SYMPOSIUM ARTICLES

STAVING OFF THE CLIMATE CRISIS: THE SECTORAL APPROACH UNDER THE CLEAN AIR ACT

BY
TERESA B. CLEMMER*

The challenge before us is unprecedented. Global climate change demands a transformation of our entire economy and energy system within just a few short years in order to preserve a healthy natural world and a sustainable way of life for our children and grandchildren. The good news is that the technological solutions are well within reach. The bad news is that our system of democratic governance in the United States is so paralyzed that it may be incapable of meeting this challenge. Nevertheless, we already have some powerful tools that will enable us to make substantial progress toward a brighter future. The Clean Air Act is a broad federal statute consisting of many different programs and approaches. Among these are fair, effective, and flexible regulatory authorities that can be used right away to move technological solutions off the shelf and into common usage. In particular, under sections 111 and 202 of the Clean Air Act, the United States Environmental Protection Agency (EPA) has authority to directly regulate stationary and mobile sources on a sector-by-sector basis. This Article surveys the emission reduction strategies available in key industries and mobile source categories, and it concludes that EPA can quickly reduce emissions by approximately 24% using the sectoral approach. This will put us on the path toward the necessary 50% to 85% reductions overall, and it will allow us to keep moving forward while the more difficult transformation of our energy system is underway. A

* Associate Professor of Law and Acting Director of the Environmental Clinics, Vermont Law School. I would like to express my sincere appreciation for the insights of Professor Patrick Parenteau concerning the severity of the climate crisis, as well as the help of student clinician Jonathan Voegele in interpreting efficiency data.

key advantage of the sectoral approach is its straightforward legal framework. With clear statutory guidelines, EPA's regulations are not likely to get caught up in protracted litigation. The sectoral approach also promotes fairness by ensuring a level playing field across each industry, and it promotes efficiency by focusing on outcomes and motivating industry to find innovative ways of achieving them. In short, this Article urges EPA to focus its attention on regulating greenhouse gas emissions on a sector-by-sector basis under the Clean Air Act. Moreover, in light of the urgency of the climate crisis, this Article also urges Congress to reject any legislative proposal that would strip EPA of these effective regulatory tools.

I. INTRODUCTION

We have our work cut out for us. The climate is warming rapidly, and our emissions must come down quickly in order to avoid unthinkable consequences. In light of the all too evident legislative paralysis on climate change, this article advocates for the ongoing use of the regulatory tools available under the Clean Air Act[1] to achieve rapid reductions that will help us make enough progress in the next five to ten years to stave off the worst climate impacts. In particular, the mobile source rules recently promulgated by the United States Environmental Protection Agency (EPA) under section 202 of the Clean Air Act demonstrate that technological solutions are readily available and that the agency is committed to adopting cost-effective regulatory measures with ample lead-time and flexible compliance mechanisms. EPA should next turn its attention to sector-by-sector

[1] Clean Air Act, 42 U.S.C. §§ 7401–7671q (2006).

regulation of stationary sources under section 111 of the Clean Air Act, starting with the low-hanging fruit. In many industries, low-cost technologies are just waiting for a regulatory nudge to move them off the shelf and into common usage. These efforts will buy us the time we need to tackle the more difficult challenges ahead. I am hopeful that, during these next few years of EPA-driven incremental progress, the nation will simultaneously be making the policy choices necessary to wholly transform our energy system and address the climate crisis in a manner that preserves a reasonable semblance of our current quality of life and the natural systems that sustain us.

Unfortunately, many of the current legislative proposals addressing climate change include provisions that would severely limit the applicability of the Clean Air Act,[2] and other bills would virtually eliminate EPA's authority over greenhouse gases altogether.[3] It would be a great tragedy to throw away these tried-and-true regulatory programs. We should not gamble our children's future by relying solely on climate legislation that appears likely to contain such extensive concessions to industry that it may not achieve any meaningful change in the short window of time we have left to address the looming threat of climate change. In September of 2008, shortly before the election of President Obama, Mary Nichols, Chairman of the California Air Resources Board, explained that "[w]e cannot wait another minute" to address climate change and that the Clean Air Act is a "powerful tool" that can and should be used right away.[4]

Part II of this Article describes the urgency of the climate crisis in light of recent scientific developments. Part III explains some of the underlying reasons why Congress has been unable to enact meaningful legislation responding to this crisis. Part IV analyzes the potential for early, fair, rational, and cost-effective greenhouse gas reductions in several mobile source categories, as well as in a number of industrial sector categories. The main thesis of this Article is that direct EPA regulation on a sector-by-sector basis under the Clean Air Act's mobile source and new source performance standard (NSPS) programs offers hope for achieving substantial reductions in a timely manner. As a result, it is critical that we preserve EPA's authority to regulate under the Clean Air Act while pursuing other measures to transform our energy system.

---

[2] *See, e.g.*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §§ 301–331 (2009) (proposing amendments to the Clean Air Act and proposing to authorize the Administrator of EPA to implement the bill's programs); *see generally infra* text accompanying notes 69–81.

[3] *See, e.g.*, Lieberman-Warner Climate Security Act of 2008, S. 3036, 110th Cong. §§ 1101–1204 (2008) (proposing that Congress implement a new cap-and-trade program on greenhouse gases, relegating the Administrator of the EPA to an administrative role).

[4] Press Release, Cal. Envtl. Prot. Agency, ARB Chairman Tells U.S. Senate Committee Clean Air Act Is Powerful Tool to Fight Global Warming (Sept. 23, 2008), *available at* http://www.arb.ca.gov/newsrel/nr092308.htm (last visited Nov. 21, 2010).

II. THE CLIMATE CRISIS

"[T]he universe is not required to be in perfect harmony with human ambition."[5]

The world's leading scientists agree that "[w]arming of the climate system is unequivocal."[6] In the twentieth century, global average temperatures have already increased by 0.74 degrees Celsius[7] (1.3 degrees Fahrenheit). Averages can tend to mask the real story though. Much more dramatic increases have been occurring in the higher latitudes and higher elevations. In Alaska, for instance, average annual temperatures have increased 3.0 degrees Fahrenheit over the past sixty years, with average yearly increases of 4.9 degrees in the town of Talkeetna (nestled in the foothills of the Alaska Range) and 4.5 degrees in the town of Barrow (on the far northern coast of the Chukchi Sea).[8] Similarly, in Fort Collins, Colorado, which is situated 5000 feet above sea level, average annual temperatures have increased by 4.1 degrees Fahrenheit during the last 50 years.[9]

The effects of climate change are already apparent throughout the world, including in the United States. Sea levels have already risen by an average of nineteen centimeters (7.5 inches) across the globe during the twentieth century.[10] Once again though, average statistics for sea level rise do not paint a complete picture. The waters of the Chesapeake Bay, for example, are rising twice as fast as the global average.[11] This means the United States is already losing a great deal of land as a result of climate change. Louisiana alone has lost 1829 square miles of land area since the

5 CARL SAGAN, COSMOS 201 (1980).

6 Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,517 (Dec. 15, 2009) (to be codified at 40 C.F.R. ch. 1) [hereinafter EPA Endangerment Finding].

7 *Id.*, at 66,517; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT 30 (The Core Writing Team et al. eds., 2008), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf. Human activities have been the major contributors to this warming trend. EPA Endangerment Finding, *supra* note 6, at 66,517. According to EPA, today's "high atmospheric concentrations of greenhouse gases are the unambiguous result of human activities," and "[t]he scientific evidence is compelling" that these human-generated concentrations are "the root cause of recently observed climate change." *Id.* at 66,517–18.

8 Alaska Climate Research Ctr., Temperature Change in Alaska, http://climate.gi.alaska.edu/ClimTrends/Change/TempChange.html (last visited Nov. 21, 2010).

9 NAT'L CONFERENCE OF STATE LEGISLATURES & UNIV. MD. CTR. FOR INTEGRATIVE ENVTL. RESEARCH, CLIMATE CHANGE AND THE ECONOMY: COLORADO: ASSESSING THE COSTS OF CLIMATE CHANGE 1 (2008), *available at* http://www.cier.umd.edu/climateadaptation/Climate%20change–COLORADO.pdf.

10 S. Jeffress Williams et al., *Sea-Level Rise and Its Effects on the Coast*, *in* COASTAL SENSITIVITY TO SEA-LEVEL RISE: A FOCUS ON THE MID-ATLANTIC REGION 11, 13 (2009), *available at* http://downloads.climatescience.gov/sap/sap4-1/sap4-1-final-report-all.pdf.

11 U.S. ENVTL. PROT. AGENCY ET AL., CLIMATE CHANGE, WILDLIFE, AND WILDLANDS CASE STUDY: CHESAPEAKE BAY AND ASSATEAGUE ISLAND 1, *available at* http://www.epa.gov/climatechange/wycd/downloads/CS_Ches.pdf.

1930s.[12] During the 1990s and early 2000s, Louisiana was losing thirteen square miles per year, or "the equivalent of approximately one football field lost every hour."[13] This is troubling, to say the least, given that more than two million people, or nearly half of Louisiana's population, lived in its coastal parishes as of 2006.[14]

In addition to sea level rise and widespread loss of costal lands, extreme weather events are occurring more frequently in many parts of the United States as well. Heat waves are more prevalent in the Northwest, hurricanes are becoming more destructive in the Atlantic, and many areas are experiencing more frequent periods of intense rainfall and drought.[15] People in more vulnerable regions of the world—such as Africa, Bangladesh, and many small island nations—are already suffering devastating effects and have fewer resources to deal with them than we do in the United States.[16] Flooding, drinking water shortages, and agricultural disruptions caused by climate change have already led approximately twenty-six million people to flee their homes and seek refuge elsewhere.[17]

Far worse is yet to come. Given the long atmospheric lives of most greenhouse gas pollutants and the slow uptake of the oceans, most scientific models predict that we are committed to at least another 0.5 degrees Celsius of warming, along with concomitant sea-level rise, extreme weather, and other effects.[18] These inescapable facts have prompted experts at the Pentagon to begin planning for the national security threats and humanitarian consequences of climate change abroad,[19] while the

12 La. Dep't of Natural Res., Louisiana Coastal Facts, http://dnr.louisiana.gov/crm/webfactsheet–2010-07-29 (last visited Nov. 21, 2010) (citing JOHN A. BARRAS ET AL., U.S. GEOLOGICAL SURVEY, LAND AREA CHANGE IN COASTAL LOUISIANA: A MULTIDECADAL PERSPECTIVE (FROM 1956 TO 2006) 1–2, 4–7 (2008), *available at* http://pubs.usgs.gov/sim/3019/downloads/SIM3019_Pamphlet.pdf; Louis D. Britsch & Joseph B. Dunbar, *Land Loss Rates: Louisiana Coastal Plain*, 9 J. COSTAL RES. 324, 335–37 (1993)).

