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Introduction

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Despite the recent retrenchment of the United States from its commitments under the Paris Agreement, the USA is indispensable to international efforts to address climate change. We remain the second largest emitter of greenhouse gases in the world.[1] Historically, we are the largest emitter.[2] In order to contribute to global efforts to limit temperature increases to 2°C or less, the United States will need to transform its electricity and transportation sectors in the coming decades, with other parts of the economy to follow.[3] Electricity and transportation in combination emit more than half the country's carbon dioxide, the most common greenhouse gas.[4] Their transformation will need to occur over the next four and a half decades (roughly the life of the forty-nine-year-old Clean Air Act) and will require massive shifts in the fuels we use to power our businesses, industry, government and homes and to propel our cars, trucks, trains, ships and planes.[5]

In designing public policy, analysts often focus on criteria such as efficiency and distributional fairness. These are important attributes of good policy design,

[1] In 2014, US carbon dioxide (CO_2) emissions constituted 15 percent of global CO_2 emissions. China, the largest polluter, emitted 30 percent. *See Global Greenhouse Gas Emissions Data*, in Greenhouse Gas Emissions, https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data.

[2] *See* Mengpin Ge et al., *6 Graphs Explain the World's Top 10 Emitters*, World Resources Institute Blog (Nov. 25, 2014), http://www.wri.org//blog/2014/11/6-graphs-explain-world%E2%80%99s-top-10-emitters.

[3] Article 2 of the Paris Agreement, the international document that resulted from the 21st United National Framework Convention on Climate Change Conference of the Parties, commits the signatories to "[h]olding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change." *See* United Nations, *Paris Agreement*, 2015, http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.

[4] *See* U.S. EPA, Greeenhouse Gas Inventory Report: 1990–2014, https://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

[5] For analyses of potential pathways to achieving 80 percent GHG emissions reductions in the United States by 2050, *see* Energy and Environmental Economics, Pathways to Deep Decarbonization in the United States.

and in the climate and energy context we have seen significant attention paid to them. Our focus in this book is, nevertheless, different. Our claim is that despite the recent pause in US efforts to reduce emissions, the United States will need to return to aggressively regulating its greenhouse gas emissions. And in doing so, we will need well-designed energy policy that will need to be not only efficient and fair but also durable in order to achieve substantial reductions in greenhouse gas emissions by midcentury. Most centrally, we will need durable energy policy to motivate the substantial private-sector investment in long-lived energy infrastructure that will be necessary to transform our energy system.

Durability alone, however, will not suffice. We also need our policies to be adaptable – to incorporate and respond to new scientific, technological and economic information. Without policy that endures and yet evolves, we will not achieve the long-term transformation in our energy systems that is crucial to stabilizing the earth's temperatures.

Finally, policies to reduce greenhouse gases also need to be as flexible as possible. Flexibility eases the burden of compliance by drawing on emitter knowledge and experience to help determine how best to reduce emissions and by reducing the economic costs of doing so.[6] Addressing climate change will be the most expensive and far-reaching environmental effort in history. Flexible policy is likely to improve cost-effectiveness, which can, in turn, speed up emissions reductions, improve the fairness of climate policy and contribute to its political durability.

The Clean Air Act (CAA) is currently the central policy tool for regulating greenhouse gases (GHGs) from the energy sector.[7] Its use is in many respects by default: efforts to pass comprehensive federal climate legislation have failed, and given the current political climate, these efforts are moribund.[8] And the Environmental Protection Agency's (EPA) regulation of GHGs under the CAA is the result not of an affirmative choice by the agency but in response to a series of lawsuits that have forced EPA to regulate emissions from a variety of sources.[9] The Trump administration's posture toward regulating GHGs under the CAA is dramatically different from its predecessor under President Obama. It includes rolling back the Clean Power Plan, which

[6] *See* U.S. EPA, *Building Flexibility with Accountability into Clean Air Programs*, in Clean Air Act Overview, https://www.epa.gov/clean-air-act-overview/building-flexibility-accountability-clean-air-programs.

[7] *See* U.S. EPA, *Air Pollution: Current and Future Challenges*, in Clean Air Act Overview, https://www.epa.gov/clean-air-act-overview/air-pollution-current-and-future-challenges.

