THE ONCE AND FUTURE CLEAN AIR ACT: IMPACTS OF THE INFLATION REDUCTION ACT ON EPA'S REGULATORY AUTHORITY

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Abstract: The Clean Air Act is one of Congress's greatest success stories. The major piece of legislation, passed in the context of environmental and public health crises, has driven technological change through regulation that has dramatically improved air quality even in a prolonged period of economic growth. In the context of climate change, however, despite many efforts since the 1990s, the Clean Air Act has not proven to be a successful legislative tool. Instead, the Act has faced complex obstacles in the statutory language and a trend in Supreme Court jurisprudence—leading up to and including the June 2022 decision in *West Virginia v. EPA*—that shows an increasing skepticism of administrative agency authority.

Then, in August 2022, the Inflation Reduction Act (IRA) broke through the congressional logjam. The IRA is the most significant piece of climate legislation in U.S. history, with a commitment of $369 billion in spending on energy security and climate change programs over the next decade. Research groups estimate that the IRA will result in major reductions in U.S. greenhouse gas emissions, bringing them nearly fifty percent below 2005 levels. The IRA is a spending bill, not a regulatory one, reflecting a highly constrained legislative environment in which filibuster rules and partisan intransigence mean that policy-by-spending is the only feasible option, not only for environmental issues but a broad range of social programs and priorities. Yet the IRA—despite these characteristics and the legislative and judicial context—will have important regulatory consequences.

The Clean Air Act gives the Environmental Protection Agency (EPA) statutory authority to set strict standards that are, in part, based on a determination of what clean technologies are already available. This is done through the "adequately demonstrated" standard in Section 111 and other requirements to balance environmental benefits with cost and/or technological feasibility. As the IRA works to

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lower costs and increase the market share of clean energy technologies, the EPA will be able to promulgate stronger technology-based standards in the next decade—both more stringent in nature and more legally secure—than would otherwise be the case. Despite the limitations of spending policy, the IRA can play an important role in bringing about an effective energy transition, allowing the EPA to return to the original idea of "technology-forcing" in the Clean Air Act and consolidate, through prescriptive regulation, the technological advances ushered in by federal spending programs.

INTRODUCTION

In the summer of 2022, two tectonic shifts, separated by only two months, ruptured the sphere of U.S. environmental policy: the U.S. Supreme Court's decision in *West Virginia v. EPA*[1] and the enactment of the Inflation Reduction Act (IRA).[2] In *West Virginia*, the Court surprised observers[3] by taking up a challenge to the Clean Power Plan—the Obama Administration's biggest and boldest climate plan that never came to life.[4] Because the Court had already killed the plan in 2016, the *West Virginia* case had no direct on-the-ground consequences.[5]

Nevertheless, the six-Justice majority wiped away a critical climate policy tool, holding that the EPA lacked authority under the Clean Air Act (the Act) to consider "generation shifting" in the electricity industry—moving from coal and natural gas to renewable energy sources—as a mechanism for controlling the greenhouse gas (GHG) emissions that warm our planet.[6] The Court came to this conclusion by applying the newly minted "major questions doctrine,"[7] rea-

[1] *See* 142 S. Ct. 2587 (2022) (limiting the scope of regulatory options that the EPA can use to set regulatory standards for emissions that contribute to climate change).

[2] *See* Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818 (providing funding, programs, and incentives as a vehicle for climate change regulation).

[3] *E.g.*, Rachel Reed, *Supreme Court Preview:* West Virginia v. EPA, HARV. L. TODAY (Feb. 28, 2022), https://hls.harvard.edu/today/scotus-preview-west-virginia-v-epa/ [https://perma.cc/5EJA-ZYKF].

[4] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662, 64662 (Oct. 23, 2015) (codified at 40 C.F.R. pt. 60).

[5] *See* West Virginia v. EPA, 577 U.S. 1126, 1126 (2016) (granting a stay of the EPA's regulation). In February 2016, with Justice Scalia voting in one of his final orders from the bench, a 5-4 Court took the extraordinary step of placing a stay on the Clean Power Plan even before the D.C. Circuit had the opportunity to review the regulation, blocking it from ever taking effect. *Id.*

[6] *West Virginia*, 142 S. Ct. at 2603, 2614–16. The idea of generation shifting as a regulatory tool is important in the context of climate mitigation because it affords a much greater level of flexibility in compliance and is much cheaper (with current technology) than controlling or capturing emissions of carbon dioxide at an emissions source. In the *West Virginia* decision (discussed in greater detail in Part II *infra*), the Supreme Court implied that, under the Clean Air Act, the EPA could only consider pollution control measures that could be implemented *at a source facility* in crafting rules for GHG emissions from power plants. *Id.* at 2611.

[7] *Id.* at 2610.

soning that the question of the EPA's authority to consider generation shifting as a form of regulation and compliance is a "question of deep economic and political significance" and therefore requires a "clear statement" from Congress.[8]

In August 2022, the IRA broke through the congressional logjam as the most significant piece of climate legislation in U.S. history, with a commitment of $369 billion in spending on energy security and climate change programs over the next decade.[9] The IRA established new block grant programs; expanded funding for research and development of clean energy technology; and extended or augmented tax credits and rebates for individuals and businesses that incentivize clean energy, energy efficiency, and the electrification of transportation and industrial processes.[10] Various research groups have concluded that the IRA will result in major reductions in U.S. GHG emissions over the next decade relative to current policy. For example, Princeton's REPEAT model suggests an annual reduction of one billion metric tons of carbon dioxide (CO_2)-equivalent by 2030, resulting in a total GHG reduction of nearly fifty percent below 2005 levels.[11]

Importantly, the IRA is a spending bill, not a regulatory one, rising from the ashes of the thought-to-be-dead Build Back Better plan pushed by the Biden Administration.[12] The legislation reflects a re-tooling of policy work in a highly constrained legislative environment—one in which filibuster rules and partisan intransigence mean that policy-by-spending is the only feasible option, not only for environmental issues but a broad range of social programs

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[8] *Id.* at 2616, 2626 (Gorsuch, J., concurring) (quoting King v. Burwell, 576 U.S. 473, 486 (2015)). The Court's espousal of the "major questions doctrine" in *West Virginia* is discussed in greater detail *infra* in Part II.C.2.

[9] *See* Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818 (investing primarily in climate policy and energy security). Senate Democrats published a one-page summary of the bill soon after its adoption. SENATE DEMOCRATS, SUMMARY: THE INFLATION REDUCTION ACT OF 2022, https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf [https://perma.cc/59KW-H3WU].

[10] Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818.

[11] JESSE D. JENKINS ET AL., PRELIMINARY REPORT: THE CLIMATE AND ENERGY IMPACTS OF THE INFLATION REDUCTION ACT OF 2022, at 7 (2022), https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-08-04.pdf [https://perma.cc/3XZF-U58R].

[12] *See, e.g.*, Brad Plumer & Lisa Friedman, *Democrats Got a Climate Bill. Joe Manchin Got Drilling, and More*, N.Y. TIMES (July 30, 2022), https://www.nytimes.com/2022/07/30/climate/manchin-climate-deal.html [https://perma.cc/W356-G5YK] (describing the process of compromises among Senate Democratic leadership and Senator Joe Manchin leading up to the final legislation); Emily Cochrane & Catie Edmonson, *Manchin Pulls Support from Biden's Social Policy Bill, Imperiling Its Passage*, N.Y. TIMES (Dec. 19, 2021), https://www.nytimes.com/2021/12/19/us/politics/manchin-build-back-better.html?searchResultPosition=1 [https://perma.cc/K63H-NEJP] (reporting on Senator Manchin's refusal to support an earlier version of the bill, which the Biden Administration had pushed in Congress as the "Build Back Better" plan).

and priorities. In the IRA, Congress did not directly respond to the *West Virginia* decision, nor did it provide a "clear statement" on EPA's authority to specifically promote generation shifting as a climate policy tool.[13] Nevertheless, several provisions in the IRA bolster the EPA's authority to regulate GHG emissions from a variety of sources.[14] Despite the limitations of spending policy, the IRA, if it works as intended, can and will operate to strengthen and reinforce EPA's regulatory authority, bringing about the generation shifting envisioned in the Clean Power Plan. The IRA will allow the EPA to adopt more effective rules over the next decade to consolidate the technological advances that the statute will usher in.[15]

This Article examines the extent to which the IRA might influence the EPA's future regulatory action on climate change in light of two contextual stories: the trend toward judicial hostility to administrative policymaking (punctuated by *West Virginia*), and the history of "technology-forcing" policy in a half century of the Clean Air Act, in which Congress has directed EPA to drive new developments in pollution control through both subsidies and regulatory mandates—carrots and sticks. Regulations to limit climate change and GHGs have been a particular target of judicial hostility—placing the IRA at center stage in the climate policy field—although Clean Air Act regulations remain the primary tool for combating a host of other air pollution, environmental, and public health issues. The EPA's statutory authority to set strict standards in many sections of the Clean Air Act relies on findings that clean technologies are already available, either through the "adequately demonstrat-

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[13] *See* Inflation Reduction Act of 2022; *West Virginia*, 142 S. Ct. at 2616 (Gorsuch, J., concurring) (referring to the major questions doctrine as a "clear-statement" rule).

[14] *See, e.g.*, Greg Dotson & 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, 10033–34 (2023). For example, the IRA adds new sections to the Clean Air Act, including section 135, related to GHG emissions from electricity generation, and section 136, related to methane emissions from the oil and gas sector. Inflation Reduction Act of 2022 §§ 60107, 60113 (codified at 42 U.S.C. §§ 7435–7436). Each of these new provisions include section-specific definitions that cement the EPA's determination after *Massachusetts v. EPA* that GHGs are air pollutants within the meaning of the Clean Air Act. *See* 42 U.S.C. §§ 7435(c), 7436(i) (defining "greenhouse gas" as including "carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride"); Massachusetts v. EPA, 549 U.S. 497 (2007).

[15] As Dotson and Maghamfar put it:

> While the [IRA] does not directly address the specific holding of [*West Virginia*], it makes clear that Congress agrees that the CAA regulatory authorities apply to GHGs and directs EPA, backed by specially designated resources, to use its CAA authorities to achieve greater reductions in GHG emissions from the power sector than expected in the newly calculated baseline. This amounts to a significant new development in EPA's mandate to address climate pollution from power plants.

Dotson & Maghamfar, *supra* note 14, at 10033–34.

ed" standard in Section 111[16] or other requirements to balance environmental benefits with cost and/or technological feasibility.[17] As the IRA works to lower costs and increase the market share of clean energy technologies, the EPA will be able to promulgate stronger technology-based standards in the next decade—both more stringent in nature and more legally secure—than would otherwise be the case.[18] As new technology becomes less expensive and more prevalent, "green" constituencies are likely to grow stronger, meaning that political opposition to stronger regulatory mandates may also diminish. In this sense, policy-by-spending in the climate change arena will tend to reinforce further regulation rather than displace it.

The Article proceeds in four parts. First, it traces the history of the Clean Air Act's technology-based standards, including technology-forcing standards for motor vehicles as well as the New Source Review (NSR) and New Source Performance Standards (NSPS) programs for stationary sources. The theory behind technology-forcing regulation has not always been borne out in practice, but several success stories, such as the adoption of the catalytic converter, demonstrate how state and federal regulators can harness research and development in an iterative process to accelerate deployment of pollution control technology.[19] Second, the Article turns to the issues of legislative and judicial intransigence in modernizing the Act in a climate-changed world. This includes congressional failure to update statutory standards and agency authority to mitigate climate change, as well as the trend in jurisprudence that has sharply curtailed EPA's efforts to apply the Act to new problems, with *West Virginia* as the conservative philosophical capstone.[20] Third, this Article analyzes how the IRA, despite these legislative and judicial problems, may establish a path forward for "policy-by-spending" on climate change and bolster future EPA regulations by promoting the development of pollution control technology or

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[16] 42 U.S.C. § 7411; *see also* Christopher P. Davis, Jeffrey R. Kurtock, James P. Leape & Frank C. Magill, *The Clean Air Act Amendments of 1977: Away from Technology-forcing?*, 2 HARV. ENV'T L. REV. 1, 13–14 (1977) (noting some of the early difficulties in applying the "adequately demonstrated" standard in the 1970s).

[17] *See* 42 U.S.C. §§ 7412(g)(2)(A)–(B), 7479(3). For example, the "best available control technology" (BACT) and "maximum achievable control technology" (MACT) standards rely on an EPA determination of what technology is "achievable." *Id.*

[18] The EPA's statements in 2023 discuss how its proposed rule on power plants "[l]everages the clean energy incentives and opportunities provided in the Inflation Reduction Act." EPA, Webinar: Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants: Webinar for Communities with Environmental Justice Concerns and Members of Tribal Nations (June 2023), https://www.epa.gov/system/files/documents/2023-06/111%20Power%20Plants%20Stakeholder%20Presentation_Webinar%20June%202023.pdf [https://perma.cc/4NR2-FP7Q].

[19] *See infra* notes 23–147 and accompanying text.

[20] *See infra* notes 148–243 and accompanying text.

cleaner options.[21] The Article concludes with lessons drawn from this new era of policymaking and offers recommendations for strengthening the once and future Clean Air Act.[22]

I. HISTORY OF THE CLEAN AIR ACT'S TECHNOLOGY-FORCING STANDARDS

In 1970, Congress enacted the major framework for what we know today as the Clean Air Act.[23] The Clean Air Act has had its shortcomings, but, by and large, implementation of the statute has decoupled the emissions of several conventional air pollutants (sulfur dioxide, nitrous oxides, carbon monoxide, and lead, as particularly important examples) from economic growth in the United States.[24] There is still further to go in controlling the health risk from particulate matter (PM) emissions[25] and from toxic and hazardous air pollutants,[26] but these are areas where progress in reducing emissions can still be made with the existing law.[27]

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[21] *See infra* notes 244–310 and accompanying text.

[22] *See infra* notes 311–322 and accompanying text.

[23] Clean Air Amendments of 1970, Pub. L. No. 91-604, 84 Stat. 1676. The 1970 statute expanded on authority provided by Congress in earlier federal efforts to address air pollution in 1955 and 1963. *See Evolution of the Clean Air Act*, EPA, https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act [https://perma.cc/69U7-FLS3] (Nov. 28, 2022).

[24] *See, e.g.*, Joseph E. Aldy et al., *Looking Back at Fifty Years of the Clean Air Act* 1, 51 (Res. for the Future, Working Paper No. 20-01, 2020), https://media.rff.org/documents/UpdateFifty_Years.pdf [https://perma.cc/HLQ9-2B6Z]; Janet Currie & Reed Walker, *What Do Economists Have to Say About the Clean Air Act 50 Years After the Establishment of the Environmental Protection Agency?*, 33 J. ECON. PERSP. 3, 4 (2019).

[25] Exposure to PM—tiny particles suspended in the air that can lodge inside the lungs and bloodstream—is associated with increased risk of heart attacks, decreased lung function, and other related diseases and symptoms. *See, e.g.*, EPA OFF. OF AIR & RADIATION, PARTICLE POLLUTION AND YOUR HEALTH (2003), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1001EX6.txt [https://perma.cc/ER8E-X2VM]. In 1971, the EPA issued a first set of regulations on "total suspended particles" as a measure of ambient air quality; this has since been replaced by two complementary sets of standards for PM_{10} (particles 10 microns or less in diameter) and $PM_{2.5}$ (2.5 microns or less in diameter). *See Timeline of Particulate Matter (PM) National Ambient Air Quality Standards (NAAQS)*, EPA, https://www.epa.gov/pm-pollution/timeline-particulate-matter-pm-national-ambient-air-quality-standards-naaqs [https://perma.cc/P3M9-JD77] (Oct. 17, 2022) (showing the history of EPA's standards on PM from 1971 to 2012).

[26] In 1990, Congress expanded the program for regulation of acutely toxic and hazardous air pollutants by specifically listing nearly two hundred pollutants for EPA regulation. 42 U.S.C. § 7412(b).

[27] In *Michigan v. EPA*, the Supreme Court put up a procedural roadblock in the regulation of air toxics by reading section 112's special provisions on fossil fuel-fired power plants to require more "up-front" cost-benefit analysis to justify the need for regulations. 576 U.S. 743, 759 (2015). The Court expressed skepticism regarding the regulation's justification based on co-benefits (ancillary health benefits from a regulation based on reduced exposure of co-pollutants incident to regulation of the targeted pollutant), but as the EPA demonstrated in its response after remand of the rule at issue in that case, regulations can be crafted in ways to get around these problems. *See id.* at 749–50, 759–60 (expressing skepticism due to the small value of "direct" benefits from mercury reduction in comparison to the co-benefits from reductions in particulate matter); Supplemental Finding That It Is Appro-

For over half a century, the Clean Air Act has served its purpose as a visionary statute for promoting public health. Congress adopted the statute on a near-unanimous, bipartisan basis, giving the EPA the tools to make scientific and regulatory decisions about how to balance health, environmental concerns, economic cost, and technological feasibility.[28] In some instances, Congress specifically directed the agency as to which of these considerations are paramount;[29] in other provisions of the statute, Congress left a greater degree of discretion.[30]

In the 1970s, Congress designed the Clean Air Act (as well as the Clean Water Act and other major environmental statutes) to be "technology-forcing," with the adoption of strict regulatory targets that led to the development of cleaner technologies.[31] Automobile manufacturers and other industries—with the strong "stick" of regulation—managed to meet standards that seemed unachievable at the time by investing in the design of new pollution control equipment and other processes to improve efficiency and reduce pollution.[32]

Yet throughout its development, the Clean Air Act has had two weaknesses baked into the statutory language. First, the statute in many respects has failed to directly account for the discriminatory impact of the location of air pollution sources—both stationary and mobile—on minority communities.[33] As a result, the benefits of the statute have not been equally felt.[34] With regard

priate and Necessary to Regulate Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units, 81 Fed. Reg. 24420, 24438–41 (Apr. 25, 2016) (codified at 40 C.F.R. pt. 63) (discussing the EPA's position and response to comments regarding the consideration of co-benefits in cost-benefit analysis).