13 *Id.* (citing JOHN A. BARRAS ET AL., *supra* note 12, at 5, *available at* http://pubs.usgs.gov/sim/3019/downloads/SIM3019_Pamphlet.pdf).

14 *Id.* (citing U.S. CENSUS BUREAU, ANNUAL ESTIMATES OF THE POPULATION FOR COUNTIES OF LOUISIANA: APRIL 1, 2000 TO JULY 1, 2006 (2007), *available at* http://www.census.gov/popest/counties/tables/CO-EST2006-01-22.xls).

15 U.S. CLIMATE CHANGE SCI. PROGRAM, WEATHER AND CLIMATE EXTREMES IN A CHANGING CLIMATE: REGIONS OF FOCUS: NORTH AMERICA, HAWAII, CARIBBEAN, AND UNITED STATES PACIFIC ISLANDS 35–36 (Thomas R. Karl et al. eds., 2008), *available at* http://downloads.climatescience.gov/sap/sap3-3/sap3-3-final-all.pdf.

16 *See generally* GLOBAL HUMANITARIAN FORUM, THE ANATOMY OF A SILENT CRISIS 58–65 (2009), *available at* http://www.eird.org/publicaciones/humanimpactreport.pdf (discussing case studies from disproportionately impacted developing countries).

17 ENVTL. JUSTICE FOUND., NO PLACE LIKE HOME: WHERE NEXT FOR CLIMATE REFUGEES? 6, 15 (2009), *available at* http://www.ejfoundation.org/pdf/climate_refugees_final.pdf (citing GLOBAL HUMANITARIAN FORUM, *supra* note 16).

18 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 7, at 52, 53 tbl.3.2 (extreme weather and other effects); Earth Sys. Lab., Nat'l Ctr. for Atmospheric Research, CGD Tools: Climate FAQs, http://www.cgd.ucar.edu/research/faqs/future.html (last visited Nov. 21, 2010) (sea-level rise).

19 *See* U.S. DEP'T OF DEF., QUADRENNIAL DEFENSE REVIEW REPORT: FEBRUARY 2010 iv, xv, 7, 73, 84–88 (2010), *available at* http://www.defense.gov/qdr/images/QDR_as_of_12Feb10_1000.pdf (discussing the impact of climate change on concerns of national security).

Department of the Interior and many other agencies have initiated programs to deal with climate-related disruptions at home.[20]

We do not have much time left to prevent the most catastrophic effects of climate change. The best case scenario would be to stave off warming beyond a 2.0 to 2.4 degrees Celsius increase.[21] Sea level rise associated with this level of warming—an average increase of 0.4 to 1.4 meters, with much greater increases in some localized areas[22]—would exacerbate the flooding, erosion, saltwater intrusion, and submersion of coastal areas throughout the United States,[23] including parts of Florida,[24] Louisiana,[25] North Carolina, Virginia, Maryland, Delaware, New Jersey, New York, and other Northeastern states,[26] as well as California, Oregon, Washington, and Hawaii.[27] This level of warming "could submerge several small island states and Bangladesh" as well.[28]

Nevertheless, to achieve even this modest and arguably insufficient 2.0 to 2.4 degrees Celsius target, the Intergovernmental Panel on Climate Change (IPCC) has concluded that "global emissions must peak no later than 2015,"[29] which is only five years from now. Global emissions of carbon dioxide and other greenhouse gases would ultimately have to be reduced 50% to 85% by 2050.[30] Experts agree that this task is achievable, albeit

20 *See* U.S. Dep't of Interior, DOI Climate Change Response, http://www.doi.gov/whatwedo/climate/cop15/index.cfm (last visited Nov. 21, 2010) (discussing the department's programs for scientific research, adaptation, land management, energy projects, and other responses to climate change).

21 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 7, at 67 tbl.5.1 (illustrating that a best case scenario would be the stabilization of carbon dioxide at 350–400 parts per million, with a peaking year of 2015, and a carbon dioxide reduction of 50% to 85% by 2050).

22 *Id.*

23 *See* Nat'l Oceanic & Atmospheric Admin., Tides & Currents, http://tidesandcurrents.noaa.gov/sltrends/sltrends.html (last visited Nov. 21, 2010).

24 *See* Dep't of Geosciences Envtl. Studies Lab., Univ. of Ariz., Climate Change and Sea Level: USA: Florida, http://www.geo.arizona.edu/dgesl/research/other/climate_change_and_sea_level/sea_level_rise/florida/slr_usafl_i.htm (last visited Nov. 21, 2010).

25 *See* Dep't of Geosciences Envtl. Studies Lab., Univ. of Ariz., Climate Change and Sea Level: USA: Louisiana, http://www.geo.arizona.edu/dgesl/research/other/climate_change_and_sea_level/sea_level_rise/louisiana/slr_usala_i.htm (last visited Nov. 21, 2010).

26 *See* Dep't of Geosciences Envtl. Studies Lab., Univ. of Ariz., Climate Change and Sea Level: USA: Northeast, http://www.geo.arizona.edu/dgesl/research/other/climate_change_and_sea_level/sea_level_rise/northeast/slr_usane_i.htm (last visited Nov. 21, 2010).

27 *See* MATTHEW HEBERGER ET AL., CAL. CLIMATE CHANGE CTR., THE IMPACTS OF SEA-LEVEL RISE ON THE CALIFORNIA COAST 9 (2009), *available at* http://www.pacinst.org/reports/sea_level_rise/report.pdf (California); CLIMATE IMPACT GROUP, OVERVIEW OF CLIMATE CHANGE IMPACTS IN THE U.S. PACIFIC NORTHWEST 4 (2004), *available at* http://www.ef.org/westcoastclimate/D_PNW%20impacts.pdf (Oregon and Washington); ENERGY, RES. & TECH. DIV., DEP'T OF BUSINESS, ECON. DEV. & TOURISM, STATE OF HAWAII, HAWAII CLIMATE CHANGE ACTION PLAN 1-1 (1998), *available at* http://hawaii.gov/dbedt/info/energy/publications/ccap.pdf (Hawaii).

28 Dr. Rajendra Pachauri, Chairman, Intergovernmental Panel on Climate Change, Welcoming Ceremony at COP15/CMP5 on Dec. 7, 2009, at 2 (Dec. 7, 2009) (transcript available at http://www.ipcc.ch/pdf/presentations/cop%2015/RKP-welc-cer-cop15.pdf).

29 *Id.*

30 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 7, at 67 tbl.5.1 (illustrating that a best case scenario would be stabilization of carbon dioxide at 350–400 parts per million, with a peaking year of 2015, and a carbon dioxide reduction of 50% to 85% by 2050).

daunting.[31] For instance, the IPCC has concluded that stabilization at this level "can be achieved by deployment of a portfolio of technologies that are currently available and those that are expected to be commercialized in coming decades, provided that appropriate and effective incentives are in place and barriers are removed."[32] If aggressive steps are taken quickly, many co-benefits, such as health benefits from the transition to cleaner energy sources because of the corresponding reduction in toxic and conventional air pollution, could substantially offset the costs.[33] If deep cuts in greenhouse gas emissions are postponed any longer, however, the costs and consequences of climate change would increase dramatically.[34] The sober truth is that, if we do nothing, "[u]nmitigated climate change would, in the long term, be likely to exceed the capacity of natural, managed and human systems to adapt."[35]

Unfortunately, we have been moving in the wrong direction. Between 1970 and 2004, global greenhouse gas emissions increased at a rate of 1.6% per year.[36] Worse, in the absence of aggressive governmental policies, global greenhouse gas emissions are projected to increase even faster, at a rate of up to 2.5% per year, reaching levels 25% to 90% higher than 2000 emission levels by the year 2030.[37] The United States is contributing to these distressing trends. Our greenhouse gas emissions increased 14% between 1990 and 2008[38] and are projected to increase 4% between 2005 and 2020.[39]

In raw numbers, the United States contributes approximately 7000 teragrams (million metric tons) of greenhouse gases (carbon dioxide

---

31 *See, e.g.*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 7, at 68; RACHEL CLEETUS ET AL., UNION OF CONCERNED SCIENTISTS, CLIMATE 2030: A NATIONAL BLUEPRINT FOR A CLEAN ENERGY ECONOMY 128, 160 (2009), *available at* http://www.ucsusa.org/assets/documents/global_warming/climate-2030-report.pdf; NAT'L CONFERENCE OF STATE LEGISLATURES, ECONOMIC AND ENVIRONMENTAL COSTS OF CLIMATE CHANGE OVERVIEW (2008), *available at* http://www.ncsl.org/portals/1/documents/environ/ClimatechangeOver.pdf; Pachauri, *supra* note 28, at 2; EUROPEAN CLIMATE FOUNDATION: ROADMAP 2005, http://www.europeanclimate.org/index.php?option=com_content&task=view&id=72&Itemid=79 (last visited Nov. 21, 2010).

32 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 7, at 73.