[8] The only bill to pass a single house of the US Congress was the American Clean Energy and Security Act, also known as Waxman-Markey for its authors. *See* Center for Climate and Energy Solutions, *The American Clean Energy and Security Act*, https://www.c2es.org/federal/congress/111/acesa.

[9] *See*, e.g., Massachusetts v. EPA, 549 U.S. 497 (2007), St. NY et al. v. EPA, Docket No. 06–01322 (D.C. Cir. Sept 13, 2006).

was the Obama administration's program to regulate the electricity sector and a centerpiece of the nation's climate policy submitted as part of its commitment under the Paris Agreement.[10] A recent proposal, not yet finalized, would also freeze combined GHG emissions and fuel economy standards for passenger automobiles and revoke California's authority to issue its own standards.[11] Yet, unless Congress eliminates EPA authority to regulate GHGs, the agency will nevertheless be legally required under the CAA to issue new sets of regulations.[12]

The CAA is, in many respects, a remarkable statute. Over its almost fifty-year history, the CAA has resulted in large reductions in harmful air pollutants. These reductions have occurred across all areas of the country, across a wide range of pollutants and from a huge number of sources, including in the electricity and transportation sectors, which must be at the heart of long-term climate and energy policy.[13] In many respects, the CAA has been at once *durable* – in that it has continued to produce reductions in air pollution over the course of its long life and has long outlasted the political coalition that led to its adoption; it has been *adaptable* – in its ability to respond over time to changes in economic, technological and scientific information; and it has been *flexible* – through the use of incentive-based regulation in lieu of prescriptive regulations in many cases, which has enabled greater pollution reductions at lower cost. To give two examples, the CAA is responsible for the virtually complete elimination of lead over a two-decade period from the transportation sector, leading to widespread public health benefits.[14] This was accomplished through durable but evolving regulations that became increasingly stringent in response to an emerging scientific consensus about the effects of lead[15] and ultimately employed a flexible market-based approach to achieve the virtual elimination of lead in gasoline.[16] Second, the CAA is responsible for dramatic reductions in fine particulate matter,[17] again through regulations that adapted in

[10] *See* A Review of the Clean Power Plan, 82 Fed. Reg. 16329 (April 4, 2017) (EPA announcement that it will reconsider the CPP), https://www.federalregister.gov/documents/2017/04/04/2017–06522/review-of-the-clean-power-plan.

[11] U.S. EPA, The Safer and Affordable Fuel Efficient Vehicles Proposed Rule for Model Years 2021–2026, https://www.epa.gov/regulations-emissions-vehicles-and-engines/safer-and-affordable-fuel-efficient-vehicles-proposed.

[12] For an overview of the regulatory requirements that the *Massachusetts* v. *EPA* decision triggered, *see* Ann Carlson, *An Ode to the Clean Air Act*, 30 J. Land Use L 119 (2014).

[13] *See* U.S. EPA, Our Nation's Air: Status and Trends through 2015 (2016).

[14] *See* U.S. EPA, *Progress Cleaning the Air and Improving People's Health*, in Clean Air Act Overview, https://www.epa.gov/clean-air-act-overview/progress-cleaning-air-and-improving-peoples-health.

[15] *See* Herbert L. Needleman, *The Removal of Lead from Gasoline: Historical and Personal Reflections*, 84 Envtl. Res. 20, 20–34 (1999).

[16] *See* Robert W. Hahn & Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 Ecology L. Q. 361, 380–91 (1989).

[17] From 2000 to 2015, the national average of PM_{10} particle pollution decreased by 36 percent, and the national average of $PM_{2.5}$ levels decreased by 37 percent. *See* U.S. EPA, *Particulate Matter (PM_{10}) Trends*, in Air Trends, https://www.epa.gov/air-trends/particulate-matter-pm10-trends; U.S. EPA,

response to new scientific information. The harmful effects of particulate matter were not widely recognized until the 1990s, after the last major amendments to the CAA.[18] Once the harmful effects became clear, EPA exercised its mandate to protect human health by naming fine particulate matter as a regulated pollutant and then implementing reductions through regulations that encompassed both flexible and prescriptive approaches.[19]

Both because of its centrality in environmental regulation and because the CAA is now being used as the principal means for regulating US GHG emissions, this book makes the CAA its centerpiece. Our aim is to determine whether and how the CAA has exhibited durability, adaptability and flexibility – or failed to do so – and to draw lessons for what the CAA can tell us about how policymakers can incorporate mechanisms to ensure a long-lasting but evolutionary and cost-effective approach to cutting GHGs to almost zero. We believe our analysis is helpful not only at the federal level but also for state policymakers focused on regulating carbon emissions from their transportation and electricity sectors and ultimately buildings and industry.

