CARBON SEQUESTRATION TECHNOLOGY AND THE CLIMATE CRISIS: COULD CORPORATIONS "TAKEBACK" THEIR EMISSIONS?

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Global warming is one of the biggest challenges facing modern society. However, energy policy and environmental technology have been stagnant, particularly in the United States. Carbon Sequestration Technology is a prime example of this stagnation. Originally hailed as a saving grace, the technology has not advanced at the rates scientists and industry alike hoped for. Carbon sequestration refers to any method by which carbon is extracted from the atmosphere and placed back into the biosphere, traditionally the realm of plants. But carbon sequestration technology typically referred to as carbon capture technology, promises to give humans the ability to sequester carbon on a massive scale. The technology, however, has been unable to perform at that massive scale. Legislation has been passed that aims to incentivize further development of the technology, most notably the Inflation Reduction Act, but meaningful progress has remained stubbornly out of reach.

This Note considers the advantages and disadvantages of carbon sequestration technology. It then offers an analysis of a carbon takeback obligation in the context of the United States regulatory and legislative environment. A carbon takeback obligation would require producers of fossil fuels to have extended responsibility for the waste their products create. Specifically, producers would be required to sequester an increasing percentage of the emissions created by their products. Such a scheme has been received favorably by politicians and researchers in other countries but has yet to gain traction in the United States. Nonetheless, with growing public support for comprehensive climate change measures, the current political landscape may present an opportune moment for the government to pursue more ambitious policies.

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I. INTRODUCTION

The world is warming. The global temperature has risen 2°F since 1850 and continues to heat rapidly.[1] This unprecedented anthropological climate change has led to a myriad of humanitarian crises, including natural disasters,[2] diminished water supplies,[3] climate-induced mass-migration,[4] and species extinctions,[5] to name a few. Yet, despite the dire nature of the crisis facing the globe, very few meaningful steps have been taken to combat the issue. Because the worst effects are not currently being felt, public (and private) support for drastic change has been hard to garner. Additionally, there are billions of dollars to be made in the business of burning fossil fuels.[6] These realities create large obstacles for the climate movement. However, despite this, climate change has become a larger focus of the voting public.[7] This gain in political momentum has made climate

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[1]Rebecca Lindsey & Luann Dahlman, *Climate Change: Global Temperature*, CLIMATE.GOV (Jan. 18, 2024), https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature#:~:text=Highlights,2%C2%B0%20F%20in%20total [https://perma.cc/X763-7XLP].

[2] Tiffany Hsu, *Falsehoods Follow Close Behind This Summer's Natural Disasters*, N.Y. TIMES (Aug. 30, 2023), https://www.nytimes.com/2023/08/30/business/media/maui-idalia-disinformation-climate-change.html?searchResultPosition=3 [https://perma.cc/8HSM-CA2S].

[3] Christopher Flavelle, *Colorado River States Are Racing to Agree on Cuts Before Inauguration Day*, N.Y. TIMES (Jan. 6, 2024), https://www.nytimes.com/2024/01/06/climate/colorado-river-negotiations.html?searchResultPosition=1 [https://perma.cc/YL3T-RTPW].

[4] Amanda Taud, *Global Warming Is Bringing More Change Than Just Heat*, N.Y. TIMES (July 19, 2023), https://www.nytimes.com/2023/07/19/world/climate-change-migration.html?searchResultPosition=7 [https://perma.cc/244V-M26C].

[5] Catrin Einhorn, *A Quarter of Freshwater Fish Are at Risk of Extinction, a New Assessment Finds*, N.Y. TIMES (Dec. 11, 2023), https://www.nytimes.com/2023/12/11/climate/climate-change-threatened-species-red-list.html?searchResultPosition=4 [https://perma.cc/67SX-H7XB].

[6] Ron Bousso, *Big Oil Doubles Profits in Blockbuster 2022*, REUTERS (Feb. 8, 2023), https://www.reuters.com/business/energy/big-oil-doubles-profits-blockbuster-2022-2023-02-08/ [https://perma.cc/EP4T-N7YM].

[7] Alec Tyson, Brian Kennedy & Cary Funk, *Gen Z, Millennials Stand Out for Climate Change Activism, Social Media Engagement With Issue*, PEW RSCH. CTR. (May 26, 2021), https://www.pewresearch.org/science/2021/05/26/gen-z-millennials-stand-out-for-climate-change-activism-social-media-engagement-with-issue/ [https://perma.cc/KK3N-Y3DK].

change a mainstream issue and has led to some successful legislation on the issue.[8]

The current state of affairs regarding climate change is not enough. More needs to be done to combat the existential threat. Now is the time to act, when political momentum is swinging toward the side of climate activism and when we have not yet reached a point of no return. The most effective method of combatting climate change is to reduce our reliance on fossil fuels and to find a way to slow down consumption. There is no time for hesitation; we must explore all viable avenues for success.

One method that has been consistently hailed by the fossil fuel industry, but derided by climate activists, is carbon sequestration technology. Carbon sequestration technology encompasses a broad number of techniques, but the essential end result is the transfer of carbon from the atmosphere to some other location, commonly the Earth.[9] The fossil fuel industry sees carbon sequestration technology as a silver bullet, which allows them to 'go green,' while continuing to cash in on the production of fossil fuels.[10] Climate activists see it as an inefficient and untested technology that diverts resources from more critical methods of combating climate change.[11]

This Note will delve into the advantages and disadvantages of carbon sequestration technology alongside an examination of the existing legal and regulatory landscape governing its use. Part II will give some background on the current uses and methods of carbon sequestration. Part III will scrutinize the limitations and critiques of the technology. Part IV will outline the prevailing legal and regulatory framework governing carbon sequestration. Finally, Part V will propose recommendations for advancing the technology, with a specific emphasis on the feasibility of implementing a carbon takeback

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[8] *Inflation Reduction Act Guidebook*, THE WHITE HOUSE, https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/ (last updated Sept. 21, 2023) [https://perma.cc/QJ9B-DSP2].

[9] *DOE Explains…Carbon Sequestration*, OFF. OF SCI., https://www.energy.gov/science/doe-explainscarbon-sequestration (last visited Sept. 19, 2024) [https://perma.cc/DX39-BH7J].

[10] *Carbon Capture and Storage*, SHELL, https://www.shell.com/energy-and-innovation/carbon-capture-and-storage.html#iframe=L3dlYmFwcHMvQ0NTX0dsb2JlLw (last visited Feb. 5, 2024) [https://perma.cc/A85N-5PTJ].