33 *See id.* at 59.

34 *See id.* at 65–66.

35 *Id.* at 73 (emphasis omitted) (citing Yohe et. al, *Perspectives on Climate Change and Sustainability*, *in* CLIMATE CHANGE 2007: WORKING GROUP II: IMPACTS, ADAPTATION AND VULNERABILITY (PARRY ET AL., EDS.), 811, 826, *available at* http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg2_report_impacts_adaptation_and_vulnerability.htm (click on "Chapter 20"); INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WORKING GROUP II: SUMMARY FOR POLICYMAKERS (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf).

36 WORKING GRP. III TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: MITIGATION 97 (Bert Metz et al. eds., 2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter1.pdf.

37 *Id.* at 111.

38 U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2008, at ES-3 (2010), *available at* http://epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010_Report.pdf.

39 U.S. DEP'T OF STATE, U.S. CLIMATE ACTION REPORT 2010, at 78 (2010), *available at* http://www.state.gov/documents/organization/140636.pdf.

equivalent) to the global atmosphere each year.[40] A 50% to 85% reduction by 2050—as called for by the IPCC's best case 2.0 to 2.4 degrees Celsius scenario—will require us to slash our contribution by 3500 to 6000 teragrams each year. To do this, we will need to radically transform our energy system, eliminate our reliance on fossil fuels, sharply reduce our patterns of energy use, and rapidly develop wind, solar, geothermal, and other sources of energy. With economies of scale, this kind of transformation is possible in a much shorter time than many people believe.[41]

Nevertheless, we are behind schedule, and the problem at hand may be worse than we have predicted. Sea levels have risen 50% faster than projected by models for the period between 1963 and 2001.[42] Researchers once predicted a sea level rise of 0.6 to 1.9 feet by the end of the century, but they have since adjusted their prediction to a range from a plausible 2.6 to a possible 6.6 feet.[43] Summer sea ice has similarly been shrinking much faster than anticipated.[44] There is also a real possibility of sudden climactic changes and self-perpetuating feedback loops that could severely hamper or even eliminate our ability to reverse global warming trends.[45] We cannot gamble the fate of our civilization. So, even as the we prepare to make the big leaps necessary to achieve an economy-wide transformation, we must simultaneously take immediate steps to start moving our current emissions trajectory in a downward direction.

III. LEGISLATIVE GRIDLOCK ON CLIMATE CHANGE

"Indecision is the graveyard of good intentions."[46]

40 *See* U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-4 to ES-6 tbl.ES-2. For analytic simplicity, this paper is focusing solely on direct emissions of greenhouse gases, rather than the net result of direct and indirect emissions, sinks, and non-gaseous climate-forcing substances and processes (e.g., black carbon, aerosols, feedback loops). For ease of comparison, this paper will refer to all greenhouse gas emissions by reference to teragrams of carbon dioxide equivalent, as is the practice of IPCC and EPA.

41 *See* Interview with Daniel Kammen, Dir., Renewable & Appropriate Energy Lab., Univ. of Cal. Berkeley, in S.F., Cal. (June 20, 2010) (recording available at http://vodpod.com/watch/3909506-daniel-kammen-renewable-energy-and-economies-of-scale). Also, studies show that renewable energy is capable of generating more jobs than fossil fuel-based energy. DANIEL M. KAMMEN ET AL., RENEWABLE & APPROPRIATE ENERGY LAB., PUTTING RENEWABLES TO WORK: HOW MANY JOBS CAN THE CLEAN ENERGY INDUSTRY GENERATE? 2 (2004), *available at* http://rael.berkeley.edu/sites/default/files/very-old-site/renewables.jobs.2006.pdf.

42 B. EKWURZEL, UNION OF CONCERNED SCIENTISTS, LATEST CLIMATE SCIENCE UNDERSCORES URGENT NEED TO REDUCE HEAT-TRAPPING EMISSIONS 1 (2009), *available at* http://www.ucsusa.org/assets/documents/global_warming/Latest-Climate-Science-high-res.pdf.

43 *Id.*

44 *Id.*

45 *See* PETER U. CLARK ET AL., *Executive Summary*, *in* ABRUPT CLIMATE CHANGE: SYNTHESIS AND ASSESSMENT PRODUCT 3.4, at 2 (2008), *available at* http://downloads.climatescience.gov/sap/sap3-4/sap3-4-final-report-all.pdf; U.S. GEOLOGICAL SURVEY ET AL., THRESHOLDS OF CLIMATE CHANGE IN ECOSYSTEMS: FINAL REPORT, SYNTHESIS AND ASSESSMENT PRODUCT 4.2, at 1, 4, 5 (2009), *available at* http://downloads.climatescience.gov/sap/sap4-2/sap4-2-final-report-all.pdf.

46 Proverb by Anonymous. WM. HARDCASTLE BROWNE, PROVERBS 122 (1900).

What should the we do to maximize our progress over the next five to ten years, and who should take the lead in doing it? These are critical questions facing our generation. In the United States, many have looked to Congress to solve the climate crisis and stave off the most destructive and destabilizing scenarios. Yet, Congress has so far proven itself incapable of rising to the occasion.

Since 2007, the debate in Congress over comprehensive climate legislation has escalated to a fever pitch, reaching a pinnacle with the passage of the Waxman-Markey bill[47] by the House of Representatives in June 2009 by a narrow margin of 219 to 212.[48] A year later, however, the hopes of many were dashed when Senator Harry Reid (D-Nev.) announced in July 2010 that he was shelving major climate legislation for the remainder of the legislative session.[49] His move prompted numerous headlines pronouncing the death of climate legislation, such as "After the Climate Bill Failure,"[50] "Cap and Trade Is Dead,"[51] and "Four Ways to Kill a Climate Bill."[52]

The news media and blogosphere thus appear to agree that the future looks grim for any meaningful legislative solution to the climate crisis in the near term and perhaps in the longer term as well. Some of the reasons cited include: increasing reliance on the filibuster in the Senate, particularly by industry-friendly Republicans;[53] disproportionate representation in the Senate by coal-dependent rural states;[54] misinformation campaigns by prominent climate deniers, such as Senator James Inhofe (R-Okla.), who has called climate change "the greatest hoax ever perpetrated on the American people";[55] Democrats from coal and farm states who are firmly opposed to a

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

48 OpenCongress, H.R. 2454: American Clean Energy and Security Act of 2009, http://www.opencongress.org/bill/111-h2454/actions_votes (last visited Nov. 21, 2010).

49 Dean Scott, *Reid Abandons Carbon Limits in Energy Bill, Will Focus on Oil Spills, Efficiency Measures*, 41 Env't Rep. (BNA) 1633, at 1633 (2010).

50 John M. Broder, *After the Climate Bill Failure*, GREEN, July 23, 2010, http://green.blogs.nytimes.com/2010/07/23/after-the-climate-bill-failure/ (last visited Nov. 21, 2010).

51 Bryan Walsh, *Cap and Trade Is Dead (Really, Truly, I'm Not Kidding). Who's to Blame?*, ECOCENTRIC, July 22, 2010, http://ecocentric.blogs.time.com/2010/07/22/cap-and-trade-is-dead-really-truly-im-not-kidding-whos-to-blame/ (last visited Nov. 21, 2010).

52 Lee Wasserman, Op-Ed., *Four Ways to Kill a Climate Bill*, N.Y. TIMES, July 26, 2010, at A23, *available at* http://www.nytimes.com/2010/07/26/opinion/26wasserman.html#.

53 Climate and Energy Legislation, N.Y. TIMES, July 23, 2010, http://topics.nytimes.com/top/news/business/energy-environment/climate-and-energy-legislation/index.html (last visited Nov. 20, 2010); David Roberts, *The Senate is Just Not That Into You: The Filibuster is Giving Enviros Unwarranted Self-Esteem Issues*, GRIST, July 29, 2010, http://www.grist.org/article/2010-07-28-filibuster-is-giving-progressives-unwarranted-self-esteem-issues (last visited Nov. 21, 2010).

54 *See, e.g.*, David Roberts, *How 7.4% of Americans Can Block Humanity's Efforts to Save Itself*, GRIST, Nov. 12, 2009, http://www.grist.org/article/2009-11-12-how-7.4-of-americans-can-block-humanitys-efforts-to-save-itself (last visited Nov. 21, 2010).

55 Ralph E. Stone, *Republicans Poised to Accelerate Climate Change Armageddon*, FOGCITYJOURNAL.COM, Nov. 18, 2010, http://www.fogcityjournal.com/wordpress/2511/republicans-poised-to-accelerate-climate-change-armageddon (last visited Nov. 28, 2010).*See* Liisa Antilla, *Current Climate: Case Studies of US Media Coverage of Climate Change – Self-Censorship and Denial*, ONE BLUE WORLD, Mar. 7, 2009, http://oneblueworld.blogspot.com/2009/03/current-climate-case-studies-of-us_07.html (last visited Nov. 21, 2010).

cap on carbon emissions;[56] the Obama administration's poll-driven strategy emphasizing jobs and economic growth rather than leadership and public education about the impending climate crisis;[57] and environmentalists' overriding focus on an economy-wide cap-and-trade bill.[58]

There are deeper causes for this legislative paralysis as well. According to Professor Richard Lazarus, during the 1970s and 1980s, Congress demonstrated a willingness to engage in vigorous substantive policy debates, enact sweeping environmental laws, keep close watch over agency implementation of those laws, and then revisit and rework the laws as needed for many years after their enactment.[59] By contrast, as Professor Lazarus has persuasively argued, Congress now "exhibits little capacity to engage in . . . deliberative democracy."[60] Despite the existence of many serious issues and calls for reform, Congress has not enacted any major new pollution control legislation since 1990, nor any major natural resources legislation since 1992.[61]

Lazarus attributes this "legislative paralysis" in large part to the deliberate shift of power away from the authorization committees in Congress, such as the Senate Committee on Environment and Public Works, and toward the Congressional appropriations committees responsible for managing the public purse.[62] As a result, the conventional wisdom is that environmental legislation can now be achieved only on an incremental, ad hoc, and secretive basis through legislative riders on omnibus appropriations bills, which are ever-increasing in both prevalence and girth.[63] Congress's heavy reliance on the appropriations process to enact substantive environmental laws has sacrificed the valuable substantive expertise and staff resources of the authorization committees, hindered transparency and public input, and ultimately led to "a huge loss in meaningful deliberations about national policy."[64]

---

56 Bryan Walsh, *supra* note 51, http://ecocentric.blogs.time.com/2010/07/22/cap-and-trade-is-dead-really-truly-im-not-kidding-whos-to-blame (last visited Nov. 21, 2010). *See* Keith Good, *Deal Reached on Waxman-Markey Climate Bill*, FARMPOLICY.COM, June 24, 2009, http://www.farmpolicy.com/?p=1228 (last visited Nov. 21, 2010).

