adhesive, asphalt, fertilizers, glue, insulation, plastics, propane, and solvents.[115] Common products are backpacks, cameras, crayons, deodorant, and ink.[116] Further, even products like artificial limbs, medicine, medical devices, solar panels, and wind turbine blades are made with fossil fuels.[117] Virtually all products individuals use around them are manufactured using fossil fuels.[118] The reality is that fossil fuels will likely always be needed in some manufacturing capacity.[119] Therefore, it is important to consider the impacts of trying to rid society of fossil fuels completely.[120]

V. WEIGHING THE PROS AND CONS OF THE INDUSTRY

Although the fossil fuel industry plays a significant role in manufacturing and the economy at large, fossil fuels are responsible for severe impacts on the environment and human health.[121] It is important to consider the positive and negative effects the industry has as the decarbonization movement grows.

A. Pros of the Fossil Fuel Industry

Fossil fuels were once thought to be extremely limited because they are a nonrenewable resource, but technological advancements and extraction methods have shifted this notion.[122] Fossil fuels have been located in abundance in almost every country in the world which allows them to satisfy the energy demand without difficulty for the foreseeable future.[123]

Likewise, the recovery of fossil fuels has become a well-developed process that has made fossil fuels convenient and available for

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113. *COGA Fact Sheet: Everyday Products & Uses*, COLO. OIL & GAS ASS'N (June 13, 2019), https://www.coga.org/factsheets/everyday-products-uses.

114. *Products Made from Oil and Natural Gas*, U.S. DEP'T OF ENERGY, https://www.energy.gov/sites/prod/files/2019/11/f68/Products%20Made%20From%20Oil%20and%20Natural%20Gas%20Infographic.pdf.

115. *Id.*

116. *Id.*

117. *Id.*

118. Pam Corn, *Fossil Fuels…It's Not a Simple Solution*, GUTTMAN ENERGY (Oct. 30, 2020), https://www.guttmanenergy.com/fuel-matters-blog/fossil-fuels-its-not-a-simple-solution/.

119. *Id*.

120. *See id.*

121. *See* WHITE HOUSE COUNCIL OF ECON. ADVISORS, *supra* note 102.

122. Robert L. Bradley Jr., *The Growing Abundance of Fossil Fuels*, FOUND. OF ECON. ENERGY (Nov. 1, 1999), https://fee.org/articles/the-growing-abundance-of-fossil-fuels/.

123. Rinkesh, *Various Pros and Cons of Fossil Fuels*, CONSERVE ENERGY FUTURE, https://www.conserve-energy-future.com/pros-and-cons-of-fossil-fuels.php (last visited Feb. 18, 2025).

immediate use.[124] Seismic technology has greatly contributed to the ease of locating fossil fuel formations.[125] These formations usually provide a rich deposit of fossil fuels. Once located, there is usually a rich deposit that provides a large number of resources from that particular area.[126] Fossil fuels are extremely efficient because small quantities are capable of providing large amounts of energy.[127] One kilogram of natural gas contains 53.1 megajoules of energy, while one kilogram of lithium-ion battery only contains 0.5 megajoules of energy.[128] The chemical makeup of fossil fuels makes them highly stable compounds that are easy to store for long periods of time without their molecular composition changing.[129]

Since fossil fuels have been used for centuries, companies are accustomed to the extraction methods and treatment processes which allows for decreased production time compared to more novel renewable sources that require additional research and development.[130] This has allowed them to be relatively cheap to develop, whereas renewables are only recently starting to become comparable.[131] Fossil fuels can be easily stored and inexpensively transported by large trucks, tankers, barges, or railroads, or pumped through a vast network of pipelines above and below ground.[132] This allows oil and gas to be transported from rural or offshore sites to urban developments to provide energy and other byproducts.[133]

Furthermore, fossil fuels are seen as more reliable than other alternative energy forms.[134] This is because oil and gas are not affected by climatic conditions in the same way that renewable forms of energy

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124. John London, *Positives and Negatives of Fossil Fuels*, SCIENCING (Jan. 9, 2018), https://sciencing.com/info-8220975-positives-negatives-fossil-fuels.html.