[28] *See* Clean Air Act, S. 1630, 101st Cong. (1990), https://www.senate.gov/legislative/LIS/roll_call_votes/vote1012/vote_101_2_00055.htm [https://perma.cc/YG7M-J9DP] (passing 89-11 in the Senate); Clean Air Act Amendments of 1990, S. 1630, 101st Cong. (1990), https://clerk.house.gov/Votes/1990525 [https://perma.cc/T6ME-XWS8] (passing 401-25 in the House).

[29] *See, e.g.*, Whitman v. Am. Trucking Ass'n, 531 U.S. 457, 469, 471 (2001) (holding that the National Ambient Air Quality Standards provisions in sections 108 and 109 of the Clean Air Act unambiguously prohibit consideration of economic cost in setting the standards for criteria pollutants).

[30] *See, e.g.*, 42 U.S.C. § 7411(a)(1) (indicating that the EPA should "tak[e] into account . . . cost . . . and any nonair quality health and environmental impact and energy requirements" in setting standards of performance for categories of new and existing sources).

[31] *See, e.g.*, Thomas O. McGarity, *Radical Technology-forcing in Environmental Regulation*, 27 LOY. L.A. L. REV. 943, 944 (1994); David Gerard & Lester B. Lave, *Implementing Technology-forcing Policies: The 1970 Clean Air Act Amendments and the Introduction of Advanced Automotive Emissions Controls in the United States*, 72 TECH. FORECASTING & SOC. CHANGE 761, 762 (2005).

[32] *See infra* notes 53–64 and accompanying text.

[33] Numerous studies have demonstrated the discriminatory distribution of air pollution sources along racial lines. *See, e.g.*, Susan A. Perlin, David Wong & Ken Sexton, *Residential Proximity to Industrial Sources of Air Pollution: Interrelationships Among Race, Poverty, and Age*, 51 J. AIR & WASTE MGMT. ASS'N 406, 419 (2001); Ken Sexton et al., *Air Pollution Health Risks: Do Class and Race Matter?*, 9 TOXICOLOGY & INDUS. HEALTH 843, 850 (1993).

[34] In addition to unequal distribution of air pollution exposure based on race and socioeconomic status, the Clean Air Act's regulatory programs have not paid sufficient attention to "microclimates"

to mobile sources in particular, the Clean Air Act does little to reorient the nation's disastrous transportation policies since the mid-twentieth century that have prioritized cars above communities—policies that led to the demolition or bisection of minority and low-income communities in major cities, explosion of sprawl development, massive over-construction and subsidization of roads, and underinvestment in (or outright dismantling of) trains, trolleys, and other forms of mass transportation.[35]

Second, the Clean Air Act failed to effectively promote transitions in technology by exempting existing facilities from regulation in ways that prolonged the life of polluting industries.[36] The 1977 Clean Air Act preconstruction permit review program for new and modified stationary sources (commonly referred to as the NSR program) has been a strong tool for keeping new pollution sources out of already-degraded areas and for requiring state-of-the-art controls on new systems. But the exemption of existing facilities created, in essence, an asset and preferential treatment for what are often the dirtiest sources.[37]

Section A of this Part provides an overview of the Clean Air Act's technology-based standards for controlling air pollution.[38] Section B of this Part addresses the States' role in implementing National Ambient Air Quality Standards (NAAQS), as well as the historical success of technology-forcing standards.[39] Further, Section C provides an in-depth look at NSR, including the application of NSR in attainment and nonattainment areas, as well as the statutory restraints on NSR's scope that limit the program's ability to drive new technological development in pollution control.[40] Section D of this Part details the category-by-category standards employed by NSPS, the NSPS's susceptibility to partisan shifts, and associated litigation.[41] Finally, Section E summarizes lessons learned in the years following the Clean Air Act's adoption.[42]

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where pollution may be higher in specific areas, without specific monitoring. *See* Ann E. Carlson, *The Clean Air Act's Blind Spot: Microclimates and Hotspot Pollution*, 65 UCLA L. REV. 1036, 1041–42 (2018).

[35] *See generally* Deborah N. Archer, *Transportation Policy and the Underdevelopment of Black Communities*, 106 IOWA L. REV. 2125 (2021) (explaining the past and present of racially discriminatory policies in highway construction and transportation funding).

[36] *See, e.g.*, Nicholas S. Bryner, *The Green New Deal and Green Transitions*, 44 VT. L. REV. 723, 758 (2020).

[37] *See, e.g.*, Shi-Ling Hsu, *The Real Problem with New Source Review*, ENV'T L. REP. 10095, 10096 (2006) (citing economic studies that estimate the value of existing sources' exemption from new regulations).

[38] *See infra* notes 43–52 and accompanying text.

[39] *See infra* notes 53–64 and accompanying text.

[40] *See infra* notes 65–112 and accompanying text.

[41] *See infra* notes 113–146 and accompanying text.

[42] *See infra* note 147 and accompanying text.

A. Air Quality and Technology Standards in the Clean Air Act

The Clean Air Act, as a comprehensive set of legislative programs for addressing air pollution, uses a mix of standards based on ambient air quality, technology, and performance.[43] As a first principle, the Act establishes the NAAQS program,[44] through which the EPA makes a determination (based on scientific recommendations) as to what level of air pollution, allowing an "adequate margin of safety," is consistent with public health and welfare.[45]

The NAAQS decision-making process is separated from any consideration of cost.[46] Rather, the EPA sets the level for each of the so-called criteria pollutants solely based on scientific evidence and health data.[47] The NAAQS program does not place individualized limitations on specific pollution sources; rather, it sets a standard that triggers and influences the degree to which the EPA and/or state regulations might require pollution control technology or changes in industrial practices to meet numerical limits.[48] When air quality in a given area deteriorates to the point where pollutants approach or exceed NAAQS limits, regulators can clearly observe that the negative externalities of industrial or commercial activity—the pollution impacts on human and environmental health—have reached a point to where policy intervention is needed to internalize those costs.

As opposed to the NAAQS, technology-based standards in the rest of the Clean Air Act are set based on particular technological approaches, production methods, fuels, and/or processes that industries or other sources might use or implement.[49] One important note in understanding the statute is that the Act's NSPS and NSR programs—despite being "technologically-based"—do not specifically require the application of a designated technological process for emissions reductions.[50] Instead, the EPA and relevant state-level authorities survey and evaluate available technology to derive a numerical limit.[51] The regulated entity then may choose to use the designated technology upon which

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[43] 42 U.S.C. §§ 7401–7675 (containing Chapter 85's provisions governing Air Pollution Prevention and Control).

[44] *Id.* § 7408.

[45] *Id.* § 7409.

[46] Whitman v. Am. Trucking Ass'n, 531 U.S. 457, 471 (2001).

[47] *See id.* at 471, 473.

[48] *See* 42 U.S.C. §§ 7408–7410 (requiring establishment of air quality criteria and the NAAQS program, including state plans for implementation).

[49] *See, e.g.*, *id.* § 7479(3) (defining "best available control technology" for NSR).

[50] *See id.* (outlining a number of "technologically-based" factors that can be used on a "case-by-case basis" to determine BACT).

[51] For example, NSPS standards in EPA regulations are expressed as a rate, such as a number of pounds of pollutant emitted per unit of production. 40 C.F.R. § 60.42Da(e) (2023) (listing the NSPS for particulate matter emitted from power plants build after 2011 at 0.090 lb/MWh gross energy output or 0.097 lb/MWh net energy output).

the standard was based or may operate in any other way that will meet the equivalent numerical standard.[52]

Both ambient air quality-based and technology-based standards could be designed in a way that is "technology-forcing," even though the framing and input that goes into setting the standard may differ. EPA regulations included early efforts to force technological development; however, for most of the half-century of Clean Air Act implementation, technology-based standards have taken center stage.

B. Technology-Forcing Standards in the 1970 Clean Air Act

The 1970 Clean Air Act instituted much of the regulatory framework that continues in the statute today.[53] This includes laying out the NAAQS concept for measuring and prescribing ambient air quality.[54] As part of that program, Congress instituted a collaborative process between the EPA and state-level legislative and regulatory authorities—a classic example of "cooperative federalism."[55] States adopt what are known as "State Implementation Plans" (SIPs), which the Act indicates must "provide[] for implementation, maintenance, and enforcement" of the NAAQS.[56] The EPA must then review and determine whether the SIP meets appropriate requirements, and may directly issue federal regulations that apply in the state if the plan is inadequate.[57]

Nonetheless, we find the most significant example of technology-forcing standards in the 1970 Act's provisions on mobile sources—specifically, air pollutant emissions from motor vehicles. In Title II of the 1970 statute, Congress established a strict numerical target that would have been unachievable with scalable, market-available technology at that time.[58] The 1970 Act directed the EPA to require a ninety percent reduction of carbon monoxide (CO) and hydrocarbons (HC) below 1970 standards by model year 1975, as well as a ninety percent reduction of nitrogen oxides (NO_x) below average uncontrolled

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[52] *See, e.g.*, *id.* (requiring only that sources meet the provided rate of pollution without prescribing a required method for doing so).

[53] Clean Air Amendments of 1970, Pub. L. No. 91-604, 84 Stat. 1676.

[54] Clean Air Act § 108, 42 U.S.C. § 7408.

[55] *See generally* Joshua D. Sarnoff, *Cooperative Federalism, the Delegation of Federal Power, and the Constitution*, 39 ARIZ. L. REV. 205, 205–06 (1997) (listing the various methods of "cooperative federalism" that Congress can employ).

[56] Clean Air Act § 110, 42 U.S.C. § 7410.

[57] *Id.*

[58] *See* Clean Air Amendments of 1970, 42 U.S.C. ch. 85, tit. II (modifying, for example, light duty vehicle emission standards).

emissions by 1976.[59] The EPA had to put these standards in place by regulation within a tight timeframe of 180 days.[60]

These specific, strict targets in the 1970 Act eventually led to widespread adoption of the catalytic converter and three-way catalyst in cars.[61] Several factors in that particular instance allowed the regulations to work as technology-forcing. For example, the standard required a high degree of ambition in reductions, as well as a high cost of noncompliance—a ten thousand dollar per-car penalty for dirty cars—that conveyed a sense of seriousness.[62]

The 1970 standard forced the development and adoption of technology, but success was not immediate, nor without further dedicated effort by regulators and Congress. The statute enabled the EPA to grant a one-time, one-year delay.[63] This allowed some flexibility, but not so much as to undermine the strict nature of the requirement. In 1977, Congress was able to smooth out the transition with a further delay on the NO_x standard, which was not immediately met but has since seen effective compliance.[64]

C. New Source Review: Technology-based Standards Balanced with Cost on a Case-by-Case Basis

NSR is a case-by-case requirement established by Congress in 1977 to ensure that each new stationary source is reviewed prior to construction to better implement the NAAQS and the goal of reaching and maintaining good ambient air quality.[65] NSR refers collectively to two programs, differentiated between areas in attainment with NAAQS levels for a given pollutant (regulated to prevent significant deterioration of air quality) and areas in "nonattainment" that have exceeded the standard.[66] NSR further differentiates between *existing*

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[59] Clean Air Amendments of 1970 § 6(a).

[60] *Id.*

[61] David Gerard & Lester Lave, *Experiments in Technology Forcing: Comparing the Regulatory Processes of US Automobile Safety and Emissions Regulations*, 7 INT'L J. TECH. POL'Y & MGMT. 1, 8–11 (2007) (providing a narrative timeline of regulatory action and implementation of the tailpipe standards, in comparison to National Highway and Traffic Safety Administration (NHTSA) standards for airbags as a safety measure).

[62] 42 U.S.C. § 7524 (1970) (amended 1990). The 1970 statute set the per-car penalty at $10,000; the 1990 amendments increased it to $25,000, indexed for inflation. *Id.*

[63] Gerard & Lave, *supra* note 61, at 8.

[64] *See* 42 U.S.C. § 7521(b)(1)(B) (including phased-in standards for NO_x emissions for the period of 1977 through 1980); *see also* Gerard & Lave, *supra* note 61, at 10 (explaining that the delay in technology rollout was likely due to weak research and development, as well as technological complexity).

[65] *See* 42 U.S.C. §§ 7470–7479, 7491–7492 (declaring a statutory purpose of protecting public health), 7501–7509a (seeking implementation of nonattainment plans as quickly as is feasible).

[66] *See id.* §§ 7470–7479, 7491–7492 ("Prevention of Significant Deterioration of Air Quality" for areas in attainment), 7501–7509a (setting requirements for state plans in "Nonattainment Areas").

sources that pre-date the preconstruction review process and "new" and "modified" sources subject to the Act's review requirements.[67]

NSR has led to significant changes in pollution control over time, but when compared to a half century of expectations, the results have been mixed, due in part to concerted (and successful) efforts by emissions sources to avoid going through the process.[68] As explained below, although NSR preconstruction permits create a system that can lead to the widespread adoption of new pollution controls, this technology-forcing pathway is limited by the requirement to incorporate review of existing industry practices, balanced against considerations of cost, feasibility, impacts on energy, and other factors.[69]

1. The Scope of NSR

NSR is triggered whenever a new "major" facility is proposed for construction or when a facility is undergoing a modification that will result in an increase in the potential to emit regulated pollutants.[70] Before construction may begin, the environmental permitting agency must make a case-by-case determination about what level of emission controls the Clean Air Act requires.[71] The EPA delegates authority in most states to the state environmental agency to conduct the case-by-case technology analysis and issue the NSR permit, consistent with each state's Clean Air Act implementation plan.[72]

For pollutants in an area out of attainment with the relevant NAAQS, the most stringent technological standard applies for new and modified sources.[73] The permitting agency must apply the Lowest Achievable Emission Rate (LAER) standard, which is intended to prevent any further worsening of al-

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[67] *See id.* §§ 7470–7479, 7491–7492, 7501–7509a. The definition of "new" and "modified" source is borrowed from the New Source Performance Standard section of the Clean Air Act. *Id.* §§ 7411(a)(2), 7411(a)(6).

[68] Because NSR only requires a preconstruction permit for new sources and modifications, existing sources are exempt from the program—so long as any changes made on site can be characterized in a way that avoids the statutory definition of "modification" that would trigger new review. This has created a significant incentive for litigation and lobbying challenging the application of the statute to modifications. For example, see various iterations of the EPA's rule on routine maintenance and repair. *See, e.g.*, New York v. EPA, 443 F.3d 880, 883 (D.C. Cir. 2006).

[69] 42 U.S.C. § 7479(3) (statutory definition of "best available control technology").

[70] *Id.* § 7479. The statute defines a source as "major" for purposes of the "Prevention of Significant Deterioration" program if it has the capacity to emit over a threshold of one hundred or two hundred and fifty tons per year of a criteria pollutant. *Id.* § 7479(1).

[71] *Id.* §§ 7475(a), 7479(3).

[72] *See id.* § 7410 (outlining requirements for state implementation plans); *Delegation of Clean Air Act Authority*, EPA, https://www.epa.gov/caa-permitting/delegation-clean-air-act-authority [https://perma.cc/LGS4-VSK6] (Jan. 18, 2023) (identifying the Clean Air Act regulations that delegate authority to the states versus regulation authority retained by the EPA).

[73] 42 U.S.C. § 7501(3), 7503(a).

ready-bad air quality and leverage the opportunity to put the area on a pathway toward eventual compliance.[74] LAER, by definition, includes "the most stringent emission limitation which is achieved in practice" or "the most stringent emission limitation" found in any state's applicable plan.[75] Cost will only be relevant in a LAER determination if a regulated source can show that "such limitations are not achievable"—a difficult burden to meet.[76] Existing sources in nonattainment areas are required to meet a less stringent standard based on the permitting authority's evaluation of Reasonably Available Control Technology (RACT).[77]

For areas in attainment with NAAQS, Congress set up the Prevention of Significant Deterioration (PSD) program to maintain air quality and prevent activity that would lead toward nonattainment.[78] Under PSD, any new or modified source must pass through case-by-case preconstruction review under the BACT standard—less stringent by definition than LAER, but an important and detailed review process.[79]

In developing the PSD program, "environmentalists feared that without additional limits on pollution increases in clean air areas, regulation under the Clean Air Act would not force the development of new control technology."[80] This is, essentially, an argument against standardized, category-by-category technology requirements for new sources in all locations—because doing so hardens reliance on current state-of-the-art technology and reduces incentives for innovation. In other words, "if more effective but more expensive controls become available, all new plants must install them; this [therefore] leads industry to locate in clean areas and install state-of-the-art technology rather than to devise better technology."[81] Accordingly, "PSD would force industry to develop better controls rather than move to clean air areas."[82]

2. Application: Determination of "Best Available Control Technology"

The EPA issued a manual in 1990 that provides an oft-cited form of direction on how permitting agencies (the EPA or state environmental authorities)

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[74] *Id.* §§ 7502–7503. State plans for nonattainment areas must be designed to lead to "reasonable further progress" toward achieving "ambient air quality standard[s]." *Id.* §§ 7501(1), 7502(c).

[75] *Id.* § 7501(3).

[76] *Id.*

[77] *Id.* § 7502(c)(1).

[78] *Id.* §§ 7470–7492 (containing title I, part c of the Clean Air Act).

[79] *Id.* §§ 7475, 7479(3).

[80] R. SHEP MELNICK, REGULATION AND THE COURTS: THE CASE OF THE CLEAN AIR ACT 82 (1983).