[11] Fiona Harvey, *Carbon Dioxide Removal: The Tech That Is Polarising Climate Science*, THE GUARDIAN (Apr. 25, 2023), https://www.theguardian.com/environment/2023/apr/25/carbon-dioxide-removal-tech-polarising-climate-science [https://perma.cc/8P2T-YSZH].

obligation. Climate change, coupled with carbon sequestration, is a hot-button issue. There are merits on both sides of the debate about the utility of carbon capture technology. However, at this point in the equation, the world has no ability to be picky in our approach to combatting climate change. Therefore, every viable solution warrants thorough examination and should be afforded every opportunity to succeed.

II. CARBON SEQUESTRATION BACKGROUND

Carbon capture technology is not a new invention; the application of carbon capture to combat climate change, however, is a newer, more varied concept. The technology first aided the fossil fuel industry in the early 1970s and was used to make oil recovery more efficient (Enhanced Oil Recovery, or EOR).[12] The first use for environmental purposes, however, did not occur until the late 1990s or early 2000s.[13] The flagship environmental use, the Sleipner CCS project, was implemented by Norway and continues to showcase the positives and negatives of carbon sequestration technology.[14] However, it would be remiss not to mention the oldest use of carbon sequestration: the process by which plants remove carbon from the atmosphere and return oxygen. Scientists and industry have looked to each of these uses to create the current state of carbon capture technology.[15] This Note will primarily focus on larger scale, post-combustion, and direct air capture, but below is a brief discussion of the different technologies.

A. Post-Combustion Capture

Post-combustion capture stands as the predominant method of carbon sequestration, involving the direct capture of carbon emissions at their source.[16] For example, a carbon capture device may be attached to a smokestack to remove the carbon before it ever reaches

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[12] Jinfeng Ma et al., *Carbon Capture and Storage: History and the Road Ahead*, 14 ENG'G 33, 35 (2022), https://www.sciencedirect.com/science/article/pii/S2095809922001357 [https://perma.cc/K2K3-M9AB].
[13] *Id.*
[14] *Id.*
[15] *DOE Explains…Carbon Sequestration*, *supra* note 99.
[16] Eden Weingart, *How Does Carbon Capture Work?*, N.Y. TIMES (Mar. 19, 2023), https://www.nytimes.com/interactive/2023/03/19/us/carbon-capture.html [https://perma.cc/VX4E-9QKS].

the atmosphere. The carbon is separated from the other components within the gas and pressurized for other uses.[17] The general consensus is that this type of carbon capture is one of the more efficient methods because it captures carbon directly from the source when it is at its highest concentration.[18]

B. Direct Air Capture

Another option is direct air capture, which is essentially attempting to pull carbon directly from the atmosphere. This type of technology is not particularly energy efficient due to the lower concentration of carbon dioxide within the atmosphere compared to an industrial smokestack.[19] "Over one thousand tons of ordinary air would have to be processed in order to capture a single ton of [carbon dioxide]," highlighting the inefficiency of this type of method.[20] And the energy needed for direct air capture would make the environmental benefits negligible.[21] Research is being conducted in this area to determine the viability of large-scale direct air capture plants, but it is currently a disfavored process.[22]

III. POST-CAPTURE USE

The fossil fuel industry's utilization of captured carbon is the source of many environmentalists' ire. One of the primary uses of captured carbon is for enhanced oil recovery.[23] Enhanced oil recovery using carbon dioxide is the process by which carbon is injected into the earth to force remaining oil out of the ground.[24] It is similar in nature to fracking, although it is less destructive because, in theory, it

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[17] *Id.*
[18] *Id.*
[19] *Id.*
[20] *Id.*
[21] Mihrimah Ozkan, *Atmospheric Alchemy: The Energy and Cost Dynamics of Air Carbon Capture*, MRS ENERGY & SUSTAINABILITY, 2 (July 9, 2024), https://link.springer.com/article/10.1557/s43581-024-00091-5 [https://perma.cc/XXS4-BLAC].
[22] Silvan Aeschlimann, Charithea Charalambous & Daniel Pike, *Reality Check: This Decade Is Make-or-Break for Direct Air Capture*, RMI (Oct. 17, 2023), https://rmi.org/make-or-break-for-direct-air-capture/ [https://perma.cc/44GS-DFP3].
[23] Weingart, *supra* note 16.
[24] *Id.*

does not change the surrounding geology.[25] But, while that carbon may then be sequestered underground, the oil that it has recovered will be used to release more carbon into the atmosphere. Notably, approximately 78% of carbon sequestration plants utilize carbon for enhanced oil recovery purposes.[26]

The alternative option is to sequester the carbon deep underground in porous rock that has space for the injected gas to occupy.[27] Geologic sequestration is the most environmentally friendly method for carbon sequestration but presents its own unique challenges. Perhaps the largest challenge is merely the fact that it offers no profitable use for the carbon,[28] therefore creating no incentives for businesses to develop the expensive technology. Additionally, in the US, there are specific regulatory challenges surrounding sequestration deep into the earth. Geological sequestration requires a separate class of wells, specifically Class VI wells.[29] As will be explored further in section IV of this note, Class VI wells require a complex permitting process. As such, there are only two Class VI wells in the United States.[30] However, due in part to the incentives created by the Inflation Reduction Act, there are now nearly 200 Class VI well applications under review or approved by the Environmental Protection Agency (EPA).[31] Therefore, carbon capture technology for

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[25] *Enhanced Oil Recovery (EOR) Techniques and Helpful Technology*, IF SOLS., https://ifsolutions.com/what-is-enhanced-oil-recovery-eor-techniques-technology/ (last visited Sept. 19, 2024) [https://perma.cc/4SG6-YMDY].

[26] Leah Douglas, *Explainer: Why Carbon Capture is no Easy Solution to Climate Change*, REUTERS (Nov. 27, 2023, 10:53 AM), https://www.reuters.com/business/environment/why-carbon-capture-is-no-easy-solution-climate-change-2023-11-22/ [https://perma.cc/DR4M-N2NA].

[27] Weingart, *supra* note 16.

[28] *See generally* Fernanda Ferreira & Howard Herzog, *How Much Is Captured CO_2 Worth?*, MIT CLIMATE (Jan. 23, 2023), https://climate.mit.edu/ask-mit/how-much-captured-co2-worth [https://perma.cc/XJU5-E9HF?type=image].

[29] Angela C. Jones, *Injection and Geological Sequestration of Carbon Dioxide: Federal Role and Issues for Congress*, CONG. RSCH. SERV.10 (2022) https://crsreports.congress.gov/product/pdf/R/R46192/2#:~:text=The%20U.S.%20Department%20of%20Energy%20(DOE)%20also%20engages%20in%20underground,credit%20for%20underground%20carbon%20storage.

[30] *Id.* at 11.