57 *See* Joseph Ramm, *The Failed Presidency of Barack Obama, Part 1*, GRIST, July 22, 2010, http://www.grist.org/article/2010-07-22-the-failed-presidency-of-barack-obama (last visited Nov. 21, 2010) (noting that despite polling to the contrary, top advisors in the Obama administration were convinced that global warming was a political loser); Michael Shellenberger & Ted Nordhaus, *Green Jobs for Janitors: How Neoliberals and Green Keynesians Wrecked Obama's Promise for a Clean Energy Economy*, THE BREAKTHROUGH INSTITUTE, Oct. 7, 2010, http://thebreakthrough.org/blog/2010/10/green_jobs_for_janitors.shtml#more (last visited Nov. 21, 2010) (noting that the Obama platform was based on the creation of green jobs and economic growth).

58 *See* Walsh, *supra* note 51.

59 *See* Richard J. Lazarus, *Congressional Descent: The Demise of Deliberative Democracy in Environmental Law*, 94 GEO. L.J. 619, 623–27 (2006).

60 *Id.* at 620.

61 *Id.* at 629–30.

62 *Id.* at 632–34.

63 *See id.* at 640–48.

64 *Id.* at 652–55, 660. While riders have been used strategically by both parties and a variety of interest groups, "there is reason to anticipate that the rise of appropriations riders is

Another important reason for legislative gridlock is the increasing polarization of political views in Congress and throughout the nation, and nowhere is it more pronounced than in the context of climate change.[65] Whereas in the 1970s, Democratic and Republican majorities voted against each other on only 30% and 36% of recorded votes in the House and Senate, respectively, by the mid-1990s, the party majorities voted against each other roughly 67% of the time.[66] Republican party leadership has reinforced this trend by bucking the traditional seniority-based appointment system and granting key leadership positions to junior members perceived as most loyal to the party platform,[67] which includes determined opposition to comprehensive climate legislation.[68]

In light of these daunting obstacles, it is remarkable that many Senators and Congressmen have nevertheless been willing to devote tremendous energy and political capital to pushing forward a variety of climate bills through the regular authorization committees over the past couple of years. Unfortunately, these legislators have compounded their difficulties by emphasizing the need for a far-reaching cap-and-trade program. The first major climate legislative proposal—the Lieberman-Warner bill introduced in the United States Senate in October 2007—encompassed a wide variety of entities, including electric power plants, industrial facilities, vehicle fleets, fuel producers, and chemical plants.[69] The bill allotted 5.775 billion allowances to these entities in 2012, with the expectation that these would be ratcheted back to 1.732 billion allowances by 2050, i.e., the much-feared cap.[70] On the other hand, covered entities would have been allowed to liberally transfer these allowances, bank or borrow against them, and take advantage of offsets and credits derived from difficult-to-measure agricultural, forestry, and carbon sequestration projects, including international projects.[71] These types of provisions raise the hackles of many members of the environmental community.[72] Yet they have not been viewed

substantively skewed over the long term in favor of an overall relaxation of pollution control requirements." *Id.* at 663–64.

65 *See generally* Alex Kaplun, *Conservative Ire Rains on 8 Republicans Who Voted for House Climate Bill*, N.Y. TIMES, June 30, 2009, http://www.nytimes.com/gwire/2009/06/30/30greenwire-conservative-ire-rains-on-8-republicans-who-vo-37491.html (stating that conservative members of Congress who voted for the House Climate Bill faced much opposition from Republican party members).

66 Lazarus, *supra* note 59, at 670.

67 *Id.*, at 674–75.

68 *See* Aaron Wiener, *Amid GOP Opposition, Even a Limited Climate Bill Is an Uphill Battle*, MINN. INDEP., June 30, 2010, http://minnesotaindependent.com/60975/amid-gop-opposition-even-a-limited-climate-bill-is-an-uphill-battle (last visited Nov. 21, 2010).

69 Lieberman-Warner Climate Security Act of 2007, S. 2191, 110th Cong. § 4 (2008).

70 *Id.* § 1201.

71 *See id.*

72 *See, e.g.*, Union of Concerned Scientists, Economic Facts Support United States Action to Curb Global Warming, http://www.ucsusa.org/global_warming/solutions/big_picture_solutions/economics-climate-factsheet.html (last visited Nov. 21, 2010) ("Attempting to limit the costs of a cap-and-trade policy with a carbon price cap or 'safety valve' would undermine both the environmental and economic benefits of the program. This or any other 'off ramp' from required emissions reductions would severely weaken the market certainty needed to

by industry as reliable or certain enough in mitigating the burdens of climate legislation to garner their support.[73] Accordingly, even though this bill was approved by the Senate Environment and Public Works Committee, it ultimately failed to overcome a Republican-led filibuster in June 2008.[74]

Since May 2009, the Waxman-Markey bill in the House of Representatives and other similar proposals have been the subject of intense scrutiny and debate.[75] Much like Lieberman-Warner, the Waxman-Markey bill envisioned a cap-and-trade program covering the full spectrum of the United States economy, including producers of electricity, petroleum, natural gas, ethanol, chemicals, petrochemicals, aluminum, cement, ferroalloys, food, glass, iron and steel, pulp and paper, lead, and zinc.[76] The Waxman-Markey bill also proposed an initial allocation of 4.6 billion allowances in 2012 that would be ratcheted down to 1 billion allowances by 2050, and it authorized liberal trading, banking, borrowing, offsets, and credits, including offsets and credits derived from forestry and international projects.[77] After passing the House of Representatives in 2009, however, the bill has since languished in the Senate.[78] Once again, industry viewed the legislation as creating too much uncertainty concerning future business prospects,[79] while environmental groups expressed concern that offsets and other industry-favored provisions would undermine the legislation's effectiveness in reducing emissions.[80] Having reached an impasse in this fashion, many politicians proclaimed the broad cap-and-trade approach reflected in these bills to be unworkable. Senator Lindsey Graham (R-S.C.), for instance,

encourage businesses to invest in new energy technologies. The unlimited use of borrowing and offsets also would threaten the integrity of the cap by delaying emissions reductions in major polluting sectors.").

73 *See* Christine Jindra, *Sens. George Voinovich, Sherrod Brown Agree in Opposition to Legislation to Fight Global Warming*, CLEVELAND.COM, May 3, 2008, http://blog.cleveland.com/openers/2008/05/climate.html (last visited Nov. 21, 2010).

74 Harvey Wasserman, *King Fossil Loves Global Warming & Removes McCain's Mountaintop*, HUFFINGTON POST, June 9, 2008, http://www.huffingtonpost.com/harvey-wasserman/king-fossil-loves-global_b_105973.html (last visited Nov. 21, 2010).

75 John M. Broder, *House Backs Bill, 219-212, to Curb Global Warming*, N.Y. TIMES, June 27, 2009, at A1 (Waxman-Markey bill); Editorial, *Does the Climate Bill Have a Chance?*, N.Y. TIMES ROOM FOR DEBATE BLOG, May 9, 2010, http://roomfordebate.blog.nytimes.com/2010/05/09/does-the-climate-bill-have-a-chance (last visited Nov. 21, 2010) (describing other similar proposals).

76 *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 311 (2009).

77 *See id.* §§ 311, 401.

78 *See H.R. 2454: American Clean Energy and Security Act of 2009*, OPENCONGRESS.ORG, http://www.opencongress.org/bill/111-h2454/actions (last visited Nov. 21, 2010).

79 *See, e.g.*, *American Clean Energy and Security Act of 2009: Hearing on the American Clean Energy and Security Act of 2009 Before H. Subcomm. on Energy and Env't*, 111th Cong. 305 (2009) (statement of William L. Kovacs, Vice President of Environment, Technology, and Regulatory Affairs, U.S. Chamber of Commerce), *available at* http://energycommerce.house.gov/Press_111/20090424/transcript_20090424_ee.pdf ("[T]he one part that troubles us the most is, you have very steep emission reductions over the course of the years but there is really no assurance in the bill that as you force fossil fuels out of the system, that there is a mechanism for bringing substitute technologies into the system . . . .").

80 *See, e.g.*, Stephen Power, *Impact of 'Offsets' to Limit Emissions Is Uncertain*, WALL ST. J., June 27–28, 2009, at A2.

announced that the climate bills in the House and Senate were "dead" and that the "concept of cap-and-trade is going to be replaced."[81]

On a parallel track, some legislators have started to move away from broad economy-wide cap-and-trade bills and give serious consideration to other approaches.[82] A few of the ideas under consideration include trading programs limited to the utility sector,[83] renewable energy standards,[84] cap-and-dividend programs,[85] and carbon taxation.[86] The perceived viability of some of these narrower proposals may be part of the reason Senator Reid has recently renewed his commitment to the cause by saying there's a chance that a climate bill might still be introduced in 2010 after the August break.[87]

It remains to be seen whether there is enough political will in Congress to overcome the many forces contributing to legislative gridlock on climate change. Perhaps a more important question to ask, however, is whether we might be better off with no new climate legislation at all. There are some good reasons for wondering about this. For instance, it appears likely that any such legislation, whether broad or narrow, would continue to include enormous concessions to industry.[88] These concessions have raised serious concerns among academics about the reliability, effectiveness, and enforceability of proposed cap-and-trade programs.[89] Professor Lesley McAllister has demonstrated, for example, that most trading programs in existence are heavily over-allocated and allow excessive banking of credits,

---

81 Richard Cowan & Thomas Ferraro, *U.S. Senator Graham Calls Cap-And-Trade Plan Dead*, REUTERS, Mar. 3, 2010, http://www.alertnet.org/thenews/newsdesk/N02177727.htm (last visited Nov. 21, 2010).