[81] *Id.*

[82] *Id.*

should conduct BACT analysis and other NSR procedures.[83] The Draft NSR Workshop Manual lays out a step-by-step BACT process in detail, based on a 1987 memorandum issued by the EPA's Office of Air and Radiation that called for a "top-down" ranking of available control technologies.[84]

Steps in the EPA's "Top-Down" BACT Process	
Step 1	Identify All Control Technologies
Step 2	Eliminate Technically Infeasible Options
Step 3	Rank Remaining Control Technologies by Control Effectiveness
Step 4	Evaluate Most Effective Controls and Document Results
Step 5	Select BACT

Fig. 1: Steps in the EPA's guidance for determining best available control technology (BACT).[85]

The BACT determination process in reviewing a permit application, whether applied by the EPA itself or by a state environmental agency, includes five basic steps listed in Figure 1.[86] The first step—critically important in setting the stage for the rest of the process—is preparing a list of all emission control techniques "with potential application to the source and pollutant under evaluation."[87] This includes different categories of alternatives, such as: processes, products, and practices that prevent or result in lower emissions; "add-on" controls that reduce or remove emissions produced; and combinations of the above.[88] Permit applicants must "make a good faith effort" to look at comparable emission sources, previous determinations made by the EPA and state agencies, and other available sources of information in compiling the list.[89] The permit agency then reviews whether the list has covered a comprehensive range of alternatives.[90]

Step two of the BACT determination is an analysis of the technical feasibility of each of the listed options.[91] Most important for this discussion is that a technological control option may, but does not necessarily need to be "demonstrated" or "installed and operated successfully on the type of source under

[83] EPA, DRAFT NEW SOURCE REVIEW WORKSHOP MANUAL: PREVENTION OF SIGNIFICANT DETERIORATION AND NONATTAINMENT AREA PERMITTING (1990), https://www.epa.gov/sites/default/files/2015-07/documents/1990wman.pdf [https://perma.cc/HL3Z-MZWY].

[84] *Id.* at B.2, B.6–7.

[85] *Id.* at B.6.

[86] *Id.* at B.2, B.6.

[87] *Id.* at B.10.

[88] *Id.*

[89] *Id.* at B.11.

[90] *Id.*

[91] *Id.* at B.17.

review" to be considered feasible.[92] Instead, so long as the technology is available and "can reasonably be installed and operated on the source type under consideration," it can be considered technically feasible.[93] For new processes, the EPA has indicated that a control technology concept should be at least at the "licensing and commercial demonstration" stage—that is, beyond pilot testing—to be considered available in a feasibility study.[94]

The third step in determining BACT is a ranking of all the options that passed the technical feasibility (availability and applicability) screening.[95] The ranking is made at this stage according to pollution control effectiveness.[96] The permit applicant notes and provides information regarding other impacts, including economic impacts, environmental impacts of the control technology, and energy impacts here as part of the organized list (with a hierarchy according to the percentage or quantity of pollution reduction), but those factors are not analyzed in comparison to one another until the following step.[97]

In the fourth stage, BACT is further refined by an evaluation of "the energy, environmental, and economic impacts," beginning with the most effective control technology ranked above.[98] At this step, it is more difficult to maintain rigid guidance, given the obvious opportunities for flexibility in balancing energy efficiency, economic efficiency, and ancillary environmental impacts in comparison with the overall effectiveness of the best identified control technology. In order "to maintain and improve the consistency of BACT decisions made on the basis of cost and economic considerations," the EPA provides specific procedures for estimating costs in appendices to the Workshop Manual.[99] The EPA's practice requires applicants to provide information about economic cost of different control technologies both in terms of overall annualized cost, as well as incremental costs for increasing levels of control at the margin.[100] The overall and incremental costs are then divided by a quantity of pollution reduction to come up with a measure of average and incremental cost effectiveness that can be compared apples-to-apples with other technologies.[101]

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[92] *Id.*

[93] *Id.*

[94] *Id.* at B.17–18.

[95] *Id.* at B.22.

[96] *Id.* at B.25.

[97] *Id.*

[98] *Id.* at B.26.

[99] *Id.* at B.35, B.1–11.

[100] *Id.* at B.43. EPA guidance indicates that permit applicants should estimate cost "on [the] order of plus or minus 30 percent accuracy," so precision is not required; however, the cost estimates do need to consider site-specific characteristics and circumstances, and the information about operation of the facility must be used consistently across comparisons of different control technology. *See id.* at B.35 (promoting uniformity by providing cost estimate procedures).

[101] *Id.* at B.36–37, B.41.

At this point, the permit applicant may accept the highest-ranked option as BACT; if they do not, they must "demonstrate to the satisfaction of the permitting agency that costs of pollutant removal . . . for the control alternative are disproportionately high when compared to the cost of control for the pollutant in recent BACT determinations."[102] Thus, the cost of the control system can be a determining factor in what the EPA or a state agency will ultimately require a new polluting source to adopt as BACT. The decision is made on a case-by-case basis, but once a certain technology is adopted in one location, it becomes much easier for an agency to impose that same technological requirement elsewhere, as there is now precedent to establish that it is "achievable" technology.

The fifth and final stage of BACT determination is the selection of the best remaining option that has not been excluded for any reason in the earlier steps.[103] BACT selection means that the agency will now include an enforceable numerical limit (expressed, for example, as a number of pounds of pollutant or as a percentage of emission reduction) in the final permit for the proposed source.[104] Note that NSR under the Clean Air Act must take place prior to the construction of new sources or modification of existing sources as defined in the statute, and the BACT determination, as well as the rest of the permit, must be presented for public comment before it can be finalized.[105]

3. The Limits of NSR

To aid permitting agencies and promote consistency nationwide, the EPA maintains a BACT/RACT/LAER Clearinghouse—a database with information about case-specific determinations in all kinds of NSR programs.[106] The online site allows the public and agencies to search across several criteria to find out what pollution control technology-based standard has been required for specific types of sources, processes, pollutants, and locations.[107]

This transparency is critical in fostering the widespread adoption of pollutant controls once an agency has deemed a specific process to be available and applicable in one place. The statutory and regulatory scheme for NSR, however, has built-in limits that restrain the EPA from fully pushing for the develop-

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[102] *Id.* at B.44–45.

[103] *Id.* at B.53.

[104] *Id.* at B.56.

[105] *Id.*; *see* 42 U.S.C. §§ 7475(a) (requiring permit before construction in "Prevention of Significant Deterioration" areas), 7502(c)(5) (requiring permit before construction in nonattainment areas).

[106] *RACT/BACT/LAER Clearinghouse (RBLC)*, EPA, https://cfpub.epa.gov/RBLC/index.cfm?action=Home.Home&lang=en [https://perma.cc/77A4-TVRD] (Feb. 14, 2017).

[107] *RBLC Basic Search*, EPA, https://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en [https://perma.cc/9Q9A-3AHJ].

ment of new pollution control technology. Because congressional direction on BACT and LAER does not, on its own, provide a target that future projects must meet, the process for each case-by-case permit review is instead reliant on looking to what other similarly situated sources have already done.[108] Getting a regulated source to use a *new* technological approach to controlling pollution for the first time may be difficult if the cost is high and will only be successful using other Clean Air Act and EPA programs (such as waivers for innovative technology), or non-regulatory mechanisms outside the NSR process to fund research and development.[109]

The idea with BACT specifically is that an industry may not simply evade pollution control requirements altogether by locating in a "clean" area where air quality standards are currently met.[110] Nevertheless, the top-down BACT process, by looking only at already-available technology, hardens reliance on current state-of-the-art systems and reduces incentives for innovation. Although cleaner air is the goal, the tightening of regulatory requirements through BACT comes as a de facto response *after* the adoption of pollution control technology. Put another way, unlike the mobile source rules that have led directly to technology-forcing results, for stationary sources of air pollution, the regulatory decision-makers lack the ability to set up front what the goals and criteria for future pollution reduction under NSR will be, relying on outside forces (for example, other regulatory programs and non-regulatory pressures) to set the level of ambition. As a result, existing pollution control practices and regulatory requirements may become ossified.

An additional major limitation of the NSR program is strong regulatory distinction between "new/modified" and existing sources as to what regulatory review and pollution control standards apply.[111] The NSR's legacy of exemptions for existing sources was a political compromise that has prolonged the economic life of a slew of polluting sources by granting an economic windfall in the form of regulatory exemption. The statute has created a single, financially significant point for entities in deciding when to undertake upgrades or updates to a facility that might trigger re-classification of the source as "modi-

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[108] *See* 42 U.S.C. § 7479(3) (requiring consideration of "available methods, systems, and techniques" when making a BACT determination); *id.* § 7501(3) (looking to what has been "achieved in practice" by similar sources).

[109] 40 C.F.R. § 52.21(b)(19) (2023) (defining "innovative control technology" as a pollution control system "that has not been adequately demonstrated in practice" but would be likely to achieve as effective or more effective results in practice than currently used emission reduction systems). Permit applicants may, but are not required to, consider and/or propose the use of innovative systems in BACT determinations, for example. *See* EPA, *supra* note 83, at B.12.

[110] MELNICK, *supra* note 80, at 138.

[111] *See* Bryner, *supra* note 36, at 760.

fied," leading to frequent regulatory battles and costly litigation about exactly where that distinction lies.[112]

D. NSPS: Category-by-Category Standards for Adequately Demonstrated Technology

The 1970 Clean Air Act established the NSPS in Section 111 of the Act.[113] In the NSPS program, the EPA sets hard standards that apply across entire categories of sources, regardless of location, as opposed to the case-by-case standard of NSR.[114] NSPS is in this sense the first place to look for operational requirements for sources of air pollution. NSR, on the other hand, serves as a second layer of regulation that can, on a case-by-case basis, be more stringent, but not more lenient, than the categorical requirement under NSPS.[115] Through NSR, permitting authorities can go beyond the category standard to address the local air pollution at the site appropriately.

1. The Clean Air Act Definition of NSPS

Section 111 provides the standard that the EPA must use in setting an NSPS regulation, referred to in shorthand as "best system of emission reduction" or BSER.[116] Under the terms of Section 111(b), NSPS regulations apply, in the first instance, to "new" and "modified" sources.[117] New sources are those for which construction begins after the EPA proposed the relevant NSPS

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[112] *See id.* Exempting old facilities has also complicated enforcement efforts, in that existing facilities do not have to declare what types of renovations are being made if their owners argue that the work is routine maintenance and repair rather than an upgrade to the system that can increase pollution emissions. Compliance depends on a credible threat that the EPA and/or state and federal authorities will step in and enforce violations where it is clear that NSR requirements for modified facilities have been ignored. In a famous example from 1999, the Clinton Administration's Department of Justice filed lawsuits against several utilities after finding that they had failed to comply with NSR over a period of decades. Carol M. Browner, Adm'r, EPA, Remarks Prepared for Delivery at Clean Air Enforcement Press Conference (Nov. 3, 1999), https://www.epa.gov/archive/epapages/newsroom_archive/newsreleases/eca1feeff72412198525681e006a25fe.html [https://perma.cc/85QA-ZNXZ]; David Stout, *7 Utilities Sued by U.S. on Charges of Polluting Air*, N.Y. TIMES (Nov. 4, 1999), https://www.nytimes.com/1999/11/04/us/7-utilities-sued-by-us-on-charges-of-polluting-air.html [https://perma.cc/42HP-Y597].

[113] Clean Air Act § 111(b), 42 U.S.C. § 7411(b).

[114] *Id.*

[115] *E.g.*, *id.* § 7501(3) ("In no event shall the application of [the lowest achievable emission rate] permit a proposed new or modified source to emit any pollutant in excess of the amount allowable under applicable new source standards of performance.").

[116] *Id.* § 7411(a)(1).

[117] *Id.* § 7411.

rule.[118] Modified sources—those with any change that results in an increase in air pollutant emitted or the emission of any new pollutants—are treated as new sources based on the date the modification begins.[119] Under Section 111(d), once rules for new and modified sources are in place, the EPA has the authority to establish a BSER standard for "existing sources" (anything for which construction had begun before proposal of the NSPS rule) and create guidelines for states to use in implementing that standard.[120]

Breaking down the language of the statute, the EPA must decide what systems of emission reduction have been "adequately demonstrated," considering also three things: (1) the cost associated with implementing the system; (2) other environmental and health impacts that may result from applying the system; and (3) the impact of applying the system on energy requirements.[121]

Early in the history of the Clean Air Act, in 1973, the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) had opportunities to interpret and provide fuller meaning to the phrase "adequately demonstrated," which it described as follows: a system is adequately demonstrated if it "has been shown to be reasonably reliable, reasonably efficient, and which can reasonably be expected to serve the interests of pollution control without becoming exorbitantly costly in an economic or environmental way."[122] Adequately demonstrated is still a relatively low bar: "It does not mean that the system 'must be in actual routine use somewhere.'"[123] Instead, "the Court has said, '[t]he Administrator may make a projection based on existing technology,

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[118] *Id.* § 7411(a)(2). Note that the determination is based on when the *proposal* is issued for any rule that is later finalized, eliminating any incentive for regulated parties to rush and begin construction of a source between publication of the proposed rule and the final rule.

[119] *Id.* §§ 7411(a)(2), 7411(a)(4). Note that some NSPS regulations do further distinguish between "new" and "modified" sources in setting the performance standard.

[120] *Id.* § 7411(d). Section 111(d)'s process is more complex in the Section 111(b) rules that the EPA directly applies; this process is discussed more fully below in Part I.C.2 and in the discussion of *West Virginia v. EPA* in Part II.C, *infra*.

[121] 42 U.S.C. § 7411(a)(1). The statute provides that the NSPS must represent "the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated." *Id.* This Article focuses primarily on the availability and technological feasibility of emission control systems as expressed in the EPA's cost consideration (because of the obvious potential impact of financial incentives on cost), while noting that the other considerations are still significant.

[122] Essex Chem. Corp. v. Ruckelshaus, 486 F.2d 427, 433 (D.C. Cir. 1973).

[123] Review of Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 83 Fed. Reg. 65424, 65433 (proposed Dec. 20, 2018) (quoting Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 391 (D.C. Cir. 1973)) (codified at 40 C.F.R. pt. 60).

though that projection is subject to the restraints of reasonableness and cannot be based on 'crystal ball' inquiry.'"[124]

Based on what the EPA determines to be adequately demonstrated, the agency then selects the BSER and establishes it by regulation for the specific source category, expressed as a quantified numerical rate that the BSER will achieve.[125] This rate typically takes the form of grams or pounds of pollutant emitted per unit of time or unit of production.[126]

Because BSER is defined with reference to what has been adequately demonstrated, the EPA is limited in the extent to which it can adopt technology-forcing regulations under Section 111. That is not to say NSPS regulations do not create change in industry. As noted above, according to the D.C. Circuit's precedents since the 1970s, emission control technology does not have to be commercially adopted at scale to be found "adequately demonstrated."[127] When the EPA promulgates an NSPS, that regulatory standard can be a force bringing the experimental into widespread practice. The EPA, however, must work with what is already out there as a starting point. This means that the EPA cannot make a health or environment-based determination about what ought to be achieved on a category-by-category basis and force industry to develop the technology to get there.[128]

2. Example: NSPS Rules on Climate-Forcing Pollutants in the Obama Administration

In 2013, President Barack Obama announced a plan of executive action on climate change for his second term in an address at Georgetown University.[129] NSPS rules for power plants were featured prominently in this plan.[130]

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[124] *Id.*

[125] *See, e.g.*, 40 C.F.R. pt. 60 (providing examples of current NSPS rules with numerical rate standards).

[126] *See, e.g.*, *id.* § 60.42Da(e) (denoting that for electricity generating units (power plants), the rule applicable since 2011 is that plants may not emit more than eleven nanograms of particulate matter (PM) per joule (ng/J) of gross energy output or twelve ng/J of net energy output).

[127] *Essex Chem. Corp.*, 486 F.2d at 433–34. The D.C. Circuit has reiterated this reading of Section 111 as recently as 2021 in *American Lung Association v. EPA*. 985 F.3d 914, 962 (D.C. Cir. 2021), *rev'd on other grounds*, West Virginia v. EPA, 142 S. Ct. 2587 (2022).

[128] The health- and environment-based determination instead must be made via the NAAQS program and the study of ambient air quality, giving states the primary responsibility for looking at air quality in each region holistically. 42 U.S.C. §§ 7408–7410.

[129] Fact Sheet: President Obama's Climate Action Plan, THE WHITE HOUSE (June 25, 2013), https://obamawhitehouse.archives.gov/the-press-office/2013/06/25/fact-sheet-president-obama-s-climate-action-plan [https://perma.cc/3QGD-T9Q8]; Barack Obama, U.S. President, Remarks by the President on Climate Change (June 25, 2013), https://obamawhitehouse.archives.gov/the-press-office/2013/06/25/remarks-president-climate-change [https://perma.cc/MQ4X-E97T].

Pursuant to this presidential agenda, in 2015, the EPA took the first steps to regulate GHG emissions from fossil fuel-fired power plants—the second largest emitting sector in the country.[131] The EPA established both a rule for new and modified sources under Section 111(b) of the Clean Air Act,[132] as well as a (more famous) set of guidelines for states to implement regulation of existing power plants under Section 111(d), known as the Clean Power Plan.[133]

The Section 111(b) rule in 2015 listed two types of electricity generating units—natural gas-fired power plants and coal-fired power plants—as categories of sources that contribute significantly to climate change.[134] For natural gas plants, the EPA determined that a plant using an integrated gasification combined cycle process—essentially, the state-of-the-art model for efficiency—qualifies as an alternative compliance method.[135] For coal plants, the EPA determined that BSER is partial use of carbon capture and storage/sequestration (CCS) technology.[136] The EPA justified its finding that partial CCS is adequately demonstrated and the best system, in accordance with Section 111, by comparing the estimated levelized cost[137] with other, non-fossil fuel electricity generation costs, such as constructing a new nuclear power plant.[138]

In 2018, the Trump Administration's EPA proposed a revision to the 111(b) rule that would have eliminated the requirement for partial CCS in new and modified coal-fired plants, based on "the high costs and limited geograph-

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[130] *See* Fact Sheet: President Obama's Climate Action Plan, *supra* note 129 (listing examples of the plan's proposed standards for reducing carbon emissions).

[131] *See* Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64510, 64510 (Oct. 23, 2015) (codified at 40 C.F.R. pts. 60, 70, 71, 98) (setting NSPS specifically for CO_2 emissions).