[31] *See generally* Ben Grove, *Interactive Map of Class VI Wells for Geologic Storage of Carbon Dioxide*, CLEAN AIR TASK FORCE (Nov. 16, 2023), https://www.catf.us/2023/11/interactive-map-class-vi-wells-geologic-storage-carbon-dioxide/ [https://perma.cc/MBU4-47EW].

true sequestration is gaining momentum but still has hurdles to clear before the benefit can be realized.

IV. CRITIQUES OF CARBON SEQUESTRATION

Carbon Capture technology comes with a few substantial drawbacks and many criticisms. Projects that have been created to scale have not performed as projected; the facilities are incredibly expensive for comparative environmental gains, and the concept of carbon capture creates a false sense of security, preventing current action. The pitfalls must be examined and considered in any projected solution.

Perhaps the biggest concern is the performance of the largest operating carbon sequestration plant. The Sleipner and Snøhvit projects in Norway are some of the largest and longest-running carbon sequestration operations.[32] Between the two projects, they have successfully captured around twenty million tons of carbon dioxide.[33] However, they have both faced unpredictable geological challenges, including the migration of carbon dioxide into previously unidentified areas.[34] Also, despite some of the most thorough monitoring within the oil and gas industry, the geology and behavior of the carbon was unpredictable.[35] That rigorous monitoring must also be continued for decades after closure.[36] Additionally, the Norwegian projects are on an even smaller scale than the majority of the projects being proposed today, creating the possibility of further unpredictability.[37] The two projects highlight the difficult nature and unpredictability of such a complex technology interacting with subterranean geology.

The other issue is the projects' rate of sequestration. A 2022 report indicated that the amount of carbon sequestered from projects

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[32] *See generally* Nour Ghantous, *Norway's Flagship CCS Projects: Cautionary Tale or Showcase?*, ENERGY MONITOR (July 12, 2023), https://www.energymonitor.ai/tech/carbon-removal/norways-flagship-ccs-projects-cautionary-tale-or-showcase/?cf-view [https://perma.cc/PNQ4-HZQC].
[33] *Id.*
[34] *Id.*; *see also* GRANT HAUBER, INST. FOR ENERGY ECON. & FIN. ANALYSIS, NORWAY'S SLEIPNER AND SNØHVIT CCS: INDUSTRY MODELS OR CAUTIONARY TALES? 14 (2023).
[35] Hauber, *supra* note 34.
[36] *Id.*
[37] *Id.*

globally has likely been overestimated by 19–30%.[38] Even at current reporting levels, carbon capture only accounts for approximately 0.12% of total emissions,[39] which also comes at the expensive price of approximately $400–$500 million per unit.[40] As of November 2023, there were forty-two operational commercial carbon capture projects across the world sequestering 0.12–0.13% of the world's emissions.[41] Of those, thirty were involved in enhanced oil recovery.[42] In terms of environmental impact, all of these numbers paint a relatively inefficient system. However, new technology has offered the possibility of lowering costs along with a resurgence of investments in the technology. Regardless, the current numbers are, overall, uninspiring.

Location poses an additional hurdle to technology implementation. Carbon sequestration technology requires extensive geographical area, including extensive pipeline networks and shipping fleets.[43] There is expected to be pushback to these networks, considering most people do not want that type of infrastructure near their communities, as evidenced by the cancellation of a three billion dollar project in the Midwest due to resident concerns.[44] Large industrial eyesores are likely to be placed in communities with less political impact and have inequitably exposed underserved communities to toxins and pollution in the past.[45] Carbon sequestration technologies should not be pursued at the cost of communities that are

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[38] *See generally* Yuting Zhang, Christopher Jackson & Samuel Krevor, *An Estimate of the Amount of Geological CO_2 Storage Over the Period of 1996-2020*, 9 ENV'T. SCI. & TECH. LETTERS 693, 696 (2022).

[39] *See generally* Oliver Gordon, *Global CCS Rates Overestimated by up to 30% - Imperial College London*, ENERGY MONITOR (July 27, 2022), https://www.energymonitor.ai/tech/carbon-removal/global-ccs-rates-overestimated-by-up-to-30-imperial/?cf-view [https://perma.cc/NP46-ACXC].

[40] *See generally* Brendan Bane, *Cheaper Carbon Capture Is on the Way*, PAC. NW. NAT'L LAB'Y (Mar. 11, 2021), https://www.pnnl.gov/news-media/cheaper-carbon-capture-way [https://perma.cc/RH6U-Q7T5].

[41] Douglas, *supra* note 26.

[42] *Id.*

[43] *Id.*

[44] *Id.*

[45] *See generally* Joel D. Kaufman & Anjum Hajat, *Confronting Environmental Racism*, NAT'L LIBR. OF MED. (May 20, 2021), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8137098/ [https://perma.cc/9K8A-Y5BM].

already harmed by existing environmental inequities—most of which they have had close to no hand in creating.[46]

Finally, the primary critique of carbon capture technologies is that companies put an inordinate focus on the technology while continuing to pollute the planet. A recent article in the MIT Technology Review pointed out that "nations and corporations are increasingly relying, openly or implicitly, on large amounts of carbon removal in their net-zero plans, including those from oil and gas companies like Eni and Shell as well as business such as Amazon, Apple, Unilever, and United."[47] They also pointed to the overreliance on planting forests as measures of carbon sinks despite the unreliability of such measures due to inaccurate carbon accounting and the deaths of those trees.[48] In either case, advanced technology or planting trees, the companies point to future prospects of planting a million trees or creating a massive carbon sequestration plant while ignoring the millions of trees currently being destroyed and the necessity of reducing emissions in the present. An assistant professor at the University of Buffalo, Holly Buck, pointed out that "[t]here will be a risk of fossil-fuel companies and others using carbon removal as an imagined way to not shift their business models as long as we don't have a mainstream plan for ending fossil fuels."[49]

The business models need to shift. Carbon capture technologies will be an incredibly important tool for the future, but there needs to be a change made now to the way that business occurs because the current levels of consumption are unsustainable. The remote possibility of massively successful technology in the future should not be used to abscond accountability in the present, particularly considering the fossil fuel industry's knowledge of the climate crisis decades before it became mainstream.[50] It makes an

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[46] *Id.*; *see also* Jonathan Watts, *Richest 1% Account for More Carbon Emissions Than Poorest 66%, Report Says*, THE GUARDIAN (Nov. 19, 2023), https://www.theguardian.com/environment/2023/nov/20/richest-1-account-for-more-carbon-emissions-than-poorest-66-report-says [https://perma.cc/BLJ5-T45J].