Each of the next five chapters focuses on important features of the CAA: the National Ambient Air Quality Standards (NAAQS), the regulation of stationary sources, the regulation of mobile sources, the regulation of transportation fuels, and the use of market mechanisms across a number of the CAA's programs. In each chapter we set forth and describe in detail the principal regulatory mechanisms used in the program. We then evaluate each program to determine whether and how, through its regulatory means, each has been durable across the life of the statute yet nimble enough to respond to changes in new information about air pollutants, technologies to reduce them and science about the health and welfare effects of air pollution exposure. Moreover, we consider whether the regulations allow for flexibility in implementation and whether the regulatory approach has either enhanced or inhibited compliance.

In this introductory chapter, we set forth and define a series of concepts and features that each of the subsequent five case studies uses to frame and analyze the program on which the chapter focuses. We also provide a general overview of the major provisions of the CAA in order to put each of the chapters into context. We also begin to tease out common themes and issues that emerged from the chapters but save for the conclusion a lengthy discussion of the lessons we have collectively learned from the CAA about how to design durable yet adaptable and flexible energy and climate policy.

Particulate Matter ($PM_{2.5}$) Trends, in Air Trends, https://www.epa.gov/air-trends/particulate-matter-pm25-trends.

[18] *See* National Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 38,652 (July 18, 1997).

[19] *Id.*

We begin with a discussion of the central concepts on which we focus: durability, adaptability and flexibility. We describe why we believe these attributes are so crucial to climate and energy policy and what we mean in using the terms.

1.1 WHY DURABILITY, ADAPTABILITY AND FLEXIBILITY?

The transportation and electricity sectors, as well as buildings and industrial facilities, are infrastructure intensive and involve large capital investments that often last many decades. We have power plants in the United States that were built over seventy years ago.[20] The average age of our nuclear fleet is approaching forty years.[21] Cars built today can last for 150,000 miles or more with a typical age of 15 years,[22] heavy-duty trucks may stay on the road for thirty years and our rail cars, ships and airplanes remain in operation for decades.[23] In order to incentivize innovations in all these capital-intensive industries to produce low or zero GHG emissions by midcentury, it seems almost self-evident that we need stable, durable policies across multiple decades. Stability and durability in policy will provide the signal necessary to investors and innovators to develop technologies and systems that can help accomplish our long-term emissions goals. Stability and durability will also reduce the attendant risk that accompanies investments in the research and development of these technologies.

By stability and durability, however, we do not mean that a policy must be fixed for the next forty-five years. Instead, by durability, we mean a policy framework that continues to accomplish the objectives for which it was adopted. In political terms, we argue – borrowing from the work of our colleague Eric Patashnik – that a durable policy is one that remains effective after the coalition that led to its adoption no longer exists or no longer holds the reins of power. The policy, in other words, outlasts its initial supporters. And the policy must accomplish its goals even in the face of changes in scientific knowledge, in technological innovation, and in economic change.[24]

[20] *See* Steven Mufson, *Vintage U.S. Coal-Fired Power Plants Now an "Aging Fleet of Clunkers,"* WASH. POST, June 13, 2014, https://www.washingtonpost.com/business/economy/a-dilemma-with-aging-coal-plants-retire-them-or-restore-them/2014/06/13/8914780a-f00a-11e3-914c-1fbd0614e2d4_story.html?utm_term=.58b4def1ofce.

[21] *See* U.S. Energy Info. Admin., *How Old Are U.S. Nuclear Power Plants, and When Was the Newest One Built?*, in FREQUENTLY ASKED QUESTIONS (June 21, 2017), http://www.eia.gov/tools/faqs/faq.php?id=228&t=21.

[22] National Highway Transportation and Safety Administration, *Final Regulatory Impact Analysis, Corporate Average Fuel Economy for MY 2017-MY 2025 Passenger Cars and Light Trucks* (August, 2012).

[23] California Environmental Protection Agency Air Resources Board, Draft Supporting Information for Technology Assessments: Truck and Bus Sector Description VI-2 (2016).