[132] *Id.*

[133] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662, 64662 (Oct. 23, 2015) (codified at 40 C.F.R. pt. 60). Given the decline in coal-fired electricity, the Clean Power Plan was the bigger-ticket item, addressing existing plants. Due to the different structure of Section 111(d) as opposed to 111(b), the Clean Power Plan does not directly provide a regulatory standard, but rather provides "guidelines" with a BSER determination that sets in motion a process for states to create implementation plans to reduce emissions from existing sources. *See* 42 U.S.C. § 7411(d) (referring to the state implementation plan process under Section 110 of the Act).

[134] Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64513.

[135] *Id.*

[136] *Id.* The rule accounted for post-combustion capture and storage of 16–23% of the CO_2 that would otherwise be emitted from the coal-fired plants, or an emissions level of 1,400 pounds of CO_2 per megawatt-hour (MWh) of electricity generated. *Id.* at 64513, 64546; 40 C.F.R. § 60 subpt. TTTT, tbl.1.

[137] Levelized cost refers to an estimated average cost per unit of electricity generation over the life of the plant, as opposed to the marginal cost.

[138] Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64545.

ic availability of CCS."[139] There was little reason to support the 2018 proposal other than an anti-regulatory concern that the Obama-era rule was setting a precedent for consideration of CCS to reduce the authorized level of GHG emissions.[140] Due to cost considerations, including the low cost of natural gas, wind, and solar in comparison (as well as pre-existing environmental regulation of coal), the United States has stopped building new coal-fired power plants.[141] Therefore, the EPA projected that the proposal would not actually result in any significant change in U.S. GHG emissions (or, for that matter, impose any regulatory costs or generate any benefits in practice).[142]

Ultimately, the Trump Administration never finalized the proposed change to the 111(b) rule. Nevertheless, litigation regarding the EPA's original determination in 2015 regarding the BSER for coal-fired power plants remains unresolved.[143] A coalition of states, led by North Dakota, filed a petition for review of the rule in October 2015, alleging that the technologies that the EPA relied on to set the BSER for new coal-fired power plants were not adequately demonstrated; therefore, the rule was inconsistent with the Clean Air Act's Section 111.[144] The states, industry intervenors, and environmental organizations defending the rule all briefed the case, but the D.C. Circuit held the case in abeyance in 2017 at the request of the Trump Administration.[145] Throughout 2021 and 2022, the Biden Administration continued to request that the court hold the case while the Administration considered what actions to take for the NSPS rules.[146]

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[139] Review of Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 83 Fed. Reg. 65424, 65426 (proposed Dec. 20, 2018) (codified at 40 C.F.R. pt. 60).

[140] To wit, the 2018 proposal cited approvingly the 2015 Rule's determination that, because the power sector has been moving increasingly away from coal-fired generation in the United States, "few [plants] will trigger" the application of the rule. *Id.* at 65427.

[141] *See, e.g.*, David Fritsch, *Of the Operating U.S. Coal-Fired Power Plants, 28% Plan to Retire by 2035*, U.S. ENERGY INFO. ADMIN. (Dec. 15, 2021), https://www.eia.gov/todayinenergy/detail.php?id=50658 [https://perma.cc/2G3Y-QG4Y] (providing a graph showing the "coal power plant capacity" in the United States by initial operating year, with no new plants since 2013).

[142] Review of Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 83 Fed. Reg. at 65427.

[143] *See* Case Docket, North Dakota v. EPA, No. 15-1381 (D.C. Cir. Oct. 23, 2015) (indicating that the latest filing in the case occurred on September 29, 2023).

[144] Petition for Review, North Dakota v. EPA, No. 15-1381 (D.C. Cir. Oct. 23, 2015); State Petitioners' Opening Brief, North Dakota v. EPA, No. 15-1381, 2016 WL 8201624 (D.C. Cir. Oct. 13, 2016).

[145] Case Docket, North Dakota v. EPA, No. 15-1381 (D.C. Cir. Oct. 23, 2015); Order Holding Case in Abeyance, North Dakota v. EPA, No. 15-1381 (D.C. Cir. filed Apr. 28, 2017).

[146] *See* Case Docket, North Dakota v. EPA, No. 15-1381 (D.C. Cir. Oct. 23, 2015) (listing the EPA's case filings since the litigation's inception).

E. 20th Century Takeaways

The above examples show the ways in which Congress and the EPA have successfully driven technological change and innovation to reduce air pollution under the Clean Air Act. Despite those early successes, external factors to the regulatory process have taken on a larger role in driving change in more recent years. What the EPA can do with its Clean Air Act authority is cement those changes and harden externally driven emission reductions through prescriptive regulation. Regarding climate change, there was significant hope in the 1990s that the Clean Air Act could aid the U.S. response to a global problem—as had been done with the global problem of stratospheric ozone depletion.[147] Nonetheless, this hope ran into obstacles in both legislative and judicial approaches to environmental law.

II. Greenhouse Gas Regulation Under the 21st Century Clean Air Act: Legislative Gridlock and Judicial Hostility to Climate Regulation

Section A of this Part evaluates Congress's stagnation in enacting climate legislation—the Waxman-Markey bill being a notable example.[148] Section B details the aftermath of the catalyst 1999 rulemaking petition and *Massachusetts v. EPA*, which spurred the EPA's promulgation of regulations as an alternative solution to an inactive legislature.[149] Finally, Section C outlines the various legal challenges and subsequent judicial constraints imposed on the EPA's regulatory authority under the Clean Air Act, culminating in *West Virginia v. EPA*'s denial of the EPA's authority to promulgate generation shifting policy.[150]

A. Challenges in Updating the Clean Air Act Amid Legislative Gridlock

Since 1990, most legislative efforts in Congress to update or expand the coverage of environmental statutes have faltered. Following the 1990 Clean Air Act Amendments, which added coverage of acid rain precursors and ozone depleting substances (along with a comprehensive permit system for air pollution sources),[151] little has changed in the major canon of U.S. environmental

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[147] *See* Clean Air Act tit. VI, 42 U.S.C. §§ 7671–7671q (regulating the manufacture of ozone-depleting chemicals and restricting their use and distribution).

[148] *See infra* notes 151–162 and accompanying text.

[149] *See infra* notes 163–176 and accompanying text.

[150] *See infra* notes 177–243 and accompanying text.

[151] Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2399.

law.[152] This slowdown reflects a broader trend toward polarization in Congress and a decrease in the amount of legislation enacted since the era of House of Representatives Speaker Newt Gingrich.[153] Environmental issues, writ large, have been increasingly coded as partisan in a zero-sum narrative that pits social welfare against economic growth.[154] The rise of the filibuster as routine practice in the Senate has meant that any substantive legislative change (aside from carved-out budget reconciliation exceptions) must have supermajority support, making new environmental statutory authority extraordinarily difficult to achieve.[155]

Regarding climate change as an environmental problem, Congress has moved slowly. In 1978, Congress took its first small step to signal recognition of a growing field of climate science by establishing an interagency National Climate Program led by an office in the Department of Commerce.[156] Nevertheless, no major proposals for addressing the causes of climate change came until much later.

The high watermark for legislation that would have imposed regulatory constraints on GHGs came in 2009 when the House of Representatives passed the Waxman-Markey bill, which would have created a nationwide cap on GHG

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[152] Exceptions include various energy-related statutes supported by a coalition of agricultural interests and national security hawks, such as the Energy Policy Act of 2005 and Energy Independence and Security Act of 2007, which added the Renewable Fuel Standard to the Clean Air Act. *See* 42 U.S.C. § 7545(o) (providing regulations surrounding renewable fuel). Congress also updated the Toxic Substances Control Act in 2016. Frank R. Lautenberg Chemical Safety for the 21st Century Act, Pub. L. No. 114-182, 130 Stat. 448 (codified at 15 U.S.C. §§ 2601–2629).

[153] *See, e.g.*, Drew DeSilver, *A Productivity Scorecard for the 115th Congress: More Laws Than Before, but Not More Substance*, PEW RSCH. CTR. (Jan. 25, 2019), https://www.pewresearch.org/fact-tank/2019/01/25/a-productivity-scorecard-for-115th-congress/ [https://perma.cc/EVW4-XTT9] (including charts that show an overall decline in legislative productivity since the 1990s).

[154] *See, e.g.*, MICHAEL A. LIVERMORE, ELIZABETH PIENNAR & JASON A. SCHWARTZ, INST. FOR POL'Y INTEGRITY, THE REGULATORY RED HERRING: THE ROLE OF JOB IMPACT ANALYSES IN ENVIRONMENTAL POLICY DEBATES 1 (2012), https://policyintegrity.org/publications/detail/regulatory-red-herring/ [https://perma.cc/6JPA-ELKS] (addressing the partisan narrative pitting social welfare against economic growth in a report examining the use of "job impact analysis" to forecast the costs and benefits of regulatory changes). On Republicans' frequent use of the rhetoric of "job-killing" regulations, see Ruth Marcus, Opinion, *Bad Science Around 'Job-killing Regulations,'* WASH. POST (Apr. 24, 2012), https://www.washingtonpost.com/opinions/bad-science-around-job-killing-regulations/2012/04/24/gIQARQQTfT_story.html [https://perma.cc/NW4X-TU95].

[155] For a critical account of the filibuster in the modern Senate, see generally, for example, ADAM JENTLESON, KILL SWITCH: THE RISE OF THE MODERN SENATE AND THE CRIPPLING OF AMERICAN DEMOCRACY (2021).

[156] National Climate Program Act, Pub. L. No. 95-367, § 5, 92 Stat. 601, 601–03 (1978) (codified at 15 U.S.C. § 2904). This effort was updated in 1986 in a budget reconciliation bill based on legislation originally sponsored by then-Senator Joe Biden. *See* Consolidated Omnibus Budget Reconciliation Act of 1985, Pub. L. No. 99-272, § 6084, 100 Stat. 82, 136 (1986) (codified at 15 U.S.C. § 2903) (amending multiple sections of the National Climate Program Act).

emissions and a federal renewable electricity standard.[157] Prior to the Obama Administration, certain groups of Republican officials had expressed openness to GHG regulation through a cap-and-trade regime or similar policy, but when the time came to draft legislation, support from the political center and center-right dissipated.[158] For example, candidate John McCain expressed support for cap-and-trade policies throughout the 2000s and into the 2008 presidential election, but he then came out against Democratic proposals in 2009.[159]

As the House voted for the Waxman-Markey bill, Republicans and other opponents seized on the opportunity to portray the bill as a tax that would harm workers and the U.S. economy.[160] In doing so, they recalled the political fallout from an energy tax—the so-called "BTU tax"—that the Clinton Administration supported in the House in 1993.[161] Ultimately, the Waxman-Markey bill never came up for a floor vote in the Senate and died at the end of the session in 2010.[162] Since that point—even as the political movement for a Green New Deal drove a push for climate legislation in 2021 as President Joe Biden took office—prospects for an overhaul of environmental legislation to deal with climate change (or other environmental problems) have been nonexistent and are likely to remain so until Senate procedures change.

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[157] American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009).

[158] *See* H.R. 2454, 111th Cong. (2009), https://clerk.house.gov/Votes/2009477 [https://perma.cc/7WZL-QRKL] (indicating that the final vote on passage of the Waxman-Markey bill in the House, 219-212, included crucial support from eight Republicans who voted in favor, while forty-four Democrats from the majority voted no).

[159] *See, e.g.*, Lisa Lerer, *McCain Slams 'Horrendous' Climate Bill*, POLITICO (Nov. 19, 2009), https://www.politico.com/story/2009/11/mccain-slams-horrendous-climate-bill-029747 [https://perma.cc/CX6U-VY7J] (describing Presidential candidate John McCain's opposition in 2009 in contrast to his earlier stance); Elisabeth Bumiller & John M. Broder, *Greenhouse Gas Must Be Capped, McCain Asserts*, N.Y. TIMES (May 13, 2008), https://www.nytimes.com/2008/05/13/us/politics/13mccain.html [https://perma.cc/KRB2-TXXR] (illustrating Senator McCain's professed support for climate legislation during the earlier parts of the campaign).

[160] *See, e.g.*, John M. Broder, *'Cap and Trade' Loses Its Standing as Energy Policy of Choice*, N.Y. TIMES (Mar. 25, 2010), https://www.nytimes.com/2010/03/26/science/earth/26climate.html [https://perma.cc/QD9E-EFTW] (describing how Democratic officials moved on from the bill within months after passage in the House due to firm opposition in the Senate and perceptions of political liability). Many accounts were written with various perspectives as to why Waxman-Markey failed. *See, e.g.*, Bryan Walsh, *Why the Climate Bill Died*, TIME (July 26, 2010), https://science.time.com/2010/07/26/why-the-climate-bill-died/ [https://perma.cc/LP6B-R4RQ] (arguing that the bill suffered from poor messaging and a lack of enthusiasm from liberals, in addition to conservative and industry-led opposition).

[161] *See, e.g.*, Lisa Lerer, *Is Cap and Trade Dems' Next 'BTU'?*, POLITICO (July 13, 2009), https://www.politico.com/story/2009/07/is-cap-and-trade-dems-next-btu-024843 [https://perma.cc/E3SP-NFK2].

[162] For a more detailed account on the negotiations within the Administration and Congress over the bill throughout 2009 and 2010, and how it ultimately failed, see Ryan Lizza, *As the World Burns*, NEW YORKER (Oct. 3, 2010), https://www.newyorker.com/magazine/2010/10/11/as-the-world-burns [https://perma.cc/G3MV-UTMG].

B. Agency Action as an Alternative to Climate Legislation

Coinciding with the political trends that have made updating environmental legislation more difficult, climate advocates also pursued action in administrative agencies to reduce GHG emissions. These efforts stretch back decades but took on particular strength by the end of the Clinton Administration.[163] In 1998, EPA General Counsel Jonathan Cannon wrote a memorandum concluding that the agency had the authority to regulate CO_2 emissions,[164] and in 1999, a coalition of nineteen environmental organizations filed a petition with the EPA seeking regulation of GHG emissions from "motor vehicles under [Section] 202 of the Clean Air Act."[165]

The 1999 petition set in motion a series of actions by the EPA to control GHG emissions using existing regulatory authority under the Act. In 2003, after a protracted review period and comments from the public, the George W. Bush Administration's EPA denied the petition.[166] The EPA, reversing its earlier position, reasoned that it did not have authority to regulate GHGs as air pollutants under the Clean Air Act, and that even if it did, the decision to regulate would be discretionary and would not be consistent with the Administration's policy at the time.[167]

In 2007, the U.S. Supreme Court vacated the EPA's denial of the GHG petition in *Massachusetts v. EPA*—a landmark decision that interpreted Clean Air Act authority broadly and recognized the special interest of the states in mitigating climate change.[168] The *Massachusetts* decision and the election of President Obama revived the idea of using existing agency authority to tackle the climate problem in new ways. In Obama's first term, the EPA responded to *Massachusetts* by issuing a finding that six GHGs "endanger" public health and welfare and that this finding triggered statutory obligations for the EPA to regulate both mobile and stationary sources of those GHGs, known as the "Endangerment Finding."[169]

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[163] *See, e.g.*, Nathan Richardson, *The Rise and Fall of Clean Air Act Climate Policy*, 10 MICH. J. ENV'T & ADMIN. L. 69, 75 (2020) (providing history of administrative action geared towards reducing GHG emissions from the Clinton Administration).

[164] Memorandum from Jonathan Z. Cannon, Gen. Couns., EPA, to Carol M. Browner, Adm'r, EPA (Apr. 10, 1998) (on file with author).

[165] *See* Massachusetts v. EPA, 549 U.S. 497, 510 (2007).

[166] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52922, 52922–24 (Sept. 8, 2003).

[167] *Id.* at 52929; *see also Massachusetts*, 549 U.S. at 511 (citation omitted) (detailing the procedural history of the rulemaking petition).

[168] *Massachusetts*, 549 U.S. at 519–20, 534–35 (recognizing that Massachusetts "is entitled to special solicitude in [the Court's] standing analysis").

[169] Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66496, 66496 (Dec. 15, 2009) (codified at 40 C.F.R. ch. I); Recon-

The EPA's first major action on climate regulation after the Endangerment Finding was a joint rule with the National Highway and Traffic Safety Administration (NHTSA) establishing limits on CO_2 (and other GHG) emissions from cars and a complementary, stricter set of Corporate Average Fuel Economy (CAFE) standards.[170] The so-called "Tailpipe Rule" came as part of a negotiated agreement among the federal agencies, California state officials, and leading automakers, in the aftermath of the federal government's bailout of U.S. auto manufacturers in 2008–2009.[171] The Tailpipe Rule was designed to be technology-forcing, and stands as the EPA's signature climate policy achievement under the Clean Air Act, despite proverbial bumps in the road during the Trump Administration.[172]

The EPA had already begun planning and proposing rules to combat GHG emissions from major stationary sources like power plants in 2009. But after the Waxman-Markey legislation died in 2010, the idea of using existing Clean Air Act regulatory authority took on particular importance and became the centerpiece of the Obama Administration's Climate Action Plan.[173]

Agency officials in the Obama Administration and Members of Congress consistently stuck with a rhetorical message that they would prefer new climate legislation and that agency action would be less desirable, less flexible, and less

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sideration of Interpretation of Regulations That Determine Pollutants Covered by Clean Air Act Permitting Programs, 75 Fed. Reg. 17004, 17004 (Apr. 2, 2010) (codified at 40 C.F.R. pts. 50, 51, 70, 71).

[170] Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 75 Fed. Reg. 25324, 25324 (May 7, 2010) (codified at 40 C.F.R. pts. 85, 86, 600 and 49 C.F.R. pts. 531, 533, 536, 537, 538).

[171] *See, e.g.*, Jim Tankersley & Richard Simon, *U.S. to Limit Greenhouse Gas Emissions from Autos*, L.A. TIMES (May 19, 2009), https://www.latimes.com/archives/la-xpm-2009-may-19-na-emissions19-story.html [https://perma.cc/25WW-H5BJ] (opining that automaker's receipt of federal aid rendered them more amenable to federal regulation).