[47] *See generally* James Temple, *Carbon Removal Hype is Becoming a Dangerous Distraction*, MIT TECH. R. (July 8, 2021), https://www.technologyreview.com/2021/07/08/1027908/carbon-removal-hype-is-a-dangerous-distraction-climate-change/ [https://perma.cc/K5F4-B78L].

[48] *Id.*

[49] *Id.*

[50] *See generally* G. Supran, S. Rahmstorf & N. Oreskes, *Assessing ExxonMobil's Global Warming Projections*, 379 SCI. (2023), https://www.science.org/doi/epdf/10.1126/science.abk0063 [https://perma.cc/5SVV-TWHB].

observer wonder why the technology was not developed further earlier. But, when a technology does not receive investment, it does not develop. Interest in the technology has now skyrocketed. However, foresight from corporations and the government could have prevented the current need for a mad rush.

V. U.S. REGULATORY ENVIRONMENT

Each branch of the United States government interacts to influence energy policy. The legislature writes and enacts laws that give agencies regulatory power. Then, an agency, here the EPA, operating under its enacted legislation, regulates the industry. Some of that power is delegated to the states, and the courts review agency action for legitimacy. All three branches of government, therefore, must be considered in a policy analysis regarding carbon sequestration. As will be described below, environmental policies have hurdles to overcome, from the regulatory red tape to the strict originalists on the Supreme Court. But, there has been significant progress in carbon sequestration policy in the past few years, with progress speeding up during the Biden administration.[51] The government has spun a complex web around carbon sequestration technology, but the outlook is positive for the development of the technology.

A. The EPA's Regulatory Authority

The EPA is the regulatory agency with the most authority over carbon sequestration technology. They are responsible for permitting and monitoring carbon injection wells through the Safe Drinking Water Act[52] and for setting emission limits through the Clean Air Act.[53] In *Massachusetts v. EPA*, the Supreme Court established that the EPA has regulatory authority over carbon dioxide emissions.[54] Therefore, any federal regulations aimed at decreasing carbon dioxide emissions would be promulgated under the Clean Air Act through the EPA. The EPA has authority over carbon sequestration from the underground to the atmosphere.

Starting with their underground authority, the agency has created a regulatory scheme for injection wells called underground

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[51] Jones, *supra* note 292929, at 20.
[52] *Id.* at 9.
[53] Clean Air Act, 42 U.S.C. § 7401 (1970).
[54] Massachusetts v. EPA, 549 U.S. 497, 534 (2007).

injection control (UIC). There are six UIC well classes, with each class being subject to a different set of performance standards. Class V wells are the most prevalent type of injection well, which encompasses non-hazardous fluids such as stormwater drainage, septic system leach fields, aquifer storage and recovery wells, and experimental wells.[55] The next most prevalent type of well is the Class II well, which provides standards for injection of fluids associated with oil and natural gas production, including injection of carbon dioxide for enhanced oil recovery.[56] The least common injection well is a Class VI well, accounting for less than .01% of the total number of wells in the United States.[57] Geological carbon sequestration, the type of sequestration that injects carbon dioxide deep in porous rock for long-term storage, is categorized under Class VI wells. However, since the creation of Class VI in 2011, only six such permits have been granted, and only two of those permits resulted in well construction.[58]

The regulatory scheme provides some challenges to the continued creation of Class VI wells. The EPA has the authority to directly administer the UIC programs and, therefore, regulate the wells.[59] However, they are also able to grant primacy to individual states, so each state can create its own regulatory scheme (within federal guidelines). States may submit primacy applications for all well classes, Classes I–V, or Class VI (only).[60] Only three states have been granted primacy for Class VI wells: North Dakota, Wyoming, and Louisiana.[61] One of the main barriers to state primacy is the incredibly long and complex application process, generally taking up to six

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[55] Jones, *supra* note 29, at 11.
[56] *Id.* at 10.
[57] *Id.* For more current data, see *Current Class VI Projects Under Review at EPA*, EPA, https://www.epa.gov/uic/current-class-vi-projects-under-review-epa (last visited Apr. 1, 2024) [https://perma.cc/8UYR-8CKX] and *Table of EPA's Draft and Final Class VI Well Permits*, EPA, https://www.epa.gov/uic/table-epas-draft-and-final-class-vi-well-permits (last visited Apr. 1, 2024) [https://perma.cc/5FMK-L5EQ]. As of March 2024, there are 42 projects under review, with 2 projects having active permits. But the 44 projects still amount to less than .01% of total wells.
[58] NATHAN MUSICK ET AL., CONG. BUDGET OFF., 59345, CARBON CAPTURE AND STORAGE IN THE UNITED STATES, (2023) [hereinafter CCS in the U.S.].
[59] Jones, *supra* note 29, at 9.
[60] *Primary Enforcement Authority for the Underground Injection Control Program*, EPA, https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program-0 (last visited Apr. 2, 2024) [https://perma.cc/ZX9E-RF98].
[61] *Id.*

years.[62] On top of the application process, any carbon sequestration projects that use federal funding or cross through federal land must be reviewed under the National Environmental Policy Act (NEPA), where the federal agency prepares an environmental impact assessment.[63] NEPA review can also take multiple years to complete.[64] Finally, once the wells are constructed, they are subject to the Clean Air Act its reporting requirements.[65]

The Clean Air Act requires the EPA to regulate air emissions from both stationary and mobile sources.[66] As such, any regulation that would incentivize the use of carbon sequestration would be promulgated under the Clean Air Act, barring further legislation. The EPA sets National Ambient Air Quality Standards (NAAQS), which are limits on hazardous air pollutants in the ambient air "requisite to protect the public health."[67] There are six "criteria" air pollutants, or pollutants that have been identified as particularly harmful to public health and are strictly regulated.[68] Those pollutants are: carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution, and sulfur dioxide.[69] Each pollutant has an individualized limit. Based on these limits, states set implementation plans (SIPs).[70] As a part of these plans, states are required to strictly limit the construction of new emission sources.[71] New stationary sources, such as factories, must meet a set "standard of performance," which is informed by the "best system of emissions reduction" available at the time.[72]

Where carbon dioxide, and greenhouse gases generally, fit into this regulatory scheme has been an issue highly contested in court. In *Massachusetts v. EPA*, the Supreme Court held that the EPA must regulate greenhouse gases (GHGs) because "greenhouse gases fit well within the Clean Air Act's capacious definition of 'air pollutant'. . . ."[73] However, in *Utility Air Regulatory Group v. EPA*, the Court