82 Darren Samuelsohn, *Got Ideas About a Climate Bill? Kerry, Graham, and Lieberman Want to Hear From You*, N.Y. TIMES (Jan 27, 2010), available at http://www.nytimes.com/cwire/2010/01/27/27climatewire-got-ideas-about-a-climate-bill-kerry-graham-64375.html (last visited Nov. 28, 2010). John M. Broder & Clifford Krauss, *Advocates of Climate Bill Scale Down Their Goals*, N.Y. TIMES, Jan. 27, 2010, at A4.

83 American Clean Energy Leadership Act of 2009, S. 1462, 111th Cong. § 132(a) (2009).

84 *Id.*

85 Carbon Limits and Energy for America's Renewal (CLEAR) Act, S. 2877, 111th Cong. § 4 (2009).

86 America's Energy Security Trust Fund Act of 2009, H.R. 1337, 111th Cong. § 2 (2009).

87 *See* Timothy B. Hurst, *Reid Says Broader Climate and Energy Bill Isn't Dead Yet*, ECOPOLITOLOGY, Aug. 4, 2010, http://ecopolitology.org/2010/08/04/reid-says-broader-climate-and-energy-bill-isnt-dead-yet/ (last visited Nov. 21, 2010); Noelle Straub & Robin Bravender, *Sen. Bingaman's Practical Approach Places Him at Center of Energy, Climate, Gulf Spill Debate*, N.Y. TIMES, July 15, 2010, http://www.nytimes.com/gwire/2010/07/15/15greenwire-sen-bingamans-practical-approach-places-him-at-35976.html (last visited Nov. 21, 2010); Kate Sheppard, *The Other Climate Bill*, MOTHER JONES MAG. BLOG, Mar. 25, 2010, http://motherjones.com/blue-marble/2010/03/cantwell-collins-climate-bill (last visited Nov. 21, 2010).

88 *See* Lee Wasserman, Op-Ed., *Four Ways to Kill a Climate Bill*, N.Y. TIMES, July 26, 2010, at A21 ("For several years the Beltway wisdom has been that it is impossible to pass a bill without the approval of historic polluters, particularly the utilities . . . . The administration and Congress did their best to get the industry's permission for new regulations [by proposing] handing power companies hundreds of billions of dollars worth of allowances to pollute, additional billions to subsidize the development of technology to sequester carbon from coal-fired plants, and evisceration of federal authority under the Clean Air Act to regulate carbon.").

89 *See* Lesley K. McAllister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*, 34 COLUM. J. ENVTL. L. 395, 424, 443–44 (2009).

undermining their effectiveness in achieving meaningful emission reductions.[90] Similarly, concessions to industry in other legislative proposals, such as carbon taxation, could weaken or even defeat the purpose of the rules.[91]

As further concessions to industry, many of the legislative proposals pending in Congress would severely limit EPA's authority to regulate greenhouse gases or eliminate it altogether.[92] This has triggered opposition from prominent environmental groups. The Sierra Club, for example, has said that it would "go to the mat for defending Clean Air Act authority."[93] The following discussion takes a closer look at how much progress EPA could achieve under its existing Clean Air Act authority, and what exactly we would be giving up through legislation eliminating EPA regulatory authority over greenhouse gases.

IV. USING THE CLEAN AIR ACT TO ADDRESS CLIMATE CHANGE

"What seem to us bitter trials are often blessings in disguise."[94]

The Clean Air Act is generally viewed as the most complex of the federal environmental statutes.[95] One of the reasons for this is that the

90 *Id.* at 397.

91 *See* Mike Lillis, *Coal, Electric Industries Big Winners in Climate Bill Deal*, THE WASHINGTON INDEPENDENT, May 15, 2009, http://washingtonindependent.com/43264/coal-electric-industries-big-winners-in-climatebill-deal92 (last visited Nov. 21, 2010).

92 *See* PEW CTR. ON GLOBAL CLIMATE CHANGE, COMPARISON OF THE AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009 (WAXMAN-MARKEY) AND THE AMERICAN POWER ACT (KERRY-LIEBERMAN) 4 (2010), *available at* http://www.pewclimate.org/docUploads/pew-comparison-matrix-wm-and-kl_0.pdf (noting that two prominent climate change bills limit EPA's authority to regulate greenhouse gases under the Clean Air Act, and that for certain categories of oversight, EPA authority is eliminated); *The Waxman-Markey Bill: A Good Start or a Non-Starter?*, YALE ENV'T 360, June 18, 2009, http://e360.yale.edu/content/feature.msp?id=2163 (last visited Nov. 21, 2010) (noting that many environmentalists are frustrated by the concessions made to industrial lobby groups in the pending legislation, including a provision that would "strip" EPA's authority to regulate carbon dioxide emissions from coal plants).

93 Ben Geman, *Climate Bill Could Face Threats From Left*, E2 WIRE, Mar. 26, 2010, http://thehill.com/blogs/e2-wire/677-e2-wire/89399-climate-bill-could-face-threats-on-the-left (last visited Nov. 21, 2010) (quoting Sierra Club Executive Director Michael Brune); *see also* Jim Tankersley, *Sierra Club Chief Explains Climate Change Strategy*, L.A. TIMES, Mar. 30, 2010, http://articles.latimes.com/2010/mar/30/nation/la-na-sierra30-2010mar30 (last visited Nov. 21, 2010).

94 OSCAR WILDE, THE IMPORTANCE OF BEING EARNEST AND OTHER PLAYS 291, 325 (Richard Allen Cave ed., 2000).

95 The Clean Air Act and amendments thereto passed in 1970, 1977, and 1990 totaled approximately 464 pages in the *Statutes at Large*. *See* Clean Air Act Amendments of 1970, Pub. L. No. 91-604, 84 Stat. 1676 (1970); Clean Air Act Amendments of 1977, Pub. L. No. 95-95, 91 Stat. 685 (1977); Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2399 (1990). By comparison, the two statutes generally seen as the next most complex, the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), consist of only 120 and 215 pages in the *Statutes at Large*, respectively. *See* Resource Conservation and Recovery Act of 1976, Pub. L. No. 94-580, 90 Stat. 2795 (1976); Hazardous and Solid Waste Amendments of 1984, Pub. L. No. 98-616, 98 Stat. 3221 (1984); Comprehensive Environmental Response, Compensation, and Liability Act of 1980,

statute encompasses a dizzying array of regulatory strategies, including national health-based standard setting,[96] federal-state partnering under the principle of cooperative federalism,[97] direct EPA regulation of sources,[98] technology-based standards,[99] performance standards,[100] technology-forcing provisions,[101] risk-based regulation,[102] construction permitting programs,[103] operating permit programs,[104] scientific research programs,[105] technological guidance,[106] financial assistance,[107] civil and criminal liability,[108] and other measures. Over the past forty years, Clean Air Act practitioners and experts have come to understand that some of these approaches work well, some are best for certain types of pollutants or sources, some are unduly cumbersome, and some are dysfunctional and in need of reform.[109] When asked whether the Clean Air Act is appropriate for addressing climate change, however, many experts have set aside these distinctions and adopted an all-or-nothing approach. Either they believe the entire machinery of the Clean Air Act should be brought to bear on the problem,[110] or they believe the Act is wholly unsuited for the endeavor.[111]

Pub. L. No. 96-510, 94 Stat. 2767 (1980); Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613 (1986).

96 Clean Air Act, 42 U.S.C. § 7409 (2006).

97 *Id.* § 7401.

98 *Id.* §§ 7411, 7521.

99 *Id.* § 7412(d).

100 *Id.* § 7411.

101 *Id.* § 7521(a).

102 *Id.* § 7412(f).

103 *Id.* § 7475(a).

104 *Id.* § 7661a.

105 *Id.* § 7403.

106 *Id.* § 7511b.

107 *Id.* § 7405.

108 *Id.* § 7413.

109 *See* NAT'L ACAD. OF PUB. ADMIN., A BREATH OF FRESH AIR: REVIVING THE NEW SOURCE REVIEW PROGRAM 1–4 (2003); TITLE V TASK FORCE, FINAL REPORT TO THE CLEAN AIR ACT ADVISORY COMMITTEE: TITLE V IMPLEMENTATION EXPERIENCE E-1, 4–6 (2006), *available at* http://www.epa.gov/air/caaac/tvtaskforce/title5_taskforce_finalreport20060405.pdf; David Doniger, *Clean Air for the Year 2000*, 14 PACE ENVTL. L. REV. 107, 109–12 (1996); Victor B. Flatt, *Gasping for Breath: The Administrative Flaws of Federal Hazardous Air Pollution Regulation and What We Can Learn from the States*, 34 ECOLOGY L.Q. 107, 115–20 (2007); Ernest S. Rosenberg, *Clean Air Act Reform: A Necessity for the Act's Survival*, 14 PACE ENVTL. L. REV. 115, 120–22 (1996); Christine Sansevero, *The Effect of the Clean Air Act on Environmental Quality: Air Quality Trends Overview*, 14 PACE ENVTL. L. REV. 31, 31–32, 34 (1996).