125. *How Do Geologists Find Oil and Natural Gas?*, DUTTON INSTIT., https://www.e-education.psu.edu/earth109/node/876 (last visited Feb. 18, 2025).

126. Rinkesh, *supra* note 123.

127. *Pros and Cons of Fossil Fuels*, PERCH ENERGY, https://www.perchenergy.com/blog/energy/pros-cons-fossil-fuels (last updated Sept. 30, 2024).

128. *See Generating Electricity: Fossil Fuels*, LET'S TALK SCI. (Dec. 17, 2020), https://letstalkscience.ca/educational-resources/backgrounders/generating-electricity-fossil-fuels#:~:

129. Rinkesh, *supra* note 123.

130. London, *supra* note 124.

131. *Pros and Cons of Fossil Fuels & Why Can Fossil Fuels Be Good?*, METGROUP (July 6, 2020), https://group.met.com/en/mind-the-fyouture/mindthefyouture/pros-and-cons-of-fossil-fuels; *Unpacking the True Cost of Fossil Fuels*, ARCADIA (July 14, 2023) https://www.arcadia.com/blog/true-cost-fossil-fuels.

132. *Oil and Gas Industry: A Research Guide*, LIBR. OF CONG., https://guides.loc.gov/oil-and-gas-industry/midstream/modes#:~: (last visited Feb. 18, 2025).

133. *See Two Reasons We Need Pipelines*, TC ENERGY, https://www.tcenergy.com/about/explore-energy/creating-our-energy-future/two-reasons-we-need-pipelines/#:~: (last visited Feb. 18, 2025).

134. Bill Budinger, *Why Renewables Cannot Replace Fossil Fuels*, DEMOCRACY J. (Feb. 16, 2024), https://democracyjournal.org/arguments/why-renewables-cannot-replace-fossil-fuels/.

are.[135] Solar and wind need a certain amount of sun or wind to provide energy, and if that threshold is not met, there is no energy production.[136] Other weather-related events such as thunderstorms, flooding, droughts, and high temperatures interfere with hydropower, bioenergy crops, wind, and solar.[137]

As mentioned above, fossil fuels directly provide nearly 1.7 million jobs within the industry and indirectly provide Americans jobs in various other sectors.[138] Oil and gas companies also receive steep government subsidies which contribute immensely to the economy.[139] The positive impacts of fossil fuels cannot be denied. Therefore, as decarbonization continues it is important to consider ways of replicating these impacts in alternative forms of energy.

B. Cons of the Fossil Fuel Industry

By far, the biggest disadvantage to fossil fuels is the environmental impact.[140] It is widely known that the burning of fossil fuels is responsible for greenhouse gas emissions which contribute to global warming.[141] As the temperature of the Earth rises, the risk of increased drought, rising waters, severe storms, loss of species, and food scarcity increases.[142] However, natural gas is a relatively "clean"[143] fossil fuel when burned because it emits half the carbon dioxide of coal when burned.[144] Still, other forms of clean energy emit substantially less of

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135. *Midwest Energy & Communications, How Does Weather Affect Renewable Energy?*, MIDWEST ENERGY & COMMC'N, https://www.teammidwest.com/electric/electric-resources/guides-and-tips/how-does-weather-affect-renewable-energy(last visited Jan. 19, 2025).

136. *Id.*

137. *Climate Implications — Alternative and Renewable Energy Sources*, IND. UNIV.: ENV'T RESILIENCE INST., https://eri.iu.edu/erit/implications/alternative-and-renewable-energy-sources.html (last visited Jan. 15, 2025)[hereinafter *Climate Implications*].

138. *See* Tomer et al., *How Renewable Energy Jobs Can Uplift Fossil Fuel Communities and Remake Climate Politics*, BROOKINGS (Feb. 23, 2021), https://www.brookings.edu/articles/how-renewable-energy-jobs-can-uplift-fossil-fuel-communities-and-remake-climate-politics/.

139. Rinkesh, *supra* note 123.

140. *Id.*

141. Jamie Smith, *Advantages and Disadvantages of Fossil Fuels: Do the Cons Outweigh the Pros?*, SOLARREVIEWS, https://www.solarreviews.com/blog/fossil-fuels-pros-and-cons#pros-and-cons-of-fossil-fuels (last visited Apr. 14, 2025).