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[62] BOB VAN VOORHEES, SALLIE GREENBERG & STEVE WHITTAKER, OBSERVATIONS ON CLASS VI PERMITTING: LESSONS LEARNED AND GUIDANCE AVAILABLE 3 (2021).
[63] CCS in the U.S., *supra* note 58.
[64] *Id.*
[65] Jones, *supra* note 29, at 17.
[66] 42 U.S.C. § 7408.
[67] 42 U.S.C. § 7409.
[68] *NAAQS Table*, EPA, https://www.epa.gov/criteria-air-pollutants/naaqs-table (last visited Apr. 1, 2024) [https://perma.cc/2H5Y-5BD8].
[69] *Id.*
[70] 42 U.S.C. § 7410.
[71] *Id.*
[72] 42 U.S.C. § 7411.
[73] Massachusetts v. EPA, 549 U.S. 497, 532 (2007).

indicated that the EPA overstepped their authority in using solely greenhouse gas emissions to trigger Clean Air Act permitting requirements for "major sources," or a source with the potential to emit 100 tons per year of any air pollutant.[74] The Court upheld the EPA's authority to require the best available control technology for GHGs at sources that would otherwise be subject to regulation based on their emissions of criteria pollutants.[75] In essence, *Utility Air* recognized that the EPA must regulate greenhouse gas emissions but required that the agency use a context-appropriate approach when interpreting the term "air pollution" to include greenhouse gases.[76] How to regulate GHGs, therefore, has been a continued source of consternation for the EPA. Requiring the use of carbon sequestration technology is one avenue available to the EPA, but so far, it has not been utilized. And recent developments in the law surrounding the Clean Air Act have changed the landscape further.

B. The Supreme Court's Current Interpretation of the Clean Air Act

The Supreme Court's decision in *West Virginia v. EPA* has had reverberating effects on the regulatory world and, specifically, on the EPA's ability to combat climate change. *West Virginia v. EPA* considered an Obama-era EPA policy that regulated the emissions of power plants through the Clean Air Act.[77] The Court struck the policy down, holding that the EPA required clear congressional authorization to address "major questions," or questions with significant economic or political impact.[78] They found that the Clean Air Act did not give the EPA broad authorization to address climate change and pollution generally; rather, the Court limited the EPA's regulatory authority to individual stationary sources. They reiterated the holding from *Utility Air Regulatory Group*, that the EPA may require individual sources to utilize the "best system of emissions reductions" or the "best available control technology."[79] But the agency could not create broader regulation schemes involving carbon markets and generation shifting

[74] Utility Air Regulatory Group v. EPA, 573 U.S. 302, 310 (2014).
[75] *Id.* at 332.
[76] *Id.* at 331–32.
[77] West Virginia v. EPA, 597 U.S. 697, 706 (2022).
[78] *Id.* at 732.
[79] *Id.*

schemes because there was no "clear congressional authorization" for such a scheme.[80]

This case marked the true inception of the Major Questions Doctrine, which requires explicit legislative authority for acts that affect large swaths of the United States. The court looked to a line of cases, which included *Utility Air*, for the legal principle that there are "extraordinary cases in which the history and the breadth of the authority that the agency has asserted, and the economic and political significance of that assertion, provide a reason to hesitate before concluding that Congress meant to confer such authority."[81] There is no clear line for what counts as a significant historical, economic, or political act; the Court uses the terms "extraordinary cases" or "extraordinary grants of regulatory authority" frequently throughout the opinion without ever defining it further.[82] Therefore, this case primarily represents a significant curtailing of regulatory power. The Court is signaling that in order for agencies to create any rules that could be controversial, there must be some salient textual hook for their actions. In "extraordinary cases,"[83] the agency is granted no deference in their interpretation of the authorizing statute. If Congress wants to give an agency power to implement a specific, far-reaching program, it must write legislation that explicitly details such a program.

Additionally, in *Loper Bright Enterprise v. Relentless*, the Court further curtailed agency power. [84] *Loper* overturned *Chevron* doctrine, which had instructed courts to defer to agency interpretation of ambiguous statutes.[85] Therefore, between *West Virginia* and *Loper*, future regulations must be neatly tailored to the language of the Clean Air Act and the standards the Court has set, or new legislation must be written that is explicit in allowing the EPA to address climate change in a broad sense.

C. Legislation Addressing Carbon Sequestration

The U.S. has a plethora of legislation surrounding carbon sequestration. However, despite the funding injected into the Department of Energy (DOE) for carbon sequestration technology, the

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[80] *Id.*
[81] *Id.* at syllabus (internal citations omitted).
[82] *See, e.g.*, *id.* at 721–23 (using extraordinary four times).
[83] *Id.*
[84] Loper Bright Enter. v. Raimondo, 144 S. Ct. 2244, 2273 (2024).
[85] *Id.*

technology itself has remained relatively stagnant in the fifty-plus years it has been around. There was very little done in the way of incentivizing development, and there still have been no restrictions created that mandate its use. There is no legislation close to the explicit mandate the EPA will need to create a larger scheme of use. The Inflation Reduction Act created by President Biden is taking steps in the right direction, but it demonstrates the monumental efforts that will now be needed to get this technology up to par to meet the challenges of climate change.[86] For a technology that has been around since the 1970s, its lack of progress is an indictment of the administrations that have pushed it off prior.

Early carbon capture policy primarily focused on energy efficiency. One of the first pieces of legislation relating to carbon sequestration was passed in 2005. The Energy Policy Act of 2005 instructed the DOE to implement a research, development, and demonstration (RD&D) program with the goal of "promot[ing] a robust carbon sequestration program,"[87] which included a focus on enhanced oil recovery while increasing the sequestration of carbon dioxide.[88] The Energy Independence and Security Act of 2007 expanded the DOE's RD&D program, with a greater focus on large-scale sequestration.[89] The Energy Improvement and Extension Act of 2008 created the 45Q tax credit, which originally applied only to carbon dioxide and was limited to the first seventy-five million metric tons of carbon dioxide.[90] The Act was intended to help clean up the emissions from the coal industry. Finally, there was the American Recovery and Reinvestment Act of 2009, which provided $3.4 billion for carbon sequestration programs.[91] The Act resulted in two currently operating carbon sequestration projects: Air Products and Illinois Industrial.[92] The legislative history shows that carbon sequestration has been a piece of American energy policy for almost two decades.[93] However, research and development were primarily targeted at making the energy sector more efficient, such as through EOR, with a

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[86] *See generally The Section 45Q Tax Credit for Carbon Sequestration*, CONG. RSCH. SERV., (Aug. 25, 2023), https://crsreports.congress.gov/product/pdf/IF/IF11455 [https://perma.cc/5KU9-85F6] [hereinafter *45Q Tax Credit*].
[87] Energy Policy Act of 2005, Pub. L. No. 109-58, §963, 119 Stat. 594, 892 (2005).
[88] Jones, *supra* note 2929, at 18.
[89] *Id.*
[90] *45Q Tax Credit*, *supra* note 86, at 1.
[91] CCS in the U.S., *supra* note 58.
[92] *Id.*
[93] Jones, *supra* note 29, at 18.

smaller goal of cleaning up emissions.[94] The policy has not changed drastically since 2005, but the public's focus on climate change has increased the pressure to develop the technology.