[172] Auto manufacturers seized on the political opportunity in the Trump Administration to push for relaxation of the standards, which were beginning to reach a critical phase that would require significant changes or technological innovation. The Trump-led agencies rolled back the standards and issued a revocation of the EPA waiver that allowed California to impose its own car emissions standards. *See, e.g.*, Meredith Hankins & Nicholas Bryner, *Trump Administration and California Are on Collision Course Over Vehicle Emissions Rules*, CONVERSATION (Aug. 2, 2018), https://theconversation.com/trump-administration-and-california-are-on-collision-course-over-vehicle-emissions-rules-100574/ [https://perma.cc/UKC9-ZVTY] (explaining that, historically, the EPA denied California's waiver request on only one occasion). These disputes led to litigation, most of which was not resolved by the time the Biden Administration came into office in 2021; some cases remain in court as the agencies now push for updated standards. *See, e.g.*, Lesley Clark, *'SCOTUS Bait': Legal Battle Over Calif. Waiver Begins*, CLIMATEWIRE (Jan. 31, 2023), https://www.eenews.net/articles/scotus-bait-legal-battle-over-calif-waiver-begins/ [https://perma.cc/SL46-ZZSM] (noting that five major automakers supported California's waiver right).

[173] *See* Fact Sheet: President Obama's Climate Action Plan, *supra* note 129 (outlining a multi-point plan to reduce U.S. carbon emissions).

efficient.[174] But it was clear that once the Administration lost majority support in Congress after the 2010 midterms and throughout President Obama's second term, agency action was the only politically available alternative.[175]

Part of climate advocates' strategy in developing administrative action to curb GHG emissions was to use regulation as a lever to encourage congressional action. As the theory went, industry would be more willing to support congressional action (in which they could lobby for flexibility and assistance in compliance) if there was a credible threat that the EPA and other agencies would put stringent rules in place.[176] Nevertheless, as soon as the administrative regulation strategy under the Clean Air Act was put in place, judicial challenges blocked the federal government's ability to deal with the climate problem.

C. Judicial Challenges for Clean Air Act Implementation

Although *Massachusetts v. EPA* laid out a path forward and an expectation for EPA regulation of GHGs across the economy, U.S. Supreme Court jurisprudence over the following years closed off the path, with increasing judi-

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[174] The most famous example of this rhetoric is President Obama's oft-used line, "I've got a pen and I've got a phone," deployed on a wide range of policy issues, indicating his desire to "[work] with Congress where I can," but also "to act on my own if Congress is deadlocked." Tamara Keith, *Wielding a Pen and a Phone, Obama Goes It Alone*, NPR (Jan. 20, 2014), https://www.npr.org/2014/01/20/263766043/wielding-a-pen-and-a-phone-obama-goes-it-alone [https://perma.cc/NV87-R3G7]. Critics of the Obama Administration have expressed their view that the agencies dragged their feet—whether as a result of waiting too long for Congress to act, or due to other political pressures—and wound up doing too little, too late on climate action before leaving office in January 2017. *See, e.g.*, David Bookbinder, *Obama Had a Chance to Really Fight Climate Change. He Blew It.*, VOX (Apr. 29, 2017), https://www.vox.com/the-big-idea/2017/4/28/15472508/obama-climate-change-legacy-overrated-clean-power [https://perma.cc/L8TG-4VMN] (explaining that President Obama's second term climate policies could be easily undone by President Donald Trump's EPA).

[175] *See, e.g.*, Dana Nuccitelli, *President Obama Acts on Climate Change by Enforcing the Law*, THE GUARDIAN (June 25, 2013), https://www.theguardian.com/environment/climate-consensus-97-per-cent/2013/jun/25/climate-change-carbon-emissions-president-obama-epa [https://perma.cc/HC39-LGP7] (noting that in the wake of Congress's inaction, President Obama's strongest route for regulating GHGs was through agency enforcement).

[176] Political economy literature suggests that firms are most motivated in decisions about whether to support climate regulation based on whether the regulation will impose asymmetric costs on competitors. *See, e.g.*, Amanda Kennard, *The Enemy of My Enemy: When Firms Support Climate Change Regulation*, 74 INT'L ORG. 187, 187 (2020). Nevertheless, industries often express in public statements that they value regulatory stability, which could be better accomplished through legislative, as opposed to administrative action. *See, e.g.*, Fred Krupp, *13 Major Companies Call on Congress to Accelerate Climate Legislation. Here's Why.*, FORBES (May 15, 2019), https://www.forbes.com/sites/edfenergyexchange/2019/05/15/13-major-companies-call-on-congress-to-accelerate-climate-legislation-heres-why/?sh=411a07df739f [https://perma.cc/6833-WCPL] (arguing for companies to work with Congress in creating "public policies that harness the power of the whole economy to drive down emissions by putting prices and limits on climate pollution").

cial hostility to administrative discretion and regulatory action.[177] Except for the CAFE standard and Tailpipe Rule for motor vehicles, each major regulatory step encountered resistance.

In 2011, the U.S. Supreme Court obliquely addressed the question of administrative action on climate change in *American Electric Power Co. v. Connecticut*, a tort case brought against dominant electric utilities on public nuisance grounds that sought an injunction to control and eventually limit power sector CO_2 emissions.[178] The district court held the case non-justiciable as implicating political questions about how to address climate change—a holding reversed by the U.S. Court of Appeals for the Second Circuit.[179] The Supreme Court resolved the case by holding, unanimously, that the plaintiffs' public nuisance claim—rooted in federal common law—was displaced by the Clean Air Act.[180]

As a central piece of the holding, the Court noted that, under *Massachusetts*, the EPA plainly had the authority to regulate CO_2 emissions.[181] The Court further referred specifically to Clean Air Act Sections 111(b) and 111(d), assuming that the EPA would be required to and would indeed publish NSPS regulations under those subsections to control GHG emissions from new and existing sources, respectively.[182] In fact, the Court warned that if the EPA failed to do so in response to public petitions, the denial of such petitions could be reviewed in court as well.[183]

Despite *Massachusetts* and *American Electric Power*, the Supreme Court's subsequent decisions—as discussed below—interpreted the Clean Air Act in ways that frustrated the EPA's ability to adopt any kind of reasonable and effective regulations.[184] The Court, moving the goalpost, found that Clean Air Act authority was present enough to displace a parallel common law remedy, but strictly construed the EPA's discretion to actually effectuate meaningful

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[177] Massachusetts v. EPA, 549 U.S. 497 (2007); *see, e.g.*, Richardson, *supra* note 163, at 158 ("The Court's skepticism and hostility toward climate regulation turned *Massachusetts* from a license to build a regulatory program into a trap, drawing the Obama EPA into a legal quagmire and enabling the Trump EPA's rollback.").

[178] 564 U.S. 410, 418–19 (2011).

[179] *Id.* at 419.

[180] *Id.* at 413, 424; *see also* Aisha I. Saad, *Attribution for Climate Torts*, 64 B.C. L. REV. 867, 875–76, 930 (2023) (arguing that, in the wake of *American Electric Power Co.*, state claims have displaced federal nuisance claims, and obstacles to such state claims can be alleviated by utilizing attribution studies).

[181] *Am. Elec. Power Co.*, 564 U.S. at 424.

[182] *Id.* The Court noted that EPA was, at the time, already in the process of using section 111 to develop rules for power plants. *Id.* at 425.

[183] *Id.*

[184] *See infra* notes 185–209, 225–243, and accompanying text.

limits on stationary source GHG emissions. The effect has been to close off the pathway of regulation as an alternative to legislation.

1. *Utility Air Regulatory Group v. EPA*

After the 2009 Endangerment Finding and the 2010 Tailpipe Rule, the EPA took the position that these actions triggered a statutory obligation to regulate stationary sources of GHG emissions as well—including through the PSD/NSR program.[185] The EPA recognized that applying the PSD program (and the Title V Clean Air Act permitting program) to sources of CO_2 would present a new management challenge based on the characteristics of the pollutant.[186] CO_2 is emitted in very large quantities as one of two products of complete combustion of HCs (along with water vapor), unlike conventional pollutants, which are more typically unwanted byproducts emitted in smaller quantities (such as sulfur dioxide, which is the result of impurities, or volatile organic compounds (VOCs), CO, and HC—all products of incomplete combustion).[187]

The PSD program in the Clean Air Act defines a "major emitting facility" as one with the potential to emit at least 250 tons of any air pollutant per year (or one hundred tons of certain listed categories of sources).[188] This is a slight deviation from the Act-wide definition of "major stationary source" or "major emitting facility" as one with the potential to emit at least "one hundred tons per year . . . of any air pollutant."[189] The catch for the EPA in regulating CO_2 emissions under the PSD program is that 250 tons per year of CO_2 is simply not very much.[190] As a result, the EPA indicated in its "Tailoring Rule" that it

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[185] Util. Air Regul. Grp. v. EPA (*UARG*), 573 U.S. 302, 311–13 (2014).

[186] Stephen Johnson, the final EPA Administrator in the George W. Bush Administration, indicated his opinion that the Clean Air Act was "ill-suited for the task of regulating global greenhouse gases" in the Advanced Notice of Proposed Rulemaking issued in response to *Massachusetts*, seeking comment on how to respond to the case. Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44354, 44355 (proposed July 30, 2008) (to be codified at 40 C.F.R. ch. I). Johnson expressed a concern—which the *UARG* Court would pick up on—that the language of the Act would appear to trigger an unmanageable requirement to regulate "smaller stationary sources that also emit GHGs—such as apartment buildings, large homes, schools, and hospitals" not traditionally subject to EPA regulation. *Id.*

[187] *See* Sarma Pisupati, *Products of Combustion*, PA. STATE COLL. OF EARTH & MIN. SCI., https://www.e-education.psu.edu/egee102/node/1951 [https://perma.cc/4VET-88RQ] (explaining how conventional pollutants become products of the combustion process); B.D. Hong & E.R. Slatick, *Carbon Dioxide Emission Factors for Coal, January–April 1994*, Q. COAL REP., Aug. 1994, at 1, 1, https://www.eia.gov/coal/production/quarterly/co2_article/co2.html [https://perma.cc/7A9H-NC23] (explaining that, during the combustion process, oxygen and hydrogen combine to create water vapor).

[188] 42 U.S.C. § 7479(1).

[189] *Id.* § 7602(j).

[190] The EPA estimated at the time that applying the 100/250 tons per year threshold would mean that there would be 6.1 million major sources of GHGs in the United States—over 400 times as many as the 15,000 major sources of conventional pollutants. *See* Prevention of Significant Deterioration

would begin its first phase in implementation of GHG requirements in NSR and Clean Air Act Title V permitting with facilities already required to have a permit due to emission of conventional pollutants. This would be followed by application of a much higher threshold for what constitutes a major source, phasing in regulation of sources with the potential to emit one hundred thousand tons of CO_2 per year or modifications to increase emissions by seventy-five thousand tons per year.[191]

The Supreme Court granted certiorari in the case specifically to address the question of whether the EPA's Endangerment Finding and subsequent GHG regulation of cars necessarily "triggered" regulation of stationary sources.[192] The Justices' opinions, however, focused primarily on the scope of that regulation and the EPA's decision to tailor the regulatory program to tackle the largest, most significant subset of sources.[193] In doing so, the majority expressed deep skepticism about the entire enterprise of climate regulation under the Clean Air Act—a harbinger of the Court's conservative trend limiting administrative authority across the federal government.[194]

The EPA had grounded its tailoring decision as an interpretation of various provisions in the Act based on three related legal doctrines:

> (1) The "absurd results" doctrine, which authorizes agencies to apply statutory requirements differently than a literal reading would indicate, as necessary to effectuate congressional intent and avoid absurd results, (2) the "administrative necessity" doctrine, which authorizes agencies to apply statutory requirements in a way that avoids impossible administrative burdens; and (3) the "one-step-at-

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and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31514, 31540 (June 3, 2010) (codified at 40 C.F.R. pts. 51, 52, 70, 71) (providing a table demonstrating "coverage and burden information").

[191] *Id.* at 31516. The rule issued by EPA referred to carbon dioxide equivalent (CO_2e), rather than simply to carbon dioxide, to account for other GHGs based on their atmospheric warming potential. *Id.* at 31522.

[192] Util. Air Regul. Grp. v. EPA (*UARG*), 573 U.S. 302, 314 (2014).

[193] *See id.* at 315–16, 321, 325 (holding that the EPA lacks authority to "tailor" legislation to fulfil policy goals).

[194] *See id.* at 321–22 (holding that requiring permitting for GHGs would be contrary to the Clean Air Act's design). Jody Freeman called *UARG* "a decision laced with the legal equivalent of improvised explosive devices" that foreshadowed the conservative majority of the Court's hostility to other climate regulations. Jody Freeman, *Why I Worry About* UARG, 39 HARV. ENV'T L. REV. 9, 9–11 (2015). Other scholars also saw dangerous implications from the *UARG* case as to how the Court would view other EPA climate rules. *See, e.g.*, Ann E. Carlson & Megan M. Herzog, *Text in Context: The Fate of Emergent Climate Regulation After* UARG *and* EME Homer, 39 HARV. ENV'T L. REV. 23, 25 (2015).

> a-time" doctrine, which authorizes agencies to implement statutory requirements a step at a time.[195]

The EPA recognized that the typical application of the straightforward terms of the statute would require it to regulate every major source—an estimated 6.1 million sources—over the 100/250 tons per year statutory threshold for CO_2.[196] The EPA saw fit to read flexibility into the numbers of the statute, at least for the time being (one step at a time), to effectively give meaning to the statutory command to regulate harmful air pollutants.

The Court's majority would have none of it. In a concurring opinion, Justices Alito and Thomas argued that *Massachusetts* had been wrongly decided and that the EPA's tailoring rule only made it clearer that any GHG regulation under the Clean Air Act was impermissible and unworkable.[197] Justice Scalia, writing for the majority, did not question *Massachusetts* itself, but concluded that the EPA had both asserted "an enormous and transformative expansion" of its authority (by triggering potential regulation of 6.1 million sources) and had effectively "rewrit[ten]" the statute to limit the scope of that authority, pursuant to what the EPA understood as Congress's intent.[198]

Justice Scalia's logic began with the numerical thresholds in the statute, viewing them as unambiguous and sacrosanct, and then applied the numbers to reverse engineer the universe of sources Congress intended to cover and the problems Congress intended to address.[199] Because Congress defined what constitutes a "major source" in numerical terms, the statute, in his view, simply could not apply to pollutants for which those numbers did not represent an administratively manageable threshold or cutoff.[200]

Justice Scalia's interpretation elevated form over function, contrary to any sensible understanding of how a legislative body would draft a regulatory statute, and contrary to any reasonable idea of the purpose of including "major source" thresholds in the Clean Air Act. Congress, of course, did not include the 100/250 tons per year line for major sources because there was some special public health or environmental reason to be concerned about that particular quantity of emissions. Rather, the threshold was designed for administrative

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[195] Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. at 31516.

[196] *Id.* at 31540.

[197] *UARG*, 573 U.S. at 343–44 (Alito, J., concurring).

[198] *Id.* at 324–25 (majority opinion).

[199] *Id*. at 325–28.

[200] *Id*. at 324, 328.

simplicity so as to focus regulation on the significant actors and not expend resources on inefficient controls on de minimis sources.[201]

What all parties could agree on was that the case highlighted the difficulty of applying the Clean Air Act to a new pollution problem. Instead of finding flexibility in the *numbers* given the specific circumstances of the new problem, the majority—also ostensibly seeking to avoid absurd results—ended up finding an implausible flexibility in the phrase "any air pollutant," excluding the possibility of discretion to tailor an old statute to fit a new problem.[202] Emerging from *UARG* was an unmistakable sense that the Court viewed climate regulation under the Clean Air Act as an aberration—as something new and different, rather than an extension of what the EPA had been doing for decades.

2. *West Virginia v. EPA*

The Clean Power Plan was the culmination of years of policy development about how to use the Clean Air Act to effectively control GHG emissions through generation shifting, thus creating a regulatory lever to induce technological innovation and move the power sector away from fossil fuels toward renewables and other low-carbon sources. In 2015, the Obama EPA finalized the rule based on its authority in Section 111(d) of the Clean Air Act, providing state-by-state targets for limiting GHG emissions from existing coal- and natural gas-fired power plants.[203] The Plan never took effect. Instead, in 2016, the Supreme Court placed a giant target on the rule,[204] and then, in 2022, in *West Virginia v. EPA*, the Court finally held that the EPA lacked statutory authority to issue it.[205]

Contemporary accounts provide a thorough explanation of how the EPA crafted the Clean Power Plan and initial observations about the rule's legal vulnerabilities.[206] In short, the Obama Administration settled on using Section 111 to regulate power plants by late in the first term—something evidenced by

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[201] *See id.* at 339–40 (Breyer, J., concurring in part and dissenting in part) (quoting from EPA's rule and referring to legislative history from the 1977 amendments to the Clean Air Act).

[202] *See id.* at 342 ("[I]t is anomalous to read an unwritten exception into the more important phrase of the statutory definition ('any air pollutant') when a similar unwritten exception to less important language (the particular number used by the statute) will do just as well.").

[203] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662, 64662 (Oct. 23, 2015) (codified at 40 C.F.R. pt. 60).

[204] *See* West Virginia v. EPA, 577 U.S. 1126, 1126 (2016) (staying application of the rule pending litigation before the D.C. Circuit).

[205] 142 S. Ct. 2587, 2615–16 (2022).