142. *Causes and Effects of Climate Change*, UNITED NATIONS, https://www.un.org/en/climatechange/causes-and-effects-climate-change (last visited Apr. 14, 2025).

143. *See Natural Gas Explained*, U.S. ENERGY INFO. ADMIN. (Nov. 7, 2022), https://eia.gov/energyexplained/natural-gas/natural-gas-and-the-environment.php (last updated Oct. 10, 2024) (explaining that the burning of natural gas "results in fewer emissions of nearly all types of air pollutants and carbon dioxide" than other fossil fuels. Clean energy sources do not pollute the atmosphere when used, thus natural gas is a more "clean" energy form than other fossil fuels.).

144. Bruce Lieberman, *Pros and Cons: Promise, Pitfalls of Natural Gas*, YALE CLIMATE CONNECTIONS (July 7, 2016), https://yaleclimateconnections.org/2016 /07/pros-and-cons-the-promise-and-pitfalls-of-natural-gas/.

these harmful greenhouse gases.[145] Additionally, this pollution can cause negative effects on human health.[146] High levels of air pollution cause chronic asthma, chronic bronchitis, heart attacks, strokes, and cardiovascular diseases.[147] In 2018, research showed that fossil fuel pollution contributed to more than 8 million deaths globally.[148] In the United States, it is estimated that about 350,000 premature deaths occur from complications derived from fossil fuel production.[149]

Fossil fuels can also be disastrous when mishandled.[150] Oil spills on land or in the sea have the capability to kill hundreds of animals, cause habitat loss, and impact recreational and commercial activities.[151] Runoff from oil spills can lead to pollution of water bodies, devastating the ecosystems.[152]

Although there is conflicting research on exactly when fossil fuels will run out, at some point they will, unlike renewable forms of energy.[153] Renewable energy forms have started to compete for lower production costs than fossil fuels.[154] Fossil fuel prices fluctuate because of foreign affairs like war, strikes by trade unions, and other events like the COVID-19 pandemic.[155] For example, during the COVID-19 pandemic, contract future prices for West Texas Intermediate went from $18 a barrel to -$37 a barrel.[156]

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145. Susan Tierney & Lori Bird, *Setting the Record Straight About Renewable Energy*, WORLD RES. INST. (May 12, 2020), https://www.wri.org/insights/setting-record-straight-about-renewable-energy.

146. Ahsen Soomro, *Pros and Cons of Fossil Fuels*, ENV'T BUDDY, https://www.environmentbuddy.com/energy/pros-and-cons-of-fossil-fuels (last visited Feb. 4, 2025).

147. *Air Quality, Energy and Health,* WORLD HEALTH ORG., https://www.who.int/teams/environment-climate-change-and-health/air-quality-energy-and-health/health-impacts#(last visited Feb. 14, 2025); Byeong-Jae Lee, et al., *Air Pollution Exposure and Cardiovascular Disease*, 30 OFF. J. KOREAN SOC'Y TOXICOLOGY 71, 71 (2014).

148. Anna Miller, *Fossil Fuel Air Pollution Responsible for 1 in 5 Deaths Worldwide*, HARV. T.H. CHAN SCH. OF PUB. HEALTH (Feb. 9, 2021), https://www.hsph.harvard.edu/c-change/news/fossil-fuel-air-pollution-responsible-for-1-in-5-deaths-worldwide/.

149. *Id.*

150. Rinkesh, *supra* note 123.

151. *How Can a Spill Affect Your Community?*, NOAA (Feb. 7, 2025), https://darrp.noaa.gov/oil-spills/how-can-spill-affect-your-community#.

152. Gerardo Bandera, *How Oil Spills Affect Humans and the Environment,* FAIR PLANET (Jan. 18, 2023), https://www.fairplanet.org/story/how-oil-spills-affect-humans-and-the-environ ment /#.

153. *See* Gioietta Kuo, *When Fossil Fuels Run Out, What Then?*, MAHB (May 23, 2019), https://mahb.stanford.edu/library-item/fossil-fuels-run/.

154. *See Is Renewable Energy Cheaper Than Fossil Fuels?*, INSPIRE CLEAN ENERGY, https://www.inspirecleanenergy.com/blog/clean-energy-101/is-renewable-energy-cheaper (last visited Feb. 12, 2025).