Subsequent administrations have taken on the challenge of expanding carbon sequestration with increasing urgency. The Energy Act of 2020 further expanded the DOE's RD&D program; however, it shifted the focus of the development more toward large-scale geological carbon sequestration projects.[95] In 2021, Congress passed the USE IT Act, or the Utilizing Emission with Innovative Technologies Act.[96] Essentially, the Act was aimed at speeding up the regulatory processes surrounding carbon sequestration.[97] The Infrastructure Investment and Jobs Act of 2021 further expanded this by including a focus on commercialization for projects.[98] It also significantly increased funding.[99]

Finally, the Inflation Reduction Act of 2022 expanded the 45Q tax credit and amended the Clean Air Act.[100] The base rates of the tax credit were changed; geologically sequestered carbon dioxide (no EOR) now has the highest credit value, as long as the facility also meets specific wage and apprenticeship requirements.[101] It also extended the deadline to begin construction on carbon capture facilities by eight years.[102] For the Clean Air Act amendments, the legislation was partially a response to the decision by the court in *West Virginia v. EPA*.[103] Importantly, it defines greenhouse gases as pollutants in multiple provisions and provides funding for air pollution programs.[104] The identified GHGs are: carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride.[105] The new language does not expand the EPA's authority to allow the type of plan that the Supreme Court rejected in

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[94] *Id.*
[95] *Id.* at 19.
[96] *Id.*
[97] *See id.*
[98] *Id.* at 20.
[99] *Id.*
[100] *Id.*
[101] *45Q Tax Credit*, *supra* note 86, at 2.
[102] *Id.* at 1.
[103] Greg Doston & Dustin J. Maghamfar, *The Clean Air Act Amendments of 2022: Clean Air, Climate Change, and The Inflation Reduction Act*, 53 ENV'T L. REP. 10017, 10018 (2023).
[104] *See, e.g.*, 42 U.S.C. § 7435; 42 U.S.C. § 7437; 42 U.S.C. § 7434.
[105] *Id.*

West Virginia, but it takes steps to protect the EPA from future legal challenges regarding its authority to regulate greenhouse gases.

VI. SOLUTIONS

There are two steps the government can take from here. One is regulatory and is an action the EPA is already pursuing. The second is legislative and is a further reach that requires global cooperation. Ideally, both solutions would be used in conjunction, but it is beneficial to consider both a more immediate solution and a more ambitious solution. The regulatory option, a new EPA rule, will be considered first, and the legislative option, a carbon takeback obligation, will be considered second.

A. Regulatory Solution: New Source Performance Standard

Ironically, the Court's decision in *West Virginia v. EPA* pushes the EPA further towards carbon sequestration. While the decision undercuts the EPA's ability to address climate change on a fundamental level, it leaves the door open for the EPA to require carbon capture technology on individual stationary sources. Such a rule would be within their traditional scope of power. The Clean Air Act allows the EPA to set emission limits based on the "best system of emission reduction," or BSER.[106] BSER typically refers to the types of technology placed on stationary sources that reduce their emissions, such as filters or chemical treatments.[107] Post-combustion capture could be considered such a technology. Recognizing this, the EPA is proposing a rule that would substantially limit carbon dioxide emissions from fuel-fired power plants based on carbon sequestration technology.[108] Essentially, the EPA can set the limit based on the assumption that the factory will be able to sequester a certain percentage of its carbon emissions. The EPA would need to issue findings to support whatever number they reach, but for conversation's sake, we can say that current technology would allow a factory to sequester 50% of the carbon they produce. If they typically produce

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[106] 42 U.S.C. § 7411.

[107] *See Monitoring by Control Technique*, EPA, https://www.epa.gov/air-emissions-monitoring-knowledge-base/monitoring-control-technique (last visited Apr. 4, 2024) [https://perma.cc/K4RZ-MAHQ].

[108] *Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants*, EPA, https://www.epa.gov/stationary-sources-air-pollution/greenhouse-gas-standards-and-guidelines-fossil-fuel-fired-power (last visited Apr. 4, 2024) [https://perma.cc/E8X2-QD4P].

1,200 metric tons of carbon, the EPA could create a rule that says factories may only emit 6,000 metric tons in the same amount of time. The explanation is an oversimplification of the process, but the general principle remains.

However, such a rule would only apply to new factories because the EPA primarily has the authority to require the most efficient technology on new sources. The grandfather clause of the Clean Air Act limits the EPA's authority to regulate existing power plants, at least as far as limiting their emissions.[109] The BSER requirement would be a new source performance standard as described in Section 111 of the Clean Air Act.[110]

Such a rule is destined to be the subject of legal challenges positing that the rule addresses a "major question" for which the EPA does not have clear congressional authorization to address. Alternatively, opponents might argue that the EPA did not adequately consider cost in its decision-making. There are a host of challenges opponents might bring, but even under the *West Virginia* decision, the rule appears to be safely within the EPA's statutory authority.

B. Legislative Solution: Carbon Takeback Obligation

The ultimate goal is to achieve net zero emissions. Carbon sequestration offers the hope that we may be able to reach net zero while still using fossil fuels. However, the technology is nowhere near ready to be deployed on such a massive scale and also costs billions of dollars.[111] Some activists see such large-scale carbon sequestration as a pipe dream at best and a lethal distraction at worst.[112] The government so far has incentivized the development of the technology, with very little to show for the massive amounts of money that has been poured into the project.[113] When surveying this landscape, there has been a growing number of academics who have simply said, make

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[109] Richard L. Revesz & Jack Lienke, *The Tragic Flaw of the Clean Air Act*, THE REGUL. REV. (May 17, 2016), https://www.theregreview.org/2016/05/17/revesz-lienke-tragic-flaw-clean-air-act/ [https://perma.cc/5R5W-48XY].

[110] *See* 42 U.S.C. § 7411.

[111] *See* CCS in the U.S., *supra* note 5858.

[112] *See generally Carbon Capture and Storage—Dangerous Distractions*, CLIMATE ACTION NETWORK, https://climatenetwork.org/resource/carbon-capture-and-storage-dangerous-distractions/#:~:text=Dangerous%20Distractions%20like%20Carbon%20Capture,harm%20to%20people%20and%20ecosystems (last visited Sept. 19, 2024) [https://perma.cc/Q5WS-LGSH].