[24] ERIC PATSHNIK, REFORMS AT RISK: WHAT HAPPENS AFTER MAJOR POLICY CHANGES ARE ENACTED? (2008).

In order to last and maintain its effectiveness for multiple decades, a durable policy must also, then, include mechanisms to adapt to new information about science, technology and economics. We do not, in other words, mean by durability that a policy should remain the same across many years. The world will not remain static over the next several decades; indeed, the rapidity with which the electricity and transportation sectors are transforming both technologically and economically is already outpacing predictions of just a few years ago. But the methods to adapt policy to new information must, we believe, be themselves predictable in order to provide clear signals to regulated industries that policies will change. Put a different way, we need durable yet evolving policy that – through its adaptive mechanisms – is predictable.

We recognize that developing policy that exhibits both durability and adaptability may seem contradictory. Yet predictability through regularized administrative processes that allow an agency to adapt to new information can harmonize the two concepts. By anticipating the need for policy to adapt within the domain of an expert agency, the CAA has in many respects provided for this regularized process. Regulated parties are on notice that the CAA will adapt, but only with significant lead time, with an opportunity for broad public participation and with the input of sophisticated scientific and technical experts. This attention to process, we believe, is one key to the CAA's success: if a policy changes in a way that is not predictable or is not in accord with legal and administrative processes, it is unlikely to provide the stable, durable signal that investors need to make long-term capital commitments. Although one might expect Congress to provide this adaptive response, historically, legislative guidance has occurred only rarely. The modern CAA has been significantly amended only twice since its adoption in 1970 and not at all since 1990.[25]

Flexibility adds a third element to many successful policies. Major environmental transformation involves the turnover of industrial, commercial and residential capital that takes years. Assuming that the entire economy is not going to shut down until that happens, it is meaningful to ask: what entities are going to make which investments and when? This is a challenging question for regulators, who typically cannot observe the distribution of emissions reduction opportunities and their costs from among a large number of entities that must comply with regulation. Regulators want to get the biggest bang for the buck out of regulations that impose costs on the economy but often lack complete knowledge about where to find the biggest bang. In response to this challenge, the CAA has indeed adapted, through trials in regional offices and ultimately through national programs, to find ways to introduce flexible approaches to

[25] *See* U.S. EPA, *Evolution of the Clean Air Act*, in Clean Air Act Overview, https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act.

regulation. A flexible approach will provide incentives to a group of regulated entities to reduce emissions, rewarding individual entities that can reduce the most and operate most cleanly while calibrating the overall effort to meet environmental goals.

We see in the following chapters that flexibility has been a key ingredient of some of the most successful regulations under the CAA. However, we also see cases where it has undermined environmental outcomes and threatened the durability of some initiatives.

One example in the CAA that ties these three concepts together is the Acid Rain Trading Program, which incorporated an emissions cap that declined in two phases combined with emissions trading among regulated entities.[26] This innovative, flexible approach was the political lynchpin to the Acid Rain Program because it promised to achieve the scientifically informed environmental goal at less cost than would mandated specific measures at specific power plants.[27] However, once the second phase was completed, the program essentially collapsed because it failed to continue to adapt to new scientific and economic information and technological changes.[28]

The five CAA case studies that follow have identified a number of means to incorporate new information into long-term policy. Not every section of the CAA contains all these mechanisms, although some apply to the entire Act. Instead, our authors discuss the ways in which a variety of these mechanisms promote – and in some cases undermine – flexible, adaptable, yet durable policy. These mechanisms include requirements that EPA periodically engage in the revision of standards;[29] cooperative federalism arrangements with shared responsibility between the federal government and states;[30] formal procedures and processes that push EPA to carry out its statutory duties, including citizen suits,[31] petition processes and notice and comment;[32] expansive definitions in the Act – such as *air pollutant* – that allow the agency to regulate new pollutants;[33] technology-based standards that by definition incorporate evolution into them (terms such as *best* and *lowest*);[34] automatic tightening of targets, such as in the two phases of