155. *See* Rinkesh, *supra* note 123.

156. Matthew Johnston, *What Happened to Oil Prices in 2020*, INVESTOPEDIA (Feb. 22, 2022), https://www.investopedia.com/articles/investing/100615/will-oil-prices-go-2017.asp.

Overall, fossil fuels do significant damage to the environment and human health.[157] The longevity of human life is heavily impacted by the combustion of fossil fuels.[158] On the other hand, fossil fuels have many positive impacts on society and the economy that cannot be overlooked. It is crucial to find ways to incorporate renewable energy forms into the benefits of fossil fuels. Until renewables are capable of providing the economic benefits, job replacements, byproducts, and convenience that fossil fuels provide, fossil fuels will remain a primary source of energy.

VI. PROPOSED SOLUTIONS

As society moves toward decarbonization, the fossil fuel industry should be leveraged, not disregarded. First, the industry should reduce its emissions of carbon dioxide and other pollutants. Second, to reduce the reliance on fossil fuels, renewable energy forms should replace fossil fuels in areas where they currently dominate, such as manufacturing. Lastly, the fossil fuel industry should work to reduce the economic and societal impacts of the transition to renewable energy.

Fossil fuel companies are well-positioned to lead the industry in decarbonization and the energy transition.[159] Many global companies have immense funding and technical knowledge in the industry.[160] Companies can create their own market by developing decarbonization solutions that others can invest in.[161] Carbon capture, utilization, storage, methane leak detection, and the adoption of renewables into their processes are just a few ways the industry can ease the transition to their advantage.[162]

Carbon capture, utilization, and storage (CCUS) has been a tremendous advancement that has allowed the fossil fuel industry to be part of the decarbonization movement.[163] CCUS technology captures carbon dioxide emissions to be used or stored.[164] Once captured, carbon can be put to use in secondary recovery methods of oil and gas or be put into other products.[165] Carbon can be stored and then transported by pipeline or other means to an underground storage site.[166] A possible way to increase CCUS is to create CCUS hubs, which capture carbon from

157. Miller, *supra* note 148.
158. *Id.*
159. Kienzler et al., *supra* note 98.
160. *Id.*
161. *Id.*
162. *Id.*
163. *CCUS Hub Playbook: A Playbook for Regulators, Industrial Emitters, and Hub Developers*, CCUS HUB, https://ccushub.ogci.com/wp-content/uploads/2023/06/CCUS-Playbook_EN_2023.pdf (last visited Feb. 12, 2025).
164. *Id.*
165. *Id.*
166. *Id.*

several sources and store it in a central infrastructure.[167] This would allow for more facilities to efficiently implement CCUS.

Another way that the fossil fuel industry can monitor their emissions is through methane leak detection equipment.[168] Research shows that using this equipment to detect, capture, and sell methane is more profitable for the industry.[169] Methane leaks occur in the pipelines during transportation.[170] Leak monitoring and detection can be accomplished using satellites and aircrafts, which identify hotspots of leaking methane.[171] These methods can take high- and low-resolution images that can identify which piece of equipment is causing the leak.[172] Methane leak monitoring and detection should be done regularly to avoid catastrophic methane leaks.[173]

As mentioned, fossil fuels are crucial to the manufacturing of everyday products.[174] Fossil fuels are often used as a convenience in the manufacturing processes of materials because they save time and money.[175] However, to combat the reliance on fossil fuels, companies could utilize 3D printing for many products, which could potentially also increase energy efficiency.[176] 3D printing is the creation of a three-dimensional object by using additive processes from a digital file.[177] During additive processes, a 3D object is created by laying down successive layers of material until the desired shape is achieved.[178] 3D printers can create medical products, prosthetics, dental products, automotive and aerospace parts, industrial machine parts, and consumer products such as glasses, shoes, and furniture.[179] Yet, there are still more products

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167. *Id.*

168. Tomas de Oliveira Bredariol & Christophe McGlade, *Methane Abatement*, INT'L ENERGY ADMIN., https://www.iea.org/energy-system/fossil-fuels/methane-abatemen (last visited Jan. 26, 2025).