110 *See, e.g.*, Petition to Establish National Pollution Limits for Greenhouse Gases Pursuant to the Clean Air Act, from Center for Biological Diversity and 350.org to United States Environmental Protection Agency 7–8 (Dec. 2, 2009) (urging EPA to list seven pollutants as "criteria" pollutants, issue primary and secondary NAAQS, publish guidance concerning available control technologies, and expedite states' development of state implementation plans); Mary D. Nichols, Comment, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 40 Envtl. L. Rep. (Envtl. Law Inst.) 10,760, at 10,761 (2010) (arguing in favor of the use of the Clean Air Act's cooperative federalism approach as well as the mobile source program).

111 *See, e.g.*, Arnold W. Reitze, Jr., *Federal Control of Carbon Dioxide Emissions: What Are the Options?*, 36 B.C. ENVTL. AFF. L. REV. 1, 1–8 (2009); Jason Scott Johnston, *Climate Change*

This article charts a middle course, arguing that we should take advantage of the best tools available under the Clean Air Act and eschew those which may create more problems than they solve. In particular, the mobile source program and the NSPS program together offer a clear, straightforward, and powerful sector-by-sector approach that can achieve a great deal of emission reductions in a fair, reasonable, and cost-effective manner. Most importantly in the climate context, the straightforward legal framework will help avoid litigation and allow these reductions to be achieved in a timely manner. By contrast, even the most well-intentioned efforts to utilize the ambient air quality program are likely to meet with years of administrative delay, thorny implementation issues, protracted litigation, and little progress on controlling greenhouse gas emissions during the short window of time in which scientists have indicated such changes must occur.[112]

A. The Mobile Source Program

As discussed above, the United States contributes roughly 7000 teragrams of greenhouse gases to the global atmosphere each year.[113] The transportation sector contributes roughly 1800 teragrams of greenhouse gas emissions annually, or roughly 26% of the United States total, making it the second largest contributor after electricity generation.[114] The subset of mobile sources subject to regulation under the Clean Air Act are responsible for roughly 1663 teragrams of greenhouse gas emissions, or approximately 23% of overall United States emissions.[115] Thus, EPA regulation of this sector alone has the potential to address nearly a quarter of all United States greenhouse gas emissions.

Section 202 of the Clean Air Act authorizes the Administrator of EPA to "prescribe . . . standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health and welfare."[116] Each of these statutory prerequisites has been met. The United States Supreme

Confusion and the Supreme Court: The Misguided Regulation of Greenhouse Gas Emissions Under the Clean Air Act, 84 NOTRE DAME L. REV. 1, 3 (2008).

112 *See* Cary Coglianese & Gary E. Marchant, *Shifting Sands: The Limits of Science in Setting Risk Standards*, 152 U. PA. L. REV. 1255, 1256–1323 (2004) (reviewing the protracted evolution of NAAQS for ozone and particulate matter); Arnold W. Reitze, Jr., *Air Quality Protection Using State Implementation Plans—Thirty-Seven Years of Increasing Complexity*, 15 VILL. ENVTL. L.J. 209, 365–66 (2004) (explaining that, because of its tremendous complexity, the SIP program "may have largely outlived its usefulness" and that "[i]n the future, federally mandated measures will be the major cause of the additional emissions reductions that are needed if progress is to be made").

113 U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-4 to ES-6 tbl.ES-2.

114 *See id.* at ES-7 to ES-8 tbl.ES-3.

115 Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,540 (Dec. 15, 2009) (codified at 40 C.F.R. ch. 1).

116 Clean Air Act, 42 U.S.C. § 7521(a)(1) (2006).

Court has determined that "greenhouse gases fit well within the Clean Air Act's capacious definition of 'air pollutant'" and that "EPA has the statutory authority to regulate the emission of such gases from new motor vehicles."[117] Further, EPA recently finalized its endangerment finding for six greenhouse gas pollutants based on the accumulation of more than twenty years of research by hundreds of eminent scientists.[118] Although the endangerment finding is being challenged in court by a number of industry petitioners,[119] their arguments are largely based on rumors and leaked emails rather than peer-reviewed science and thus have little chance of success.[120] Moreover, some observers predict that the lawsuits will be dismissed for lack of standing because the endangerment finding does not impose any regulatory obligations and thus has not caused any injury to the petitioners.[121]

EPA has also found that greenhouse gas emissions from mobile sources regulated under the Clean Air Act cause or contribute to climate change.[122] This finding appears entirely reasonable given that these sources are responsible for about 23% of all United States emissions.[123] Thus, the stage has been set for EPA to exercise its broad discretion under section 202 to regulate greenhouse gas emissions from mobile sources, just as it has been doing for conventional air pollutants over the past forty years.

Using this authority, EPA has recently promulgated standards for light-duty motor vehicles,[124] and they are a model of reasonableness. EPA has coordinated its rulemaking with the United States Department of Transportation (DOT) to ensure consistency with fuel efficiency standards, as well as with the State of California and other states to ensure that manufacturers will only have to comply with a single set of regulations during the five model years covered by the rule.[125] Since the rules will not take effect until model year 2012, the auto industry will be provided adequate lead time to incorporate the new rules into its ordinary business

117 Massachusetts v. U.S. Envtl. Prot. Agency, 549 U.S. 497, 532 (2007).

118 Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. at 66,496.

119 *See, e.g.*, Petition for Review, Chamber of Commerce of the U.S. v. U.S. Envtl. Prot. Agency, No. 10-1030 (D.C. Cir. Feb. 12, 2010).

120 *See* EPA's Denial of the Petitions to Reconsider the Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 75 Fed. Reg. 49,556 (Aug. 13, 2010) ("EPA's analysis of the petitions reveals that the petitioners have provided inadequate and generally unscientific arguments and evidence that the underlying science supporting the Findings is flawed, misinterpreted or inappropriately applied by EPA.").

121 *See* Robin Bravender, *Climate: Lawsuits Roll in as EPA 'Endangerment' Deadline Looms*, GREENWIRE, Feb. 15, 2010, http://eenews.net/public/Greenwire/2010/02/15/1 (last visited Nov. 21, 2010) (quoting David Bookbinder, chief climate counsel at the Sierra Club, who said he expects the court to dismiss the lawsuits based on lack of standing).

122 Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. at 66,499.

123 *Id.* at 66,540.

124 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25,324 (May 7, 2010) (codified at 40 C.F.R. pts. 85–86, 600, 49 C.F.R. pts. 531, 533, 536–538) [hereinafter Joint EPA/DOT Light-Duty Vehicle Rule].

125 *Id.* at 25,326.

and production cycles.[126] Further, even after they go into effect, the rules will be phased in gradually, with stringency increasing at a rate of approximately 3% to 5% per year.[127] The level of the standards is based on the industry-wide implementation of technology that is "already being commercially applied" and "can be incorporated at a reasonable cost."[128]

In recognition of the need for automakers to make significant capital investments, EPA is also incorporating a variety of flexible compliance mechanisms, including fleet average standards using vehicle footprint-based curves, offsets and trading between car and truck fleets, flex-fuel vehicle credits, credits for air conditioner improvements, early reduction credits, banking and borrowing mechanisms, as well as lead time allowances and other flexibilities for smaller manufacturers.[129] For all these reasons, the vehicle rules have enjoyed a broad coalition of support from parties more commonly at odds with each other. Formal letters of commitment in support of the rule have been submitted to EPA by the State of California, as well as California's Governor and Attorney General, along with Chrysler, Honda, Toyota, Mazda, Volkswagen, BMW Group, Daimler AG, General Motors, the Association of International Automobile Manufacturers, and the Alliance of Automobile Manufacturers.[130] Moreover, the Union of Auto Workers is so strongly supportive of the rule that it is actively lobbying Congress to prevent any legislation overturning EPA's endangerment finding.[131]

The investments made by the auto industry under the EPA rule will substantially benefit both consumers and the general public. Overall, the rule is expected to result in public benefits worth $240 billion, with $182 billion coming from fuel savings alone and the rest attributable to avoided climate change impacts and other factors.[132] By contrast, the incremental cost to industry of developing and implementing the new technology necessary to meet the new standards is only $52 billion.[133] While the cost of an average vehicle to the consumer is expected to rise by $331 to $948 over

126 *Id.* at 25,332.

127 *See id.* at 25,330–31.

128 *Id.* at 25,326.

129 *Id.* at 25,412–21.

130 U.S. Envtl. Prot. Agency, Transportation and Climate: Regulations and Standards, http://www.epa.gov/oms/climate/regulations.htm (last visited Nov. 21, 2010) (providing links to the various commitment letters in support of the rule). In addition to the general reasonableness of the rule, the widespread support for it is attributable in part to industry fear of more stringent regulation by California, as authorized under California's waiver from federal preemption, as well as other states opting in to California's approach. *See* Joint EPA/DOT Light-Duty Vehicle Rule, *supra* note 124, at 25,327–28.

131 *See, e.g.*, Ben Geman, *UAW to Congress: Don't Block EPA Climate Rules*, THE HILL, Mar. 15, 2010, http://thehill.com/blogs/e2-wire/677-e2-wire/86809-uaw-to-congress-dont-block-epa-climate-rules (last visited Nov. 21, 2010) (setting forth text of a March 15, 2010 letter from UAW to Congress expressing support for the mobile source rule and opposing efforts to eliminate EPA's authority to regulate greenhouse gas emissions).

132 Joint EPA/DOT Light-Duty Vehicle Rule, *supra* note 124, at 25,346–48.

133 *Id.* at 25,348.

the five-year period, these costs will be more than recovered through each consumer's fuel savings.[134]

From a climate mitigation perspective, the key point is that this single EPA rulemaking alone will eliminate roughly 960 teragrams of greenhouse gas emissions over a five-year period, reducing the mobile source sector's contribution to climate change by nearly 12% and overall United States greenhouse gas emissions by 2.7% annually.[135] Based on industry's strong support for the rule, all of this can be achieved in a very cost-effective and reasonable manner by 2016, rather than waiting until 2030 or 2050 for substantial change as contemplated by many of the recent legislative proposals.