[113] *See generally* Jones, *supra* note 29.

it the fossil fuel industry's problem.[114] Or, in other words, make them "take back" the carbon they produce. Set a percentage of their emissions that they must sequester, and they must either reduce emissions to ease the burden or invest in the technology that will allow them to sequester the amount of carbon required. Such a policy, or a "carbon takeback obligation," has been primarily discussed by academics in the UK, owing in large part to a paper published by prominent Oxford climate scientists.[115] However, a carbon takeback obligation would face unique challenges within the United States.

i. What Would a Carbon Takeback Obligation Look Like?

The cornerstone of a carbon takeback obligation is the requirement that producers account for the sequestration of their carbon (either through technology or nature-based solutions) on a gradually increasing scale. The policy underpinning a carbon takeback obligation is an extended producer responsibility (EPR) scheme. EPR, as implemented in France, defines a producer as "any natural or legal person who develops, manufactures, handles, treats, sells or imports waste-generating products," and those producers "may be required to provide or contribute to the prevention and management of the resulting waste."[116] Applied to carbon emissions, this looks like requiring the companies that extract fossil fuels to pay for an equivalent quantity of carbon dioxide to be stored geologically.[117]

Therefore, the target of a takeback obligation would be any fossil fuel use. The reach of the policy would be wide, as extracted oil, gas, and coal are used throughout all of society, including household use. The policy would, in effect, reach household emissions just as it reaches corporate emissions but places the burden of reduction on the companies that are reaping the profits from producing fossil fuels. This would make fossil fuels more expensive across the board, but it may prompt a transition to renewable energy sources. Also, if the

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[114] *See* Oliver Gordon, *How a "Carbon Takeback Obligation" Can Ensure Net Zero*, ENERGY MONITOR (Apr. 13, 2023), https://www.energymonitor.ai/tech/carbon-removal/how-a-carbon-takeback-obligation-can-ensure-net-zero/ [https://perma.cc/VE95-AF64].

[115] *Id.*

[116] Stuart Jenkins et al., *Extended Producer Responsibility for Fossil Fuels*, 18 ENV'T RSCH. LETTERS 1, 2 (2023).

[117] *See* Fiona Harvey, *Fossil Fuel Producers Must be Forced to 'Take Back' Carbon, Say Scientists*, THE GUARDIAN (Jan. 12, 2023), https://www.theguardian.com/environment/2023/jan/12/fossil-fuel-producers-must-be-forced-to-take-back-carbon-say-scientists [https://perma.cc/X28S-GNDA].

companies wish to continue selling their product in mass, they will be forced to find ways to make it more affordable, meaning companies will be incentivized to invest in carbon capture technology to advance the technology and lower the price. Although, as the percentage they are required to takeback increases, the price of sequestration will likely increase as well due to the increased difficulty of storing such large amounts of carbon.[118] However, hopefully, by the time the percentage nears 100, the world will have shifted further towards renewable energy sources.

Additionally, the policy avoids some of the pitfalls realized by other energy policies. The preeminent paper identifies the "energy policy trilemma," or the trade-offs between affordability, environmental impact, and security of supply.[119] The authors offer the conflict in Ukraine as a prime example of how national security concerns will immediately trump any environmental policy.[120] Once they were pressed, governments chose to remove the cap from cap-and-trade systems because of a shortened gas supply. The takeback obligation avoids this by not capping emissions but requiring responsibility for those emissions. So, in a scenario where fuel is running low, the increased profit margin would offset the increased utilization of sequestration (either through their own technology or credit purchases). This also gets to the heart of the argument for the takeback obligation: the affordability question. Considering the profits of oil companies are in the billions,[121] it makes sense that paying for environmental degradation should be internalized as a cost of doing business, as opposed to externalized to governments and taxpayers. Particularly because those costs will have to be borne by someone eventually, whether in the form of government-sponsored development of carbon sequestration or in the form of costs from unmitigated climate change.[122] Therefore, as a policy, a carbon

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[118] *See* Jenkins, *supra* note 116, at 4.
[119] *Id.* at 1.
[120] *See id.* at 1–2.
[121] *See generally* Ron Bousso, *Shell Boosts Dividend After $28 Billion Profit for 2023*, REUTERS (Feb. 1, 2024, 12:58 PM), https://www.reuters.com/markets/commodities/shells-2023-profit-falls-30-28-billion-buybacks-extended-2024-02-01/ [https://perma.cc/PLU5-KYAJ].
[122] *See generally* Paige Bennet, *Climate Change is Costing the World $16 Million Per Hour: Study*, WORLD ECONOMIC FORUM (Oct. 12, 2023), https://www.weforum.org/agenda/2023/10/climate-loss-and-damage-cost-16-million-per-hour/#:~:text=Follow-,The%20global%20cost%20of%20climate%20change%20damage%20is%20estimat

sequestration requirement sounds like the ideal solution. However, as with any policy, there are challenges.

ii. A Carbon Takeback Obligation in the United States

There are a few predictable challenges to a carbon takeback obligation and likely many unforeseen challenges. Additionally, each country will have its own obstacles to achieving such an ambitious policy goal. The study that reignited interest in a takeback obligation, and most responses to the article primarily considered the feasibility in Western Europe.[123] However, in order for the policy to be successful, the paper identifies the participants as all of the countries in the OECD (The Organization for Economic Cooperation and Development).[124] The United States, along with thirty-seven other countries, are part of the OCED.[125] Therefore, this portion of the Note will consider the specific struggles facing the United States.

First, there is a need for all thirty-eight countries to cooperate for the policy to be successful. If only one country fully implements the plan, they will inevitably drive the oil and gas industry out of their country and will face massively inflated prices compared to other countries. The paper proposes that even imported fuels would need to take on responsibility for the disposal of their carbon waste.[126] Done as a unified group, this means that oil companies anywhere that hope to do business with some of the largest economies in the world would be required to engage in a takeback obligation. But, if only a few countries were to implement the policy, the companies would likely not have a large enough incentive to completely overhaul their business structure and would, instead, pass the costs of sequestration technology onto the consumers. Therefore, the few countries that

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ed%20to,climate%20change%20become%20more%20severe (the global cost of climate change damage is estimated to be between $1.7 trillion and $3.1 trillion per year by 2050. This includes the cost of damage to infrastructure, property, agriculture, and human health) [https://perma.cc/G9SE-K8AX].

[123] *See, e.g.*, Jenkins, *supra* note 116.

[124] *Id.* at 2.

[125] *See The Organization for Economic Cooperation and Development (OECD)*, U.S. DEP'T OF STATE, https://www.state.gov/the-organization-for-economic-co-operation-and-development-oecd/#:~:text=and%20Development%20(OECD)-,The%20Organization%20for%20Economic%20Cooperation%20and%20Development%20(OECD),to%20promote%20sustainable%20economic%20growth (last visited Apr. 2, 2024) [https://perma.cc/T8M4-23FF].