169. *Id.*

170. *Id.*

171. *Methane Leak Detection Supported by Satellites and Aircrafts*, GHGSAT (March 7, 2022), https://www.ghgsat.com/en/newsroom/methane-leak-detection-supported-by-satellites-and-aircrafts/.

172. *Id.*

173. *Id.*

174. *Use of Energy Explained: Energy Use in Industry*, U.S. ENERGY INFO. ADMIN. (July 13, 2023), https://www.eia.gov/energyexplained/use-of-energy/industry.php#.

175. *Id.*

176. *The Potential of 3D Printing for Increasing Energy Efficiency in Industrial Production*, EPLUS3D (June 26, 2023), https://www.eplus3d.com/the-potential-of-3d-printing-for-increasing-energy-efficiency-in-industrial-production.html.

177. *What is 3D Printing?*, 3DPRINTING.COM, https://3dprinting.com/what-is-3d-printing/(last visited Feb. 10, 2025).

178. *Id.*

179. *What Can You Make With a 3D Printer?*, HEWLETT-PACKARD, https://www.hp.com/us-en/printers/3d-printers/learning-center/what-can-you-make-with-3d-printer.html (last visited Feb. 10, 2025).

currently being researched and developed in testing stages.[180] 3D printing is essential for rapid prototyping which allows manufacturers to save production time and increase efficiency.[181] Therefore, 3D printing should be utilized in manufacturing processes to reduce or eliminate the need for fossil fuels.

Additionally, industrial facilities should utilize solar-thermal power to replace the heat generated from fossil fuels within various industrial processes.[182] Solar thermal power systems collect sunlight using mirrors and focus the sunlight into receivers, which accumulate the heat.[183] These systems can also store heat for evenings or cloudy days.[184] Solar-thermal power is a notable alternative that can work as a replacement for fossil fuels in industrial facilities.

Ultimately, many regions rely on fossil fuels for employment and economic purposes.[185] Without any precautions, these communities will suffer during the energy transition.[186] Federal funding programs could provide the monetary relief these communities need in order to stay afloat during the transition.[187] Likewise, these programs can assist in creating or locating renewable energy jobs.[188] Locating these at-risk communities and addressing which renewable energy markets should be invested in will be key in smoothing the energy transition.[189] This is a great opportunity for fossil fuel companies to get involved locally and invest in diverse renewable energy forms.

VII. CONCLUSION

It is overwhelmingly clear that fossil fuels are harming the environment at a rapid and dangerous pace. Fossil fuels cause global warming, hazards to human health, and environmental degradation, all of which do not provide a sustainable planet for future generations. To combat this, renewable energy forms are beginning to increasingly phase out

180. *Id.*

181. *Id.*

182. *See Solar-Thermal Power and Industrial Processes Basics*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.energy.gov/eere/solar/solar-thermal-power-and-industrial-processes-basics#(last visited Jan. 14, 2025).

183. *Solar Explained: Solar Thermal Power Plants*, ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/solar/solar-thermal-power-plants.php# (last updated Apr. 16, 2024).

184. *Id.*

185. Glencora Haskins & Joseph Parilla, *Place-Based Federal Investment Can Chart a New Future for Regions Dependent on Fossil Fuel*, BROOKINGS (Apr. 6, 2023), https://www.brookings.edu/articles/place-based-federal-investment-can-chart-a-new-future-for-regions-dependent-on-fossil-fuel/.

186. *See id.*

187. *See id.*

188. *See id.*

189. *See id.*

fossil fuels due to their zero emissions. However, it is important to consider the negative impacts of eliminating the fossil fuel industry as a whole. Fossil fuels are used in the manufacturing of everyday products, provide employment, and are well-developed, reliable, and convenient.

For the foreseeable future, it is not possible to completely terminate the use of fossil fuels as energy. Instead, leaders in the energy transition should focus on making the energy sector more hybrid and collaborative among the various renewable and nonrenewable forms. The fossil fuel industry should develop methods of decarbonization and implement renewable forms of energy in its processes. In the meantime, the federal government should direct funding to communities that will be negatively impacted by the shift away from fossil fuels. Despite many people's beliefs, the fossil fuel industry should be utilized as a tool to solve the GHG emissions crisis and smooth the energy transition, rather than a problem to be completely eradicated.