Furthermore, President Obama has formally requested that EPA work with DOT to develop a second phase of regulations for light-duty vehicles covering model years 2017–2025, as well as a first phase of regulations for medium- and heavy-duty vehicles covering model years 2014 and beyond.[136] EPA has estimated that this latter category is responsible for 410 teragrams of greenhouse gas emissions annually and that reductions of 40% are feasible by 2015—through improvements in engine technology, elimination of aerodynamic drag, reductions in rolling resistance, and operational factors—with additional reductions possible in later years.[137]

In addition, EPA is under pressure from states and environmental groups to regulate greenhouse gas emissions from other mobile source categories, such as aviation, marine vessels, and non-road engines. After waiting over two years for a response to their 2007 and 2008 petitions, several environmental groups have recently filed a lawsuit in federal district court seeking to compel EPA to respond.[138] Experts have indicated that substantial reductions in greenhouse gas emissions could be made from these mobile source categories. For instance, in 2008, marine vessels entering United States ports contributed approximately 308 teragrams, or

134 *Id.* at 25,348, 25,404.

135 *Id.* at 25,328. In 2007, the mobile source sector contributed 1663 teragrams of greenhouse gases. Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,540 (Dec. 15, 2009) (codified at 40 C.F.R. ch. 1). Assuming this level of emissions for the five years of the Joint EPA/DOT Light-Duty Vehicle Rule, this amounts to a total of 8315 teragrams emitted by the mobile source sector, of which 960 teragrams is 12%. Similarly, overall United States emissions of 7000 teragrams per year over five years amount to 35,000 teragrams, of which 960 is 2.7%.

136 Press Release, The White House, Presidential Memorandum Regarding Fuel Efficiency Standards (May 21, 2010), *available at* http://www.whitehouse.gov/the-press-office/presidential-memorandum-regarding-fuel-efficiency-standards (last visited Nov. 21, 2010).

137 JAMES E. MCCARTHY, CONG. RESEARCH SERV., CARS, TRUCKS, AND CLIMATE: EPA REGULATION OF GREENHOUSE GASES FROM MOBILE SOURCES 9 (2010), *available at* http://ncseonline.org/NLE/CRSreports/10Jun/R40506.pdf (summarizing Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354, 44,453–58 (July 30, 2008)).

138 The lawsuit was filed in the United States District Court for the District of Columbia on June 11, 2010, by Earthjustice and the Western Environmental Law Center on behalf of Oceana, Friends of the Earth, the Center for Biological Diversity, the Center for Food Safety, and the International Center for Technology Assessment. *See* Complaint at 1, 2, Ctr. for Biological Diversity v. U.S. Envtl. Prot. Agency, (D.D.C. June 11, 2010), *available at* http://www.earthjustice.org/sites/default/files/library/legal_docs/mobile-source-ghg-petitions-complaint-10-06-11-final.pdf.

4.4%, of United States greenhouse emissions for that year.[139] One shipping company has acknowledged that reductions in ship speed of 5% to 10% would reduce both fuel use and carbon dioxide emissions by more than 15%.[140] Each year, aircraft are responsible for approximately 210 teragrams, or 3%, of United States greenhouse gas emissions,[141] and non-road engines are responsible for another 220 teragrams, or 3.1% of United States' greenhouse gas emissions.[142] A variety of controls and measures have been identified that could reduce emissions in these mobile source categories.[143]

As a final note, California has begun regulating fuels as a means to control greenhouse gas emissions, and the standards contained in the California Low Carbon Fuel Standard aim to reduce greenhouse gas emissions by 10% per unit of energy by 2020.[144] The Institute for Policy Integrity at New York University School of Law has petitioned EPA to use its authority under the Clean Air Act to regulate fuels to achieve the same end at the national level through a regulatory cap-and-trade program.[145]

In sum, under the Clean Air Act, EPA has authority to regulate emissions from mobile sources responsible for 1663 teragrams of greenhouse gas emissions, or 23% of the United States' total each year. Reasonable regulatory measures for light-, medium-, and heavy-duty vehicles and marine vessels based on readily available technology could achieve reductions of at least 402 teragrams per year, or close to 25% of mobile source sector emissions. If we conservatively estimate that the remaining mobile source categories (aircraft, nonroad engines, and fuels used by all categories of mobile sources) could be expected to achieve reductions of at least 15% overall, this would amount to an additional reduction of 189 teragrams per year, or roughly 11% of mobile source emissions. Thus, as shown in the table below, EPA has the capacity to eliminate nearly one-third of all mobile source sector emissions over the next few years by exercising its authority under the Clean Air Act.

---

139 *Id.* at 18. 308 teragrams is derived by taking 4.4% of the 7000 teragram number discussed above. *See supra* note 40 and accompanying text.

140 MCCARTHY, *supra* note 137, at 10 (citing THE A.P. MOLLER-MAERSK GROUP, PREPARING FOR THE FUTURE: THE A.P. MOLLER–MAERSK GROUP'S HEALTH, SAFETY, SECURITY AND ENVIRONMENT REPORT 2008 at 28–30 (2008), *available at* http://maerskoil.com/SiteCollectionDocuments/www.maerskoil.com/Common/Top menu/About Us/Environment/Environment front page/2008 APMM HSSE Report_only english.pdf).

141 Complaint, *supra* note 138, at 18. 210 teragrams is derived from taking 3% of the 7000 teragram number discussed above. *See supra* note 40 and accompanying text.

142 *See* Petition for Rulemaking Seeking the Regulation of Greenhouse Gas Emissions from Nonroad Vehicles and Engines, from California et al., to U.S. Envtl. Prot. Agency 8–9 (Jan. 29, 2008), *available at* http://ag.ca.gov/cms_attachments/press/pdfs/n1522_finaldraftnonroad petition3.pdf#xml=http://search.doj.ca.gov:8004/AGSearch/isysquery/3f2c9239-4065-4481-9e2e-da592664c0e1/13/hilite/ (calculating emissions based on EPA 2007 data).

143 *See, e.g.*, MCCARTHY, *supra* note 137, at 3–6, 9–10 (discussing ways to reduce aviation emissions); Petition for Rulemaking Seeking the Regulation of Greenhouse Gas Emissions from Nonroad Vehicles and Engines, *supra* note 142, at 14–15 (discussing possible control measures).

144 *See* MCCARTHY, *supra* note 137, at 14.

145 *See id.*

Table 1. Potential for Early Reduction of Greenhouse Gas Emissions from Mobile Sources Through the Use of the Clean Air Act

Mobile Source Category	Primary GHG Pollutant	Reduction of Mobile Source Sector Emissions	Actual GHG Reductions (Teragrams CO2 Eq.)
Light-Duty Vehicles (Phase 1)	Carbon dioxide	12%	192 (average over 2012–2016)
Medium- and Heavy-Duty Vehicles	Carbon dioxide	10%[146]	164
Marine Vessels	Carbon dioxide	2.8%[147]	46
All Other Mobile Sources and Fuels	Carbon dioxide	11%	189
Total		35.8%	591

B. The NSPS Program

Stationary sources, including power plants, are responsible for 3747 teragrams of greenhouse gas emissions annually, or roughly 54% of all United States emissions.[148] EPA regulations for stationary sources under the NSPS program therefore have the potential to address more than half of all United States greenhouse gas emissions.

Under section 111 of the Clean Air Act, EPA is required to issue technology-based performance standards for designated categories of industries that emit significant quantities of air pollution.[149] As a first step, EPA must create a list of categories of stationary sources that, in EPA's judgment, "cause[], or contribute[] significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare."[150] As noted previously, the United States Supreme Court has confirmed that greenhouse

146 An estimated 40% reduction of emissions from this category, as discussed above, would translate into a 10% reduction of overall mobile source emissions.

147 An estimated 15% reduction of emissions from this category, as discussed above, would translate into a 2.8% reduction of overall mobile source emissions.

148 U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-14 tbl.ES-7.

149 *See* Clean Air Act, 42 U.S.C. § 7411 (2006).

150 *Id.* § 7411(b)(1)(A).

gases qualify as air pollution,[151] and EPA has issued an extensive formal finding that six greenhouse gases endanger public health and welfare.[152] While EPA has made a cause-or-contribute finding for mobile sources, as discussed above, it has not yet done so for any of the more than seventy source categories regulated under the NSPS program.

After EPA makes such a finding for one or more stationary source categories, or for the entire group as it has done with mobile sources, EPA must issue "standards of performance" for new and modified sources within each listed category.[153] EPA is also required to review and, if appropriate, revise each standard at least once every eight years.[154] The eight-year review and revision process is meant to balance industry's need for regulatory certainty over an extended period of time with society's need to ensure that pollution controls keep pace with new scientific and technological developments.

It is not necessary for EPA to first designate greenhouse gas pollutants as "criteria" pollutants as part of the National Ambient Air Quality Standards (NAAQS) process.[155] EPA has routinely established regulations under the NSPS program governing emissions of non-criteria pollutants, commonly referred to as "designated" pollutants.[156] There is also no requirement that the eight-year review be limited to the pollutants that EPA is already regulating from a particular source category. On the contrary, it has been common practice for EPA to later add new standards to control pollutants beyond those included in the initial regulation for a source category.[157]

151 Massachusetts v. U.S. Envtl. Prot. Agency, 549 U.S. 497, 528 (2007).

152 Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,497 (Dec. 15, 2009) (to be codified at 40 C.F.R. pt. 1).

153 42 U.S.C. § 7411(b)(1)(B) (2006).

154 *Id.*

155 *See id.* § 7408.