[126] *See* Jenkins, *supra* note 116, at 2.

would participate would be significantly burdened. The policy will only work to maximum effect if it is implemented widely.

Next, the policy also contemplates a tandem policy of "safe civilian use of fossil fuels."[127] The article does not describe exactly what this would look like, but it can be assumed this would involve incentivizing individuals to make clean energy choices and reduce their reliance on fossil fuels. In the United Kingdom and most of Western Europe, where there are developed public transit systems, walkable cities, and less electricity usage, this type of policy is more feasible. However, the average United States citizen is known for their outsized energy consumption, and this is not the result of personal moral failings.[128] The United States transportation system, and the entire culture, revolves around individual car use. The transportation sector makes up the largest portion of the United States' carbon emissions.[129] Therefore, any policy that introduces the concept of "safe civilian use of fossil fuels" would also need to introduce changes to the United States transportation industry, a notoriously difficult task.[130]

Perhaps one of the largest obstacles to a carbon takeback obligation, however, is the current political and regulatory environment. First, the United States would need to agree to join the OCED countries in pursuing the policy. Such a policy agreement would likely be similar to the Paris Climate Agreement. As evidenced by the United States' treatment of the Paris Agreement, it is clear that continuing involvement in any international plan would be suspect with each administration change.[131] Assuming the United States stayed

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[127] *Id.* at 5.

[128] *See generally What Is the United States' Share of World Energy Consumption?*, EIA, https://www.eia.gov/tools/faqs/faq.php?id=87&t=1#:~:text=The%20United%20States'%20percentage%20share,energy%20consumption%20in%20the%20world (last visited Apr. 11, 2024) [https://perma.cc/Q266-R4BL].

[129] David Kidd, *US Regulatory Barrier to an Ambitious Paris Agreement Commitment*, HARV. L. SCH. ENV'T AND ENERGY L. PROGRAM (Apr. 22, 2021), https://eelp.law.harvard.edu/2021/04/us-paris-commitment/ [https://perma.cc/HC9Q-L5G5].

[130] *See generally* Chelsea Graham, *Why Doesn't the U.S. Have Better Public Transportation*, SUSTAINABLE AM. (Apr. 30, 2023), https://sustainableamerica.org/blog/why-doesnt-the-us-have-better-public-transportation/ [https://perma.cc/7H36-6TNJ].

[131] In 2019, the United States withdrew from the Paris Climate Agreement under the Trump administration. The United States rejoined the Agreement in 2021 under the Biden Administration. *See* Michael R. Pompeo, *On the U.S. Withdrawal From the*

committed to a carbon takeback obligation with the other OCED countries, there would need to be follow-through with the Agreement. Again, the Paris Climate Agreement is the perfect example of how theoretical consensus between countries does not typically play out as expected. Each country committed to a nationally determined contribution, or NDC, as part of the Agreement.[132] However, while each country has made progress, the targets have not been uniformly met.[133] President Biden has committed to a 50–52% reduction in national greenhouse emissions by 2030[134], but the same issues that plague such a commitment would plague a carbon takeback obligation as well.

The primary obstacle to both the Paris Climate Agreement and a carbon takeback obligation is the reduced agency capacity of the EPA. The Trump-era EPA instituted rules that limited their authority, and while the Biden-era EPA is working to re-write those rules, the constant back-and-forth significantly slows down the effectiveness of the agency.[135] But the largest impediment is the Supreme Court's ruling in *West Virginia v. EPA*. As mentioned earlier, the ruling limited the EPA's authority to address questions of major economic or political importance, such as climate change. Although the decision shifted the EPA's focus more towards carbon sequestration,[136] a carbon takeback obligation would undoubtedly be addressing a major economic question. A carbon takeback obligation requires too many of the tactics the Court specifically designated as outside of the EPA's authority, such as carbon markets and sector-wide mechanisms for pollution reduction.[137]

As a result, the agency would need a very clear congressional authorization to regulate the fossil fuel industry in such a way. In order to enforce the regulation for a carbon takeback obligation, a landmark environmental law would need to be written on par with the likes of

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Paris Agreement, U.S. DEP'T OF STATE (Nov. 4, 2019), https://2017-2021.state.gov/on-the-u-s-withdrawal-from-the-paris-agreement/ [https://perma.cc/N4HW-23TR]; Antony J. Blinken, *The Unites States Officially Rejoins the Paris Agreement*, U.S. DEP'T OF STATE (Feb. 19, 2021), https://www.state.gov/the-united-states-officially-rejoins-the-paris-agreement/ [https://perma.cc/C34Q-QEMF].

[132] Kidd, *supra* note 129.

[133] *Id.*

[134] *Id.*

[135] *Id.*

[136] *See Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants*, *supra* note 108.

[137] *See* West Virginia v. EPA, 597 U.S. 697, 731–32 (2022).

the Clean Air Act and Clean Water Act. Given the current lack of coordination and efficiency in congressional legislating ability, that type of significant legislation has been more and more difficult to achieve. The Inflation Reduction Act is the most ambitious piece of environmental legislation since the Clean Air Act and Clean Water Act, but, similar to previous legislation, it provides only the carrot, and not the stick, regarding many environmental goals. One positive attribute of the Inflation Reduction Act is amending the Clean Air Act to name carbon dioxide and other greenhouse gases explicitly as air pollutants, broadening the EPA's authority, but the regulation will still be limited to individual stationary sources.[138] Therefore, explicit and ambitious legislation would be needed to implement a carbon takeback obligation.

VII. CONCLUSION

Technology that is not invested in does not develop. Technology to address climate change needs to be a focus for the United States government, and the world. Investment can look like monetary investment, regulatory investment, legislative investment, or any other amount of focus on the technology. Carbon sequestration is the prime example of a technology forgotten for too long, and now is being hailed as a possible savior for industry and the climate movement. However, the urgency of the crisis, and the pitfalls of the technology, add a greater sense of urgency to our current approach. As such, a carbon takeback obligation is a drastic approach that can hopefully address many of the main concerns, such as industry culpability, expensive development, and global cooperation. But such a solution will require collaboration between the different branches of the United States government and between the greater international community. New EPA rules within the current, slow moving, regulatory scheme are important and more realistic options, but drastic action is needed to protect the world from climate catastrophe. All methods to address climate change should be considered, and a carbon takeback obligation is a promising one.

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[138] *See generally* Sanjay Rajagopalan & Philip J. Landrigan, *The Inflation Reduction Act – Implications for Climate Change, Air Pollution, and Health*, NIH (June 10, 2023), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10276136/ [https://perma.cc/B54C-3F7W].