[206] *See, e.g.*, Freeman, *supra* note 194, at 11–14 (arguing that the Clean Power Plan contained legal vulnerabilities, including ambiguous terminology and the rule's novel nature). Richardson also provides a narrative explanation of the proposals in the Obama Administration that led to the Plan. Richardson, *supra* note 163, at 109–10.

the Supreme Court's aside in *American Electric Power*.[207] Based on the structure of the Section, the EPA first needed to establish an NSPS rule for *new* power plants under Section 111(b), but the main policy focus was on *existing* facilities, which come under Section 111(d).[208] This was because demand for new coal-fired power plants was sharply declining due to a combination of regulatory and economic pressures, while the existing power plant fleet represented the largest sector of GHG emissions in the United States at the time.[209]

a. The Clean Power Plan

The EPA published the final Clean Power Plan in 2015, marking it as the centerpiece of its efforts to implement the Obama Administration's Climate Action Plan.[210] Section 111(d) itself does not allow the EPA to directly set limitations on individual sources. Rather, the statute creates a process through which the EPA sets guidelines, which states must meet through application of their own implementation plans.[211] This convoluted process makes the facts and circumstances surrounding the Clean Power Plan somewhat opaque. In the 2015 final rule, the EPA set out state-by-state guidelines, with a specific numerical average for coal and natural gas plants in each state—based on the pre-existing electricity grid and mix of generation sources—expressed in terms of pounds of CO_2 per megawatt-hour generated (lbs CO_2/MWh).[212]

Unlike the Section 111(b) standard for new plants, which was based on at-the-site capture of at least part of the CO_2 emissions, the EPA reasoned that the

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[207] *See supra* notes 178–182 and accompanying text.

[208] The Obama Administration first proposed a 111(b) rule for GHGs from new power plants in 2012, but it did not finalize it at that time; instead, the EPA re-issued a different proposal in early 2014 and eventually finalized it in 2015. Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64510, 64510 (Oct. 23, 2015) (codified at 40 C.F.R. pts. 60, 70, 71, 98). Richardson argues that the delay until late in Obama's second term "has never been fully explained," but left the EPA "with little ability to react to legal challenges to the regulations" before Obama-appointed officials left office. Richardson, *supra* note 163, at 111.

[209] *See, e.g.*, Rebecca J. Davis, *3 Reasons US Coal Power Is Disappearing—and a Supreme Court Ruling Won't Save It*, CONVERSATION (July 28, 2022), https://theconversation.com/3-reasons-us-coal-power-is-disappearing-and-a-supreme-court-ruling-wont-save-it-187254 [https://perma.cc/7E3B-7XSP] (anticipating a large wave of coal-fired generator retirement in the next decade).

[210] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662, 64662 (Oct. 23, 2015) (codified at 40 C.F.R. pt. 60); *see also President Obama's Plan to Fight Climate Change*, THE WHITE HOUSE (June 25, 2013), https://obamawhitehouse.archives.gov/share/climate-action-plan [https://perma.cc/6SHX-AM4L] (listing the plan's three pillars: (1) reduce U.S. carbon emissions, (2) strengthen infrastructure to withstand severe weather, and (3) "forge a global solution" to climate change).

[211] 42 U.S.C. § 7411(d).

[212] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64821, 64824 tbl.12 (listing state-by-state adjusted averages).

best way—most effective and most efficient—to reduce CO_2 across the power sector was to allow greater flexibility.[213] Electric utilities *could* potentially reduce emissions at existing plants by retrofitting them with carbon capture technology, but the challenges with scaling up the technology and putting in place effective storage would be considerably more expensive than generation shifting alternatives.

In the preamble to the Clean Power Plan, the EPA explained the reasoning behind its calculation as to what it considered BSER.[214] The statute requires the EPA to set NSPS standards that "reflect[] the degree of emission limitation achievable through the application of the best system of emission reduction . . . [that the EPA] determines has been adequately demonstrated."[215] As noted above, CO_2 is an inevitable product of burning HC—not an impurity, and not an unintended byproduct from an incomplete reaction.[216] Therefore, process changes or conventional pollution control devices would not do anything to eliminate the gas. Instead, the only options short of capturing and storing it are either efficiency improvements or simply not burning hydrocarbons.

To give meaning to the statutory requirement that the agency regulate GHGs, the EPA thus had to come up with a pollutant-specific understanding of a *system*. To do this, the EPA reasoned that the entire electricity generation matrix in the United States is indeed one large system—a system with interconnected parts and grid operators at a state or regional level that are continually ramping up or ramping down generation from different sources based on available supply and demand.[217] The EPA determined that the "adequately demonstrated," "best system" for reducing emissions, then, is applying new generation technologies to shift generation away from coal toward natural gas and low-carbon sources (for example, wind, solar, nuclear, and hydroelectric power).[218] To meaningfully reduce CO_2 emissions from the power sector, a generation shifting system is far cheaper and more easily implemented than within-the-fenceline changes to power plant operations. To do otherwise would be either to (a) impose extraordinary, irrational costs on the system, or (b) simply fail to make significant reductions concomitant with the degree to which GHGs endanger public health and welfare.

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[213] *See id.* at 64672 (discussing "flexibility" as one of the fundamental objectives of both the proposal and final Clean Power Plan rule).

[214] *Id.* at 64717–811.

[215] 42 U.S.C. § 7411(a)(1).

[216] *E.g.*, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64689–90 (explaining challenges in controlling carbon dioxide emissions due to the properties of the gas).

[217] *See, e.g.*, *id.* at 64677–79 (describing characteristics of the U.S. electricity generation sector).

[218] *Id.* at 64667 (describing the three building blocks of the plan, including substitution of higher-emitting facilities with lower-emitting facilities and zero-GHG sources).

To calculate the state-by-state specific targets, the EPA decided to use three "building blocks."[219] First, the agency assumed that plants could make some modest efficiency improvements on average across existing facilities. Second, the EPA modeled the impact of switching from coal-fired power to natural gas fuel, in line with the ongoing U.S. trend. Third, the EPA modeled the changes that could be reasonably made to average CO_2 emissions by switching to renewables and by making investments in end-user energy efficiency. The final result varied significantly from state to state, according to the baseline of carbon-intensive generation.[220]

The EPA attempted to head off economic-based criticism by making the rule as flexible as possible. In accordance with Section 111(d), states and regulated facilities would have the ability to decide how to reach the guidelines with a variety of policy options.[221] One option—the preferred policy outcome—would be to convert the state-by-state CO_2 rates into a cap of total emissions that could then serve as the basis for an interstate, nationwide cap-and-trade regime.[222] The EPA calculated that under a cap-and-trade system, regulated facilities could lower compliance costs for the Clean Power Plan from $8.4 billion to $5.1 billion in 2030.[223] Overall, the agency projected that the rule would drive GHG reductions in the power sector by thirty-two percent below their 2005 peak levels by 2030, with tens of billions of dollars in net benefits due to the avoided impacts of climate change and the co-benefits of reduced exposure to other air pollutants.[224]

b. The Clean Power Plan in Court

Led by West Virginia, a coalition of states, regulated industries, and others immediately challenged the Clean Power Plan in the U.S. Court of Appeals

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[219] *See id.*

[220] *See id.* at 64824 tbl.12, 64825 tbl.13 (tables showing rate-based and mass-based targets for each state).

[221] *See id.* at 64724 ("The set of measures identified as the BSER for the source category encompasses a menu of actions that are part of the BSER and that individual affected EGUs may implement in different amounts and combinations in order to achieve their emission limits at reasonable cost.").

[222] This is referred to in the Clean Power Plan as the option to convert state-level targets to "mass-based" targets that function as a cap on overall power sector GHG emissions. *Id.* at 64822, 64825 tbl.13 (listing optional state mass-based targets). Critics of the Plan saw this as the essential legal problem—the EPA had sought to create a cap-and-trade plan when Congress had failed to establish one in 2009–2010. *See, e.g.*, West Virginia v. EPA, 142 S. Ct. 2587, 2614 (2022) (characterizing the Clean Power Plan as "essentially . . . a cap-and-trade scheme, or set of state cap-and-trade schemes").

[223] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Sources, 80 Fed. Reg. at 64934–35.

[224] *Id.* at 64924 (climate and pollution impacts); *id.* at 64928–33 (monetized benefits from reduced climate change and reduced air pollution exposure).

for the D.C. Circuit.[225] After the circuit court denied a request to stay implementation of the rule during the litigation, but before the court would hear oral argument, the Supreme Court took the extraordinary step of staying the rule—not only pending the outcome of the D.C. Circuit's resolution of the petition for review, but up through and until any potential writ of certiorari to the Supreme Court would be filed and resolved.[226] It was therefore clear that a five-vote Court majority in 2016 was already poised to interpret the Clean Air Act to invalidate the Clean Power Plan as outside the scope of EPA's authority.

Litigation against the plan was held in abeyance throughout the Trump Administration as the new EPA proposed and finalized a replacement rule.[227] In promulgating the replacement—the Affordable Clean Energy (ACE) Rule[228]—the Trump EPA never attempted to make an argument that the replacement was a more effective or economically efficient approach than the Clean Power Plan.[229] Instead, the EPA justified replacement of the Clean Power Plan solely on a legal interpretation of Section 111, concluding that the Act did not permit the EPA to look outside the "fence line" of individual sources (for example, through generation shifting) in determining what could constitute the best system of emission reduction.[230]

On January 19, 2021, the D.C. Circuit vacated the Trump EPA's ACE Rule, holding that this legal interpretation of Section 111 was improper and that the statute could in fact be read to allow the EPA to consider generation shifting.[231]

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[225] West Virginia v. EPA, 577 U.S. 1126 (2016).

[226] *Id.* at 1126.

[227] *Id.*; Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. 32520 (July 8, 2019) (to be codified at 40 C.F.R. pt. 60).

[228] Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. at 32520.

[229] The EPA constructed the repeal of the Clean Power Plan and the promulgation of the ACE Rule as "distinct final agency actions" despite appearing in one single publication in the Federal Register. *Id.* at 32532. In doing so, the EPA then used a regulatory baseline of *no rule* for purposes of regulatory impact analysis, showing (small) net benefits from the ACE Rule instead of using the Clean Power Plan as a regulatory baseline, which would have shown that the ACE Rule results in orders of magnitude lower net benefits to society. *Compare* Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. at 32572 tbl.10 (net benefits ranging from $300 million to $1 billion in 2030, depending on discount rates and estimates of ancillary health benefits), *with* Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64681 tbl.2 (net benefits from $25 billion to $43 billion in 2030, depending on discount rates, under a mass-based compliance approach).

[230] Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. at 32523–32.

[231] Am. Lung Ass'n v. EPA, 985 F.3d 914, 995 (D.C. Cir. 2021).

It was through this case that the Supreme Court eventually granted certiorari to decide the original question in *West Virginia v. EPA* and determine whether the EPA validly exercised its authority with the Clean Power Plan in 2015.[232]

With a six-vote majority, the Supreme Court reversed, holding that Section 111 does not allow the EPA "to devise carbon emissions caps based on a generation shifting approach;" therefore, the Clean Power Plan was unlawful as outside the scope of the statute.[233] Although the Justices did not read the statute to completely prohibit regulation of GHGs under Section 111(d), the holding leaves little room for any meaningful system-wide action.[234]

The Court's hostility to using the Clean Air Act to address climate change is evident in the majority's characterization of the statutory provisions at issue in *West Virginia*. The majority referred to Section 111(d) as an "ancillary" provision and a "little-used backwater"[235] despite the Court's reference to Section 111(d) a decade earlier as a critical piece of Clean Air Act authority that displaced federal common law.[236] In this context, the majority shoehorned the case into what the Court has now characterized as the "major question doctrine" line of cases.[237]

Instead of an interpretive approach centered on the regulatory mandates in the Clean Air Act—statutory grants of authority to the EPA to limit dangerous pollution—the Court's emphasis on searching for prior regulatory experience under the statutory language at issue is hostile to any administrative action that

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[232] West Virginia v. EPA, 142 S. Ct. 2587, 2599–600 (2022). Aside from the merits, there was a serious question in the case about whether West Virginia and other states still had standing to challenge the Clean Power Plan, given that the Biden Administration had no plans to revive it. *Id.* at 2606–07. The policy world had long since moved on in the years since 2015, but because the Administration stood by the position that beyond-the-fenceline generation shifting was properly within the scope of the EPA's authority, the Court held that the case was justiciable. *Id.* at 2607.

[233] *Id.* at 2614–16.

[234] *See id.* at 2628 (Kagan, J., dissenting) ("The majority today . . . deprives EPA of the power needed—and the power granted—to curb the emission of greenhouse gases.").

[235] *Id.* at 2602, 2613 (majority opinion).

[236] Am. Elec. Power Co. v. Connecticut, 564 U.S. 410, 424 (2011). Rachel Rothschild suggests that the majority crafted its opinion in *West Virginia* specifically to strike down the Clean Power Plan without entirely removing the EPA's authority to regulate greenhouse gases under Section 111(d), thereby preserving the holding in *American Electric Power* that the Act displaces federal common law nuisance claims. *See* Rachel Rothschild, *Why the Supreme Court Avoided Using Traditional Tools of Statutory Interpretation in* West Virginia v. EPA, YALE J. REG.: NOTICE & COMMENT (Jan. 12, 2023), https://www.yalejreg.com/nc/why-the-supreme-court-avoided-using-traditional-tools-of-statutory-interpretation-in-west-virginia-v-epa-by-rachel-rothschild/ [https://perma.cc/5QJB-3ADY] (opining that the Court wanted to prevent a litany of federal nuisance cases targeting fossil fuel sources).

[237] *See West Virginia*, 142 S. Ct. at 2609–10 (explaining that the "major questions doctrine" developed through caselaw that addressed the issue of agencies extending their power beyond that granted by Congress).

looks new.[238] The Court found fault in the EPA's decision to use an expansive notion of "system" in setting the overall state-by-state target, as it is unusual in the statute for the agency to encounter a situation in which it must both (a) set an effective cap on emissions, and (b) promulgate technology-based regulations to meet it.[239] Of course, this is the entire principle upon which the NSPS program is based. The EPA, having made a finding that GHG emissions endanger public welfare, did not and does not have discretion to arbitrarily cap emissions, but it is rather compelled to put in place a regulation that at a minimum places polluting sources on a pathway to mitigating the threat.

The final paragraph of Chief Justice Roberts' majority opinion further highlights that the Court sees climate change as a distinct problem, separate from other air pollution problems dealt with under the Clean Air Act.[240] The Clean Air Act includes a congressional delegation to the EPA to regulate air pollution, but because the Court sees climate change as "the crisis of the day"—with a high level of political salience—the majority concluded that the agency cannot effectively act without a clear (re)statement from the legislative branch.[241] Indeed, when viewing Justice Kagan's dissent and Justice Gorsuch's concurring opinion side-by-side, an essential piece of the dispute boils down to whether regulation of GHGs from the electricity grid is actually a "mismatch" with the EPA's statutory authority.[242]

The result of this line of cases—the arc from *Massachusetts* through *UARG* to *West Virginia*—is that the Court has sharply curtailed the EPA's ability to use the Clean Air Act to address new problems. And while these cases deal directly with GHGs, the Court's anti-administrative trend holds across all the EPA's work.[243]

Combining legislative gridlock with judicial hostility, the narrative arc of climate regulation under the Clean Air Act since the 1990s has been a near-

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[238] The Court criticizes what it sees as the EPA's "newly 'discover[ed]'" authority, citing parallel reasoning in the *UARG* case that also clamped down on the EPA's application of the Clean Air Act to climate change mitigation. *Id.* at 2612 (alteration in original) (citing Util. Air Regul. Grp. v. EPA (*UARG*), 573 U.S. 302, 324 (2014)).

[239] *Id.* at 2615.

[240] *See id.* at 2616 (providing that nationwide generation shifting policy would require congressional action).

[241] *Id.* (quoting New York v. United States, 505 U.S. 144, 187 (1992)). The glib assertion that generation shifting may be "sensible"—but that the agency is powerless to do it—serves as a rhetorical move to distract the Court's audience from the *activist* idea of strict judicial construction of the scope of agency decision-making.

[242] *Compare id.* at 2637 (Kagan, J., dissenting) (reasoning that "generation shifting creates no mismatch with EPA's expertise"), *with id.* at 2624 (Gorsuch, J., concurring) (indicating that "there is a 'mismatch' between the EPA's expertise over environmental matters" and matters of energy policy).

[243] *See, e.g.*, Sackett v. EPA, 598 U.S. 651, 678–79, 683 (2023) (limiting the scope of the federal government's jurisdiction to conserve wetlands and control pollution under the Clean Water Act, under the statute's definition of "waters of the United States").

complete failure—except for the Tailpipe Rule for cars that has itself been the subject of rollback attempts. The Clean Air Act, once known for technology-forcing, cannot be used directly to take on the complex problem of climate change, where every bit of innovation is essential. And yet, despite that failure, the Inflation Reduction Act has now provided a path forward that may allow the EPA to hark back to the technology-forcing history of the Clean Air Act.

III. Policy by Spending in the Inflation Reduction Act

Section A of this Part outlines the Inflation Reduction Act's (IRA) path to law, highlighting the Green New Deal's role in shaping climate policy and the challenges faced in the Senate.[244] Section B provides an overview of the IRA—focusing on some key provisions that authorize methane emission regulation and incentivize carbon capture and storage (CCS).[245] Finally, Section C of this Part illustrates how spending policy can be an effective vehicle for climate regulation, proving effective at reducing air and water pollution.[246]

A. Negotiations Leading to the Inflation Reduction Act

The Sunrise Movement's demonstration at returning-Speaker-elect Nancy Pelosi's office after the 2018 midterm election was the most visible symbol of a rising popular movement for environmental action.[247] In particular, this younger, more diverse movement called for a unifying of social justice and environmental issues by pushing for legislation that would reflect a class- and race-conscious idea of environmental justice.[248] Although the phrase "Green New Deal" did not originate with this specific movement, the phrase caught on—it effectively described the pairing of environmentalism with social and labor justice, conveying an active role for the federal government.[249]

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[244] *See infra* notes 247–262 and accompanying text.

[245] *See infra* notes 263–300 and accompanying text.

[246] *See infra* notes 301–310 and accompanying text.

[247] *See, e.g.*, Rex Santus, *The Climate Activists Who Got Arrested at Nancy Pelosi's Office Are Just Getting Started*, VICE (Nov. 23, 2018), https://www.vice.com/en/article/zmd3e3/the-climate-activists-who-got-arrested-at-nancy-pelosis-office-are-just-getting-started/ [https://perma.cc/VDR7-QKMK] (indicating that the sit-in resulted in some success, as eleven House Democrats offered support for the Green New Deal in its aftermath).