[26] *See* U.S. EPA, *Acid Rain Program*, in CLEAN AIR MARKETS, https://www.epa.gov/airmarkets/acid-rain-program.
[27] *Id.*
[28] *See* Juha Siikamäki et al., *The U.S. Environmental Protection Agency's Acid Rain Program*, in RESOURCES FOR THE FUTURE (Nov. 2012), http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-Bck-AcidRainProgram.pdf.
[29] 42 U.S.C. § 7408 (2012).
[30] 42 U.S.C. § 7410 (2012).
[31] 42 U.S.C. § 7604 (2012).
[32] 42 U.S.C. § 7607 (2012).
[33] 42 U.S.C. § 7602 (2012).
[34] 42 U.S.C. § 7479 (2012).

the Acid Rain Trading Program;[35] and the incorporation of sophisticated personnel, including scientists and economists, into EPA and its advisory boards.[36] In some instances, however, programs in the CAA have either failed to adapt, as is the case of the Acid Rain Trading Program in its failure to require reductions in sulfur dioxide beyond the two stages included initially in the program's provisions,[37] or adapted too frequently, as in the case of the Renewable Fuel Standard with its requirement that EPA establish a new target each year for the amount of renewable fuels that refiners must produce.[38] This apparent excess of adaptability resulted from the inability of Congress to anticipate technologically feasible goals.

Our authors have also examined the interactions among a variety of branches of government, including Congress, the executive (principally EPA), the judiciary and the states in pushing the evolution of air pollution policy. One notable finding is that Congress played a crucial role in the first two decades after the CAA passed in amending portions of the Act that either weren't working well or were too ambitious. A key example was recognizing that establishing health-based standards for hazardous air pollutants, as required by the 1970 CAA, was simply not working. Instead, Congress replaced the health-based approach with a technology-based one in the 1990 amendments, leading to a flurry of successful regulatory activity. The lack of congressional involvement in adapting to new circumstances in the subsequent two and one-half decades (with the exception of amendments to fuels programs) has hampered EPA efforts to address remaining pollution problems. A notable example of a policy that would have benefited from congressional clarification is EPA's attempt to regulate interstate air pollution by using flexible market mechanisms. Had Congress clarified the agency's ability to do so EPA could have designed better programs, implemented more quickly and cost effectively and with less court involvement.

Another important finding of several of the chapters is the key role states have played in pushing the evolution of the statute. The best-known example is California's unique role in regulating emissions from mobile sources and fuels and decisions by other states to adopt California's standards. Other important instances include the innovations some states have produced in regulating new stationary sources under the Prevention of Significant Deterioration and Nonattainment programs and the role the Ozone Transport Commission played in forcing EPA to address cross-border ozone pollution.

[35] 42 U.S.C. §§ 7651c–d (2012).
[36] 42 U.S.C. § 7403 (2012).
[37] *See* Siikamäki et al., *supra* note 27.
[38] *See* U.S. EPA, *Renewable Fuel Annual Standards*, in Renewable Fuel Standard Program, https://www.epa.gov/renewable-fuel-standard-program/renewable-fuel-annual-standards.

1.2 WHY THE CLEAN AIR ACT?

We have already explained some of our reasoning in studying the CAA to determine whether and how it has been both durable yet flexible. We elaborate here.

Environmental Performance. First, the CAA has produced tremendous environmental results over its nearly five-decade history in reducing ambient air pollution. All six of the pollutants covered by the NAAQS have declined significantly. Carbon monoxide is down 86 percent on average nationwide. Lead has declined 99 percent. Nitrous oxide has declined 59 percent and sulfur dioxide 84 percent. Ozone, which remains one of the toughest pollutants to control, is down 32 percent. And in the fifteen years since EPA began regulating fine particles ($PM_{2.5}$), concentrations have fallen 37 percent.[39] All these declines have occurred while the US economy has grown dramatically (by sixteen-fold since 1971)[40] and population has increased by 150 percent.[41] These pollution figures are national averages from all sources for the most ubiquitous pollutants. The chapters on individual programs within the CAA that follow provide more granular data, but the overall conclusion is a powerful one: the Act has produced enormous environmental benefits. The United States will need to achieve similar declines in GHG emissions over a roughly similar period of time, by midcentury, making the CAA an important statute to study.

Regulatory Diversity. Another important feature of the CAA is its embrace of a variety of regulatory tools. The centerpiece of the Act is, of course, the NAAQS, which set ambient, health-based standards for ubiquitous pollutants.[42] But the NAAQS program is administered through a system of cooperative federalism that harnesses the states to implement and enforce the standards, an innovative arrangement that merits study.[43] Moreover, many sources are subject not to health-based standards but to technology-based ones. So are many pollutants,

[39] These figures come from the US EPA's Air-Trends reporting. *See* U.S. EPA, NATIONAL AIR QUALITY: STATUS AND TRENDS OF KEY AIR POLLUTANTS, https://www.epa.gov/air-trends.

[40] According to the National Bureau of Economic Analysis, gross domestic product was, when adjusted for inflation, $1.137.8 billion in the first quarter of 1971, when the CAA took effect, and was $18,164.8 billion at the end of 2015 (EPA data about pollutants are through 2015). *See* U.S. Department of Commerce, Bureau of Economic Analysis, GDP AND PERSONAL INCOME, NATIONAL DATA, http://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1#reqid=9&step=3&isuri=1&903=5.

[41] *See* U.S. Census Bureau, HISTORICAL NATIONAL POPULATION ESTIMATES: JULY 1, 1900–JULY 1, 1999 (showing 1971 US population as 207.66 million people), http://www.census.gov/popest/data/national/totals/pre-1980/tables/popclockest.txt; and U.S. Census Bureau, ANNUAL ESTIMATES OF THE RESIDENT POPULATION, APRIL 1, 2010–JULY 1, 2015 (showing 2015 US population as 321.42 million people), http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk.

[42] 42 U.S.C. § 7409 (2012).

[43] 42 U.S.C. § 7410 (2012).

including hazardous air pollutants.[44] The CAA's system of regulating mobile sources is perhaps the most unusual, setting national standards while designating only a single state, California, to set standards more stringent than any federal standards and allowing other states to opt into those standards or follow the federal ones.[45] The Act is also not confined to relatively prescriptive regulatory tools (sometimes referred to as *command and control*). It also includes a large number of flexible market-based programs, from the regulatory approach that led to the removal of lead from gasoline, to the control of interstate air pollution embraced in Title IV's Acid Rain Trading Program, to the control of cross-state air pollution first through a regional state effort via the Ozone Transport Commission and later expanded to encompass the eastern half of the country.[46] And the CAA embraces strong citizen participation through a broad authorization of citizen lawsuits against EPA and the inclusion of important procedural and venue provisions.[47] Indeed the CAA was the first federal statute to include a citizen suit provision.[48] This regulatory diversity provides a rich basis to study the ways in which durability and adaptability are promoted and/or undermined through the Act's many tools and for understanding the cases where flexible approaches have worked well. Our chapters reflect this diversity.

Notable Shortcomings. The CAA is far from perfect. Several of its provisions and programs have something to teach us from their failures, not their successes. These include well-known failures such as the exemption of many existing sources from requirements to reduce emissions[49] and less well-known failures such as the fact that the boutique fuels program has produced virtually no emissions reductions.[50] Because the CAA is so far reaching across so many pollutants and sources, it seems virtually inevitable that some of its provisions are ill advised or unsuccessful; some have incurred costs with little in the way of associated health or environmental benefits. Examining these failures for what they can tell us about how *not* to design durable yet adaptable and flexible policies is at least as important as examining the CAA's many successes.

44 *See* U.S. EPA, *Setting Emissions Standards Based on Technology Performance*, in Clean Air Act Overview, https://www.epa.gov/clean-air-act-overview/setting-emissions-standards-based-technology-performance.

45 42 U.S.C. § 7543 (2012).

46 *See* U.S. EPA, *Building Flexibility with Accountability into Clean Air Programs*, in Clean Air Act Overview, https://www.epa.gov/clean-air-act-overview/building-flexibility-accountability-clean-air-programs.

47 42 U.S.C. § 7604 (2012).

48 *See* Charles N. Nauen, *Citizen Environmental Lawsuits after Gwaltney: The Thrill of Victory or the Agony of Defeat?*, 15 William Mitchell L. Rev. 327, 328 (1989).

49 *See* Jonathan Remy Nash & Richard L. Revesz, *Grandfathering and Environmental Regulation: The Law and Economics of New Source Review*, 101 Nw. U. L. Rev. 1677, 1709 (2007).

50 *See* Maximilian Auffhammer & Ryan Kellogg, *Clearing the Air? The Effects of Gasoline Content Regulation on Air Quality*, 101 Am. Econ. Rev. 2687, 2688 (2011).