[248] *See id.* (noting that the Sunrise Movement is focusing activism in "critical states" such as Pennsylvania, Florida, and Michigan).

[249] *See, e.g.*, Robinson Meyer, *A Centuries-Old Idea Could Revolutionize Climate Policy*, THE ATLANTIC (Feb. 19, 2019), https://www.theatlantic.com/science/archive/2019/02/green-new-deal-economic-principles/582943/ [https://perma.cc/QG8D-TT5X] (stating that, at its core, the Green New Deal is industrial policy).

In the 2020 presidential primary, on the Democratic side, several candidates explicitly adopted Green New Deal plans.[250] For the eventual nominee, President Joe Biden, the Green New Deal was not an overt part of the platform (Biden had denominated the "Build Back Better" framework), but the movement significantly shaped the party-wide approach to environmental issues, industrial policy, and federal spending to improve the nation's infrastructure.[251]

Early in the 117th Congress, key members of the Senate expressed that they would not support ending the filibuster rules for ordinary legislation.[252] This meant that major policy proposals would be limited to procedures exempt from the sixty-vote supermajority rule needed to invoke cloture and break a filibuster. Under the so-called Byrd Rule, budget "reconciliation" bills have a privileged debate status and require only a simple majority vote for passage in the Senate, so long as the substance of the legislation is limited to matters concerning the budget.[253]

In early 2021, Congress spent most of its legislative efforts in responding to the COVID-19 pandemic.[254] Budget reconciliation processes then began later in the year, with Democrats in the Senate ultimately placing first priority to enact a spending package for repairing aged, broken, and inadequate infrastructure. This led to the passage of the Infrastructure Investment and Jobs Act in November 2021—seen in hindsight as a critical first step that works hand-in-hand with much of the IRA.[255]

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[250] *See, e.g.*, David Roberts, *Jay Inslee Is Writing the Climate Plan the Next President Should Adopt*, VOX (May 18, 2019), https://www.vox.com/energy-and-environment/2019/5/18/18628870/green-new-deal-jay-inslee-2020-climate-change [https://perma.cc/57QX-TH2R]; Amanda Becker, *White House Hopeful Warren Seeks $10.7 Trillion Green New Deal*, REUTERS (Dec. 20, 2019), https://www.reuters.com/article/usa-election-warren-climate-idAFL1N28U048 [https://perma.cc/XU34-M3QN] (Elizabeth Warren).

[251] *See* Sydney Ember & Matt Stevens, *What the Democratic Party Platform Actually Says*, N.Y. TIMES (Aug. 25, 2020), https://www.nytimes.com/2020/08/19/us/politics/democratic-party-platform.html [https://perma.cc/BS8U-UXF9] (noting that the Democratic Party's 2020 Platform "sets aggressive goals" on climate change but "makes no mention of the 'Green New Deal'").

[252] *See, e.g.*, Sam Levine, Joanna Walters & Joan E. Greve, *Sinema Says No to Filibuster Reform to Scuttle Democrats' Voting Rights Hopes*, THE GUARDIAN (Jan. 13, 2022), https://www.theguardian.com/us-news/2022/jan/13/kyrsten-sinema-democrats-filibuster-voting-rights [https://perma.cc/BQK3-9E5Y] (discussing opposition to filibuster reform by Senators Sinema and Manchin in the context of voting rights legislation).

[253] *See generally* BILL HENIFF, JR., CONG. RSCH. SERV., RL30862, THE BUDGET RECONCILIATION PROCESS: THE SENATE'S "BYRD RULE" (2022) (providing a detailed overview of the Byrd Rule, its implementation, and related controversies).

[254] *See, e.g.*, American Rescue Plan Act of 2021, Pub. L. No. 117-2, 135 Stat. 4 (providing, among other things, economic stimulus payments to individual Americans).

[255] *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021) (impacting, among other things, public transit, passenger rail, highway systems, energy, and potable water access).

Given that the breakdown of the Senate in the 117th Congress included fifty Republican Senators and fifty Senators that were either Democrats or caucused with Democrats, every vote was critical, with no margin for error on party-line votes.[256] This gave individual Senators, including Kyrsten Sinema of Arizona and Joe Manchin of West Virginia—the Democratic caucus member most closely associated with the fossil-fuel industry, given his home state's traditional connection to coal mining—a tremendous amount of leverage in negotiating any bill.[257]

President Biden originally included three pillars in his domestic legislative agenda in 2021, all part of the "Build Back Better" platform: COVID-19 relief; infrastructure funding; and an additional bill on social and environmental policy.[258] The third piece of this became the Build Back Better Act that was introduced and passed in the House of Representatives.[259] Negotiation of the pared-down House version of the bill stalled in the Senate when Senator Manchin voiced his opposition, drawing rebukes from Senate colleagues and the White House.[260]

After several months during which the proposal seemed dead, suddenly, in July 2022, Senator Manchin, Senate Majority Leader Chuck Schumer, and the White House released the details of a new version of the bill—now named the IRA.[261] Less than two weeks later, the Senate passed the bill on a 50–50

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[256] *See* AM. BAR ASS'N, DEMOGRAPHICS OF THE 117TH CONGRESS: AN OVERVIEW OF THE 117TH CONGRESS, BROKEN DOWN BY RACE, EDUCATION, RELIGION, AND GENDER 8 (2021) (noting two senators identified as independents but voted alongside Democrats).

[257] *See, e.g.*, Connor O'Brien, *Manchin and Sinema 'Sabotaged' Biden's Plans, Sanders Says*, POLITICO (May 15, 2022), https://www.politico.com/news/2022/05/15/manchin-sinema-sabotage-sanders-00032579 [https://perma.cc/67FM-3X9W] (adding that Senators Sinema and Manchin refused to join efforts to alter the sixty-vote requirement for advancing legislation in the Senate).

[258] Joseph Biden, U.S. President, Remarks by President Biden in Address to a Joint Session of Congress (Apr. 28, 2021), https://www.whitehouse.gov/briefing-room/speeches-remarks/2021/04/29/remarks-by-president-biden-in-address-to-a-joint-session-of-congress/ [https://perma.cc/8EK6-KHEC].

[259] *See President Biden Announces the Build Back Better Framework*, THE WHITE HOUSE (Oct. 28, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/10/28/president-biden-announces-the-build-back-better-framework/ [https://perma.cc/2J89-X669] (listing GHG emission reduction, health care access, and affordable housing investment amongst the Build Back Better Act's goals).

[260] *See, e.g.*, Paola Rosa-Aquino & Chas Danner, *Manchin's Sudden Spike of Build Back Better Act Draws White House Rebuke*, N.Y. MAG.: INTELLIGENCER (Dec. 19, 2021), https://nymag.com/intelligencer/2021/12/manchin-says-he-is-a-no-on-bidens-bbb-social-spending-bill.html [https://perma.cc/JE39-V26Z] (indicating that portions of the bill were modified in response to Manchin's earlier objections prior to his revoking support for the bill).

[261] *E.g.*, Li Zhou, *How Democrats Plan to Overhaul Taxes, Climate Spending, and Health Care Before the Midterms*, VOX (July 28, 2022), https://www.vox.com/23281547/build-back-better-joe-manchin-inflation-reduction-act [https://perma.cc/NX75-2KZN].

vote, with Vice President Harris breaking the tie vote; following a vote on the House floor, President Biden signed the IRA into law.[262]

B. An IRA Overview

The IRA represents the most significant effort in history by Congress to address climate change. Over a ten-year period (in accordance with budget reconciliation rules), the IRA includes $490 billion in new spending authority and tax cuts or credits, which is offset by $764 billion in savings (from prescription drug policies) and tax revenue.[263] With the exception of some adjustments to Medicare prescription drug benefits and Affordable Care Act subsidies, all of the IRA's spending and tax credits go toward environmental, climate, and energy programs—an estimated $369 billion in "Energy Security and Climate Change" programs.[264]

The IRA contains a tremendous diversity of funding sources to support a transition to clean energy, from newly reconstructed tax credits for electric vehicles (new and used), to rebates and incentives for residential energy efficiency improvements, to loan guarantees and grants for research and development.[265] The Biden Administration has put out a more detailed guidebook on what is in the IRA.[266] Various organizations also have their own explanations of the IRA, but the focus in this Article is specifically on provisions that are likely to impact industries and facilities subject to stationary source controls under the Clean Air Act. Below is a discussion of several programs, including two key sections in particular—methane emissions regulation and incentives for CCS—in the context of how the IRA is likely to strengthen the EPA's future ability to adopt more stringent regulations.

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[262] Inflation Reduction Act of 2022, H.R. 5376, 117th Cong. (2022); Jim Tankersley, *Biden Signs Expansive Health, Climate and Tax Law*, N.Y. TIMES (Aug. 16, 2022), https://www.nytimes.com/2022/08/16/business/biden-climate-tax-inflation-reduction.html [https://perma.cc/9QN7-47TJ]; *see also Votes to Break Ties in the Senate*, U.S. SENATE, https://www.senate.gov/legislative/TieVotes.htm [https://perma.cc/KUS8-URCJ] (listing history of tie-breaking votes in the Senate).

[263] *See* Francesca Paris, Alicia Parlapiano, Margot Sanger-Katz & Eve Washington, *A Detailed Picture of What's in the Democrats' Climate and Health Bill*, N.Y. TIMES (Aug. 16, 2022), https://www.nytimes.com/interactive/2022/08/13/upshot/whats-in-the-democrats-climate-health-bill.html [https://perma.cc/ZW26-QNVB] (providing a table comparing the IRA with the Build Back Better Act).

[264] SENATE DEMOCRATS, *supra* note 9.

[265] *See* THE WHITE HOUSE, BUILDING A CLEAN ENERGY ECONOMY: A GUIDEBOOK TO THE INFLATION REDUCTION ACT'S INVESTMENTS IN CLEAN ENERGY AND CLIMATE ACTION 9–10, 46, 105–06 (2023), https://www.whitehouse.gov/wp-content/uploads/2022/12/Inflation-Reduction-Act-Guidebook.pdf [https://perma.cc/LV74-A2FM].

[266] *Id.* at 3.

1. Methane Emissions

Methane is a short-lived, high-impact greenhouse gas, and is therefore an important target for climate change mitigation efforts, especially in the short term. Methane sources in the United States include oil and gas operations (as methane is leaked or vented from natural gas wells and processing), agricultural activities, landfills, coal mines, and other sectors.[267] The IRA added a new section to Title I of the Clean Air Act, Section 136, that will bolster the EPA's regulatory authority over methane emissions from stationary sources.[268] Section 136 builds on a previously existing program that requires methane monitoring and emissions reporting.[269]

Two pieces of the methane program—spending policy and regulatory policy—work in tandem.[270] First, in the realm of spending, the IRA appropriated $850 million to the EPA through 2028 for emissions monitoring and reporting and for "providing financial and technical assistance to reduce methane and other greenhouse gas emissions from petroleum and natural gas systems . . . ."[271] This can include, among other things, funding for "improving and deploying industrial equipment and processes that reduce methane" emissions, spurring technological development, as well as funding for mitigating health and climate impacts from oil and gas operations.[272] The IRA further appropriated $700 million for "marginal conventional wells," specifically targeting the problem of pollution and waste from sites with a low rate of production where operators may not have sufficient economic incentives to control methane emissions.[273]

As for regulatory policy, the IRA directs the EPA to impose a "waste emissions charge" on large methane-emitting oil and gas operations (including production sites, processing and compressing, storage, import/export operations, gathering, and pipeline transmission).[274] The fee starts at $900 per ton of methane in 2024, rising to $1,500 in 2026 and thereafter.[275] Notably, the fee is

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[267] *E.g.*, JONATHAN L. RAMSEUR, CONG. RSCH. SERV., R47206, INFLATION REDUCTION ACT METHANE EMISSIONS CHARGE: IN BRIEF 3 (2022).

[268] *See* Inflation Reduction Act § 60113, 42 U.S.C. § 7436 (authorizing an inventive program for methane pollution reduction).

[269] 40 C.F.R. pt. 98.

[270] *See* Dotson & Maghamfar, *supra* note 14, at 10031–32 ("The Methane Emissions Reduction Program in new [section] 136 of the CAA combines investment, improved monitoring, internalization of pollution cots, and regulation to address methane emissions from the oil and gas sector.").

[271] 42 U.S.C. § 7436(a).

[272] *Id.*

[273] *See id.* § 7436(b) (appropriating monies for "grants, rebates, contracts, loans, and other activities" aimed at reducing methane emissions).

[274] *Id.* §§ 7436(c)–(d).

[275] *Id.* § 7436(e).

tied to the potential for EPA regulation of those methane emissions under the NSPS program in Clean Air Act Section 111.[276] Specifically, the fee will no longer be required if the EPA has put in place regulations (and if the source is in compliance with those regulations) that control methane emissions at least as effectively as what the EPA had proposed in November 2021.[277]

Therefore, $1.55 billion total in spending authority can be used for grants that enhance technological capability to monitor and capture leaking methane emissions from oil and gas operations, enhancing what may be "adequately demonstrated" under Section 111 for EPA regulations.[278] Regulated parties have a strong financial incentive to support the adoption of regulations, given that the per-ton methane emissions fee will stay in effect unless and until those regulations are finalized. This is perhaps the strongest example in the IRA of using spending authority to support Clean Air Act regulatory authority, as it bolsters regulation in two ways: one, Congress explicitly endorsed the use of Section 111 to regulate GHGs as air pollutants, and two, Congress boosted the funding for technology that will then serve as a basis for technology-forcing regulations. The EPA projected that the full implementation of its Section 111 proposed regulations would reduce methane emissions by 41 million tons—representing 920 million tons of CO_2-equivalent in climate forcing potential—from 2023 to 2035.[279] As methods improve, the funding from the IRA may lead the EPA to mandate additional reductions.[280]

2. Carbon Capture and Storage

The IRA includes a major expansion of the Internal Revenue Code Section 45Q credit for activities that capture CO_2 either for use in oil extraction or for storage in deep underground reservoirs.[281] The new changes in the IRA increase the base credit amounts per ton of CO_2 sequestered, extend the deadline for project construction, and expand the eligibility of the credit by making it

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[276] *Id.* § 7436(f)(6).

[277] *Id.*

[278] *See id.* § 7411(a)(1) (defining the "standard of performance" for new and modified sources).

[279] Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 86 Fed. Reg. 63110, 63257 (proposed Nov. 15, 2021) (to be codified at 40 C.F.R. pt. 60).

[280] On December 2, 2023, EPA Administrator Michael Regan announced that the agency had finalized the methane rule that had been proposed in 2021, awaiting publication of the official version in the Federal Register. *EPA's Final Rule for Oil and Natural Gas Operations Will Sharply Reduce Methane and Other Harmful Pollution*, EPA (Dec. 2, 2023), https://www.epa.gov/controlling-air-pollution-oil-and-natural-gas-operations/epas-final-rule-oil-and-natural-gas [https://perma.cc/B72R-3WS3].

[281] *See* Inflation Reduction Act § 13104, 26 U.S.C. § 45Q (quantifying the tax credit as a dollar amount "per metric ton of qualified [CO_2]" appropriately captured and disposed of or utilized).

available to smaller-size operations.[282] Additional provisions increase the flexibility of the credit with the intent of making capital investment in capture and storage projects more readily available.[283]

Despite years of research and development on building or retrofitting CCS within the fossil fuel plant fence line, "no operational natural gas combined-cycle facilities currently use carbon capture, utilization and storage (CCUS)."[284] Petra Nova, a coal-fired power plant in Texas, operated a facility to capture CO_2 that was sent for enhanced oil recovery in nearby oil fields, but was shut down in 2020 as low oil prices during the pandemic made the project uneconomical.[285]Almost immediately after passage of the IRA, however, companies began announcing plans for use of carbon capture in fossil fuel-fired plants.[286] For example, in September 2022, Competitive Power Ventures announced that it would develop a 1,800 megawatt natural gas plant equipped with carbon capture in West Virginia.[287] The new plans are not just limited to fossil fuel infrastructure. For example, a corn-based ethanol production facility also announced plans to construct and operate carbon capture and sequestration equipment in Indiana.[288]

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[282] *See, e.g.*, CARBON CAPTURE COAL., THE INFLATION REDUCTION ACT (IRA) OF 2022 (2022), https://carboncapturecoalition.org/wp-content/uploads/2022/08/IRA-2022-Fact-Sheet-8.16.pdf [https://perma.cc/5PA9-C5JW] (noting that the IRA lowered the threshold of carbon capture required to trigger the credit); *Inflation Reduction Act Provides Boost and Benefits to Carbon Capture Utilization and Storage Industry*, BAKERHOSTETLER (Aug. 23, 2022), https://www.bakerlaw.com/insights/inflation-reduction-act-provides-boost-and-benefits-to-carbon-capture-utilization-and-storage-industry/ [https://perma.cc/C4FH-M5W7] (positing that the IRA will have a transformative effect on the CCS industry by providing financial incentives for potential investors).

[283] BAKERHOSTETLER, *supra* note 282. The IRA also dramatically increased the credit for "direct air capture," referring to carbon capture projects not tied to GHG-emitting infrastructure. 28 U.S.C. § 45Q(b)(1)(B). What may be most relevant for EPA regulation, however, is the potential for requiring carbon capture equipment installation at fossil fuel combustion sites.

[284] *See* Carlos Anchondo, *Climate Law Spurs CCS at New West Virginia Gas Plant*, ENERGYWIRE (Sept. 19, 2022), https://subscriber.politicopro.com/article/eenews/2022/09/19/climate-law-spurs-new-west-virginia-gas-plant-with-ccs-00057278 [https://perma.cc/S2EW-9CXH] (announcing the construction of a West Virginia power plant equipped with CCS capabilities).

[285] *See* Kevin Crowley, *The World's Largest Carbon Capture Plant Gets a Second Chance in Texas*, BLOOMBERG (Feb. 8, 2023), https://www.bloomberg.com/news/articles/2023-02-08/the-world-s-largest-carbon-capture-plant-gets-a-second-chance-in-texas?leadSource=uverify%20wall [https://perma.cc/2GVE-P35A] (announcing plans for the facility to reopen in June 2023). The Department of Energy reports that Petra Nova received some $190 million in federal assistance during the construction of the plant. *Petra Nova–W.A. Parish Project*, DEP'T OF ENERGY, OFF. OF FOSSIL ENERGY & CARBON MGMT., https://www.energy.gov/fecm/petra-nova-wa-parish-project [https://perma.cc/ZPG7-8NGQ].

[286] Anchondo, *supra* note 284.

[287] *Id.*

[288] *See Cardinal Ethanol and Vault 44.01 Form Joint Venture to Implement a Carbon Capture and Sequestration Project in Indiana*, BUS.WIRE (Jan. 30, 2023), https://www.businesswire.com/news/home/20230130005121/en/Cardinal-Ethanol-and-Vault-44.01-Form-Joint-Venture-to-Implement-

The Clean Air Task Force has documented more than one hundred and forty announced plans for CO_2 capture on its frequently updated tracking list online (as of March 2023).[289] According to the tracking list, thirteen CCS projects are currently operational in the United States.[290] Nevertheless, only two of these projects actually store the CO_2 underground; the remaining eleven all use the CO_2 after capture for enhanced oil recovery, in which the CO_2 is injected into wells to force more hydrocarbons out (that will eventually be combusted, releasing GHGs).[291]

The potential for CCS carries with it two major categories of concerns: environmental and practical. Fenceline communities have sharply criticized CCS as a climate mitigation solution because it would allow existing fossil fuel facilities to continue to operate, using CCS as a method to offset CO_2 emissions while failing to address the co-pollutants that affect the environment and the health of the communities.[292] CCS at a larger scale would also involve an increased use in pipelines to transport CO_2 from combustion to storage, which could carry with it impacts from construction and the risk of accidents.[293] As a practical matter, challenges for CCS include scarcity in suitable geologic locations for long-terms storage, as well as concerns about the "permanence" of any sequestration and the potential for CO_2 to escape the surface.[294]

There may be, for the reasons above, plenty of motivation for utilities, energy companies, and other regulated parties to use methods other than CCS to reduce GHG emissions. Nonetheless, regardless of whether CCS is used widely, subsidization through the IRA can still have a critical impact in en-

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a-Carbon-Capture-and-Sequestration-Project-in-Indiana [https://perma.cc/ZMA5-TZXE] (estimating that the ethanol production facility emits nearly four hundred thousand metric tons per year of CO_2).

[289] Clean Air Task Force maintains a spreadsheet tracking these projects, noting various pieces of information about the size of the project and operation status or planned dates for development. As of March 2023, there are 147 listed projects. *US Carbon Capture Activity and Project Table*, CLEAN AIR TASK FORCE, https://www.catf.us/ccstableus/ [https://perma.cc/MD3Z-LM8F].

[290] *Id*.

[291] *See id.* (classifying two operational projects, the Red Trail project in North Dakota and the Illinois Industrial Carbon Capture and Storage project, as "dedicated saline storage," along with eleven operational enhanced oil recovery projects).

[292] *See, e.g.*, Letter from Cal. Env't Just. All. et al. to Gavin Newsom, Governor, Cal. (Oct. 24, 2022), https://caleja.org/wp-content/uploads/2022/10/Group-Letter-CCS-in-Scoping-Plan.pdf [https://perma.cc/244G-6P5M] (expressing concerns about CCS in California's climate plans). For an example of an environmental organization's more comprehensive response to CCS, see Dana Drugmand & Carroll Muffett, *Why Carbon Capture Is Not a Climate Solution*, CTR. FOR INT'L ENV'T L. (July 2021), https://www.ciel.org/wp-content/uploads/2021/07/Confronting-the-Myth-of-Carbon-Free-Fossil-Fuels.pdf [https://perma.cc/Y4AY-XLRC].

[293] Drugmand & Muffett, *supra* note 292, at 7, 10–11.

[294] *See, e.g.*, Richard Conniff, *Why Green Groups Are Split on Subsidizing Carbon Capture Technology*, YALE ENV'T 360 (Apr. 9, 2018), https://e360.yale.edu/features/why-green-groups-are-split-on-subsidizing-carbon-capture-technology [https://perma.cc/74JV-NAYM] (explaining that carbon emissions stored underground carry the potential risk of rising to the surface).

hancing the EPA's ability to use CCS as the basis for regulatory requirements.[295]

In 2015, prior to issuing the Clean Power Plan, the Obama Administration's EPA had considered partial use of CCS in setting the NSPS rule for new coal- and gas-fired power plants under Clean Air Act Section 111(b).[296] As with all NSPS rules, the Clean Air Act does not mandate that any facility actually use the method described in the regulation for deriving the BSER.[297] Rather, regulated sources may use any method or alternative process to achieve the standard, expressed in the EPA's rule as "1,400 lbs CO_2/MWh" for new coal power units.[298] Litigation challenging that rule—and whether the EPA had properly determined that partial CCS was adequately demonstrated—has been held in abeyance since 2017.[299] Although the Trump Administration had proposed changing the standard, no such change was ever finalized; rather, the Biden Administration is now reportedly in the process of replacing it.[300]

With the expansion of tax credits under the IRA for CCS, it is quite plausible that the EPA will rely on the tax-related changes to the economic viability of the technology as a basis for its determination of the BSER. In other words, the IRA provisions are likely to strengthen the EPA's position in adopting a more stringent limit on GHG emissions. Importantly, even if CCS remains limited in deployment in practice due to environmental reasons, state-level policy choices, and/or limitations of scale and geology, the effect of having a more stringent EPA rule would apply across the power sector. Thus, in locations where CCS is less practical, compliance with a CCS-based standard could look a lot like generation shifting—replacing plans for new fossil fuel infrastructure

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[295] Even prior to the IRA, Congress had committed significant resources toward research and development of CCS, in the billions of dollars. This included $2.7 billion from 2010 to 2022 toward CCS in funding administered by the Department of Energy, as well as $8.5 billion in "supplemental funding" from 2022–2026 under the 2021 Infrastructure Investment and Jobs Act for CCS generally and $3.6 billion for direct air capture. *See* ANGELA C. JONES & ASHLEY L. LAWSON, CONG. RSCH. SERV., R44902, CARBON CAPTURE AND SEQUESTRATION (CCS) IN THE UNITED STATES 1, 22 (2022).

[296] Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64510, 64513 (Oct. 23, 2015) (codified at 40 C.F.R. pts. 60, 70, 71, 98).

[297] 42 U.S.C. § 7411(b)(5).

[298] *See* Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64512, 64513 (identifying "alternative method[s] of compliance").

[299] North Dakota v. EPA, No. 15-1381 (D.C. Cir. Apr. 28, 2017) (per curiam) (order holding case in abeyance upon the Trump Administration's request pending a decision about amending the rule).

[300] The EPA opened a docket in September 2022 to begin taking public comment on eventual changes to the NSPS rule for new and existing fossil fuel-fired power plants. *Pre-Proposal Public Docket: Greenhouse Gas Regulations for Fossil Fuel-fired Power Plants*, EPA (Sept. 8, 2022), https://www.epa.gov/stationary-sources-air-pollution/pre-proposal-public-docket-greenhouse-gas-regulations-fossil-fuel [https://perma.cc/GS3K-UB2M].

with either renewable sources or greater investment in energy efficiency and demand-side reductions.

C. Policy by Spending in Other Sectors

The IRA's policy-by-spending programs are not confined to the power sector, but instead range across the spectrum of GHG emissions sources. In the fuel sector, related to GHG emissions from transportation, the IRA established, expanded, and/or extended tax credits for sustainable aviation fuel, second generation biofuels, and biodiesel and renewable diesel fuel.[301] Also for clean transportation, the IRA made significant changes to the tax credit for electric vehicles, making a limited tax credit available for used electric cars for the first time.[302] The IRA contains a multitude of additional programs—too many to name individually—including many that are targeted toward residential electrification and energy efficiency, as well as incentives for reducing GHG emissions from agriculture and forestry, industrial sources, and other sectors.[303] In addition to tax credits, the IRA promotes policy change through spending in the form of grants—such as an allocation of $2.8 billion to the EPA community-level grants for community investment and energy justice.[304]

Congress has taken the policy-by-spending approach before in the context of water quality.[305] In the 1972 Clean Water Act (CWA), Congress authorized spending—construction grants—to states and municipalities for the installation and modernization of wastewater treatment infrastructure.[306] The 1987 Amendments to the CWA further established a "revolving fund" program for states to use for water treatment facilities or other activities to control water

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[301] Inflation Reduction Act §§ 13201–13202, 26 U.S.C. § 6426.

[302] *See id.* §§ 13401–13402. Electric vehicle tax credits for new cars include requirements in the IRA for domestic manufacturing, intended to spur U.S. industry in battery production. *See, e.g.*, Owen Minott & Helen Nguyen, *IRA EV Tax Credits: Requirements for Domestic Manufacturing*, BIPARTISAN POL'Y CTR. (Feb. 24, 2023), https://bipartisanpolicy.org/blog/ira-ev-tax-credits/ [https://perma.cc/CA8H-Y6TK] (noting that, to receive the full $7,500 credit, at least half of the battery component's value must be fabricated in North America).

[303] *See, e.g.*, Minott & Nguyen, *supra* note 302.

[304] *See* Inflation Reduction Act § 60201, 42 U.S.C. § 7438 (containing provisions for "Environmental and Climate Justice Block Grants").

[305] Dotson & Maghamfar, *supra* note 14, at 10028.

[306] *See* Federal Water Pollution Control Act Amendments of 1972, tit. II, 33 U.S.C. §§ 1281–1301 (authorizing grants for both publicly and privately owned water treatment plants). This built on earlier water pollution statutes that had also authorized (at a smaller scale) construction grants for municipal sewage treatment. *See, e.g.*, William L. Andreen, *The Evolution of Water Pollution Control in the United States—State, Local, and Federal Efforts, 1789–1972: Part II*, 22 STAN. ENV'T L.J. 215, 239–42, 249 (2003) (describing statutory changes in 1956, 1961, and 1965 that included funding for municipal sewage plants).

pollution at the state level.[307] The Safe Drinking Water Act includes a similar program.[308]

In the case of the CWA, spending policy has given local authorities the capital needed to comply with more stringent regulations for wastewater treatment plants' discharges and has also made it possible to overcome political resistance to expensive regulatory requirements.[309] As has been the case in the CWA, IRA spending programs related to energy efficiency and GHG emissions reductions will give states and municipalities the infrastructure needed to comply with more stringent regulations. IRA spending will allow technology development that can then support the EPA in potential regulatory action, allowing the agency to reduce its expected lead times in technology-forcing regulation and advance findings about what technology is adequately demonstrated (for NSPS purposes) and what technology is achievable (for BACT and other statutory purposes in the Clean Air Act).[310]

CONCLUSIONS

The story of policy-by-spending as a response to climate change has only begun to be written. With the adoption of the IRA, there is a pathway—a plan that Congress has authorized but that federal agencies, states, tribes, local governments, and regulated industries have only just begun implementing.[311] An effective U.S. policy response to the climate crisis will require change and innovation at an accelerated, unprecedented pace.[312] Yet most of the basic elements of what this change could entail are readily comprehensible: scaling up

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[307] Water Quality Act of 1987, Pub. L. No. 100-4, § 212, 101 Stat. 7, 22–26 (codified at 33 U.S.C. §§ 1381–1388) (adding Title VI to the Federal Water Pollution Control Act).

[308] *See* 42 U.S.C. § 300j-12 (authorizing the use of funds to provide loans financing potable water projects).

[309] *See generally* Andreen, *supra* note 306, at 261–86 (detailing the legislative history of what became the CWA in 1971–1972).

[310] *See* Dotson & Maghamfar, *supra* note 14, at 10029 (providing transportation as an example of IRA investment that has reduced technology-forcing lead times, insofar as it has "dramatically heighten[ed] expectations of the deployment of zero emission heavy-duty vehicles").

[311] The year 2023 included a variety of announcements by federal agencies for funding under the IRA to spur low-carbon development. One program includes funding announced of $1.2 billion to support Direct Air Capture facilities to remove carbon dioxide from the ambient air, including proposed projects in southwestern Louisiana and in Texas. *Biden-Harris Administration Announces up to $1.2 Billion for Nation's First Direct Air Capture Demonstrations in Texas and Louisiana*, U.S. DEP'T OF ENERGY (Aug. 11, 2023), https://www.energy.gov/articles/biden-harris-administration-announces-12-billion-nations-first-direct-air-capture [https://perma.cc/PQ6R-UDXQ].

[312] Building on the work of the Deep Decarbonization Pathways Project, legal scholars in the United States have put together a guidebook for legal decision-makers for how to get the United States on a pathway to a low emissions future. *See* STEPHEN OLIVER ANDERSEN ET AL., LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES (Michael B. Gerrard & John C. Dernbach eds., 2019).

of renewable energy; expansion of the transmission network to carry that energy from source to use;[313] electrification of transportation and industrial sectors;[314] and so on.

Since the 1990s, partisan congressional polarization gridlock has made it difficult to update the Clean Air Act to deal with climate change, and the series of judicial decisions leading up to *West Virginia* has sharply limited the EPA's discretion to adapt the old law to meet unconventional challenges.[315] Yet the Clean Air Act—once known for technology-forcing programs that drive innovation through regulation—can now again lead that charge into the future with a monumental commitment to cutting-edge climate mitigation under the IRA.

As the IRA moves from the legislative phase to implementation, much of the responsibility will lie with federal agencies' management of grant programs and the regulatory authority of states, tribes, and local governments. Implementation of tax policies is within the purview of the Internal Revenue Service, which is in the process of providing guidelines for several of the more complicated IRA provisions.[316] Subsidies for energy efficiency and residential upgrades will depend on state-level implementation—and although states are innovating, getting those programs off the ground will likely be uneven.[317] It will be critically important for policymakers and advocates to understand how these funding mechanisms in IRA are designed to ensure that the money actually flows to drive technological change. State public utility commissions will continue to play a central role in planning for the transition in the power sector, and those commissions, along with regional grid operators, will need to collaborate to build out renewable infrastructure using IRA incentives.[318]

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[313] *See, e.g.*, JESSE D. JENKINS ET AL., ELECTRICITY TRANSMISSION IS KEY TO UNLOCK THE FULL POTENTIAL OF THE INFLATION REDUCTION ACT 4 (2022), https://repeatproject.org/docs/REPEAT_IRA_Transmission_2022-09-22.pdf [https://perma.cc/6DUT-6WUD] (finding that accelerating transmission expansion is necessary to achieve the IRA's full emissions reduction potential).

[314] *See, e.g.*, David Roberts, *The Key to Tackling Climate Change: Electrify Everything*, VOX (Oct. 27, 2017), https://www.vox.com/2016/9/19/12938086/electrify-everything [https://perma.cc/F2ME-E5NW] (listing options such as nuclear, hydroelectric, solar, and geothermal as carbon zero sources).

[315] *See supra* Part II.

[316] *See, e.g.*, Section 30D New Clean Vehicle Credit, 88 Fed. Reg. 23370, 23370–71 (proposed Apr. 17, 2023) (to be codified at 26 C.F.R. pt. 1) (providing guidelines for the electric vehicle tax credit).

[317] *See, e.g.*, *Inflation Reduction Act: States and Implementation*, NAT'L CAUCUS OF ENV'T LEGISLATORS BLOG (Mar. 16, 2023), https://www.ncelenviro.org/articles/inflation-reduction-act-states-and-implementation/ [https://perma.cc/JXP6-GC3S] (describing, with examples, strategies state legislatures can use to deploy federal funding made available in the IRA).

[318] *See, e.g.*, MIKE O'BOYLE, DAN ESPOSITO & MICHELLE SOLOMON, IMPLEMENTING THE INFLATION REDUCTION ACT: A ROADMAP FOR STATE ELECTRICITY POLICY 30–31 (2022), https://energyinnovation.org/wp-content/uploads/2022/10/Implementing-the-Inflation-Reduction-Act-A-Roadmap-For-State-Policy.pdf [https://perma.cc/8R3A-WVEV] (recommending that public utility

This spending authority—while requiring coordination across political boundaries and across political branches—does not displace the EPA's authority to regulate. Despite judicial decisions closing some doors, the EPA will be able to return to its successes in prescriptive regulation as IRA incentives promote new technological development.

Already, by 2023, the year after the IRA's enactment, EPA has moved in this direction. In May 2023, the EPA proposed a replacement Section 111(d) rule for existing power plants that relies significantly on the leverage that the IRA will provide to fund new technology at the site of GHG-emitting facilities.[319] The proposal requires existing power plants—depending on their fuel type, capacity factor, and planned date of retirement—to attain a percentage of carbon capture and storage by 2030.[320] The most stringent element of the proposal for existing coal-fired plants calls for ninety percent CCS by 2030 for facilities intending to operate beyond 2040.[321] For sources unable to take on the expense of retrofitting and investment in CCS, the alternative will be early closure or reduced operation.[322]

While *West Virginia* may foreclose the EPA from directly adopting rules to promote generation shifting toward renewables and other flexible climate mitigation action, the IRA's spending policy can drive that shift. Amid that change, even within narrow interpretations of congressional delegation in the Clean Air Act, the EPA will be able to rely on those new "adequately demonstrated" and cost-feasible developments—in rules like the May 2023 proposal—to consolidate the transition to decarbonization.

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commissions streamline the process to connecting new power plants to electricity systems, remain skeptical of CCS, and promote competition amongst energy providers to accelerate pollution source retirement).

[319] New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electronic Generating Units; and Repeal of the Affordable Clean Energy Rule, 88 Fed. Reg. 33240 (proposed May 23, 2023) (to be codified at 40 C.F.R. pt. 60).

[320] *Id.* at 33359–60 tbl.5.

[321] *Id.*

[322] *Id.* at 33343.