156 *See, e.g.*, Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources, 60 Fed. Reg. 65,387, 65,415–16 (Dec. 19, 1995) (codified at 40 C.F.R. pt. 60) (setting cadmium emission standards for municipal waste combustors); Standards of Performance for New Stationary Sources, 49 Fed. Reg. 26,884, 26,893 (June 29, 1984) (codified at 40 C.F.R. pt. 60) (setting volatile organic compounds (VOC) emission standards for flexible vinyl and urethane coating and printing industry); Standards of Performance for New Stationary Sources, 43 Fed. Reg. 7568, 7573 (Feb. 23, 1978) (codified at 40 C.F.R. pt. 60) (setting total reduced sulfur standards for kraft pulp mills); Standards of Performance for New Stationary Sources, 41 Fed. Reg. 3826, 3828 (Jan. 26, 1976) (codified at 40 C.F.R. pt. 60) (setting fluoride emission standards for aluminum reduction plants).

157 *See, e.g.*, Standards of Performance for Petroleum Refineries, 72 Fed. Reg. 27,178, 27,180 (May 14, 2007) (codified at 40 C.F.R. pt. 60) (proposing new nitrogen oxide emission standards for fluid catalytic cracking units, which previously were regulated only for sulfur oxide); Standards of Performance for Stationary Combustion Turbines, 70 Fed. Reg. 8314, 8320–21 (Feb. 18, 2005) (codified at 40 C.F.R. pt. 60) (considering whether to establish limits for carbon monoxide (CO), VOC, and particulate matter emissions for stationary combustion turbines for the first time); Standards of Performance for New Stationary Sources: Industrial-Commercial-Institutional Steam Generating Units, 49 Fed. Reg. 25,102, 25,106–07 (June 19, 1984) (codified at 40 C.F.R. pt. 60) (considering whether to set new standards for CO and sulfur dioxide emissions for certain steam generating units).

In other words, EPA has clear and well established legal authority to add standards for greenhouse gas pollutants as part of each category's eight-year review and revision. The only missing element is a cause-or-contribute finding. EPA also has an obligation to list new categories of stationary sources where the evidence demonstrates that such categories cause or contribute significantly to the endangerment posed by greenhouse gas pollution.[158]

The performance standard at the heart of the NSPS program is known as the best demonstrated technology (BDT) standard.[159] While EPA is expected to look at what level of emissions these "demonstrated" technologies can achieve, the final standard is framed as an emission limitation and does not actually require the use of any particular technology.[160] This is an important feature because it gives facilities the flexibility to adapt to changing circumstances and look for cost-effective alternatives. EPA also has the discretion to craft a "design, equipment, work practice, or operational standard, or combination thereof" where it is "not feasible" to apply a simple emission limitation.[161] Another key feature is that the statute requires EPA to take into account multiple factors beyond just the level of emission reductions that are technologically achievable, including cost-effectiveness, non-air quality health and environmental impacts, and energy requirements.[162] These statutory guidelines enhance the likelihood that EPA's NSPS rules will be achievable by industry at a reasonable cost and without unintended or otherwise adverse consequences. At the same time, however, the BDT standard is meant to drive technology forward. Courts have "recognized that section 111 'looks toward what may

158 *See* Petition to List Concentrated Animal Feeding Operations Under Clean Air Act Section 111(B)(1)(A) of the Clean Air Act, and to Promulgate Standards of Performance Under Clean Air Act Sections 111(B)(1)(B) and 111(D), from Humane Society of the United States et al., to U.S. Envtl. Prot. Agency 1 (Sept. 21, 2009), *available at* http://www.foe.org/sites/default/files/HSUS_et_al_v_EPA_CAFO_CAA_Petition.pdf [hereinafter CAFO Petition]; Petition for Rulemaking Under the Clean Air Act to List Coal Mines as a Source Category and to Regulate Methane and Other Harmful Air Emissions from Coal Mining Facilities Under Section 111, from Earthjustice et al., to U.S. Envtl. Prot. Agency 1 (June 16, 2010), *available at* http://www.biologicaldiversity.org/programs/climate_law_institute/global_warming_litigation/clean_air_act/pdfs/Coal_Mine_Petition-06-15-2010.pdf [hereinafter Coal Mine Petition].

159 The term "standard of performance" is defined as

> a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through 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 [of EPA] determines has been adequately demonstrated.

42 U.S.C. § 7411(a)(1) (2006).

160 *See id.* § 7411(a)(1), (b)(5) (providing that, in general, "nothing in this section shall be construed to require, or to authorize the Administrator to require, any new or modified source to install and operate any particular technological system of continuous emission reduction to comply with any new source standard of performance").

161 *Id.* § 7411(h)(1).

162 *See id.* § 7411(a)(1), (h)(1).

fairly be projected for the regulated future, rather than the state of the art at present.'"[163]

Finally, despite the program's emphasis on new and modified sources, the statute also requires EPA to help develop standards for existing sources through coordination with states.[164] Using EPA guidance, states must adopt and implement performance standards for existing sources that would otherwise be regulated by EPA if they were a new or modified source.[165] An important caveat, however, is that these controls on existing sources are only required for non-criteria air pollutants.[166] This means greenhouse gas emissions from the fleet of existing sources within the various NSPS categories can only be regulated under the NSPS program so long as they are not designated as criteria air pollutants. If greenhouse gases were to be listed as criteria air pollutants, this valuable regulatory tool would no longer be available.[167]

We will now turn to what the NSPS program could actually achieve in practice, particularly in the near term. The following discussion describes several of the industrial categories that are responsible for the greatest share of greenhouse gas emissions (i.e., power plants, petroleum refineries, and concentrated animal feeding operations (CAFOs)) and hence are important to address in at least a preliminary fashion immediately. In addition, a few examples with smaller shares are included here (i.e., landfills, coal mines, cement plants, and nitric acid plants) because the technological solutions are so straightforward and cost-effective that these should likewise be addressed right away. Early reductions achieved by controlling these low-hanging fruit emissions will help buy us the time we need to make the transition to alternative energy sources and adjust our energy consumption patterns.

1. Electricity Generation

Electricity generation is the proverbial elephant in the room. In 2008, for example, the power sector was responsible for 2404 teragrams of greenhouse gas emissions, which accounted for 64% of all industrial emissions and 34% of overall United States emissions.[168] The NSPS standard

163 Lignite Energy Council v. U.S. Envtl. Prot. Agency, 198 F.3d 930, 934 (D.C. Cir. 1999) (quoting Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 391 (D.C. Cir. 1973)).

164 *See* 42 U.S.C. § 7411(d) (2006).

165 *See id.* § 7411(d)(1)(A)(ii).

166 *See id.* § 7411(d)(1)(A)(i) (excluding hazardous air pollutants from control under the NSPS program).

167 Some have argued that EPA may have an obligation to list greenhouse gases as criteria pollutants now that it has made an endangerment finding for them. *See* INIMAI M. CHETTIAR & JASON A. SCHWARTZ, INST. FOR POLICY INTEGRITY, N.Y. UNIV. SCHOOL OF LAW, THE ROAD AHEAD: EPA'S OPTIONS AND OBLIGATIONS FOR REGULATING GREENHOUSE GASES 34–39 (2009), *available at* http://policyintegrity.org/files/publications/TheRoadAhead.pdf. However, this argument is based on older case law that pre-dates relevant statutory amendments and other legal developments. *See id.* at 36. As a result, the better argument appears to be that EPA retains discretion to proceed with regulating greenhouse gases under the Clean Air Act without necessarily making a criteria pollutant designation. *See id.* at 36–39.

168 *See* U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-14 tbl.ES-7.

for this category thus has the potential to control emissions from the sector that bears the lion's share of responsibility for climate change.[169] In 2008, electricity generation alone produced more greenhouse gas emissions than the entire transportation and agriculture sectors combined.[170]

As noted above, under the flexible BDT standard, EPA has the authority to adopt "design, equipment, work practice, or operational standard" rather than a specific emission limit.[171] This approach could work well for existing power plants. These emissions could be addressed through an NSPS 111(d) guidance document directing states to incorporate energy efficiency measures and a variety of other operational and technological improvements into their implementation plans. In a recent report prepared for EPA, an expert consulting firm has identified specific plant systems and equipment where cost-effective efficiency improvements can be realized for existing coal-fired power plants, including 1) boiler modifications, 2) optimization of plant controls using more accurate neural network technology, 3) use of intelligent sootblowers, 4) improved air heater and duct leakage control, 5) lowering air heater outlet temperature by controlling acid dew point, 6) turbine upgrades, 7) effective operation of the steam surface condenser, 8) upgrading or rebuilding of boiler feed pumps, 9) upgrading or replacing the induced-draft fan, or adding a booster fan, in the flue gas system, 10) installing a variable-frequency drive for use with induced-draft fans in the flue gas system, and 11) modifications to air pollution control and water treatment systems.[172] Measures like these can be implemented in the near future at existing power plants, and experts have concluded that, by doing so, it would be possible to reduce greenhouse gas emissions by approximately 120 teragrams, or 5%, annually.[173]

Although EPA has the authority to issue NSPS regulations governing new and modified coal- and fossil-fuel fired power plants, this article will not address these options. If the United States is serious about meeting the

169 The current NSPS standards for electric utility steam generating units are set forth at 40 C.F.R. Part 60, subsections D, Da, and HHHH, and these regulations do not cover greenhouse gas emissions. *See* 40 C.F.R. §§ 60.40–60.40Da, 60.4101 (2009). In 2006, EPA revised the NSPS for electric generating facilities without including any limitation on greenhouse gas emissions. *See* Standards of Performance for Electric Utility Steam Generating Units for Which Construction Is Commenced After September 18, 1978, 71 Fed. Reg. 9866, 9869 (Feb. 27, 2006) (codified at 40 C.F.R. pt. 60). Several states sued EPA based on its failure to include such limitations. *See* Plaintiff's Motion to Govern Further Proceedings at 3, New York v. U.S. Envtl. Prot. Agency, No. 06-1322 (D.C. Cir. May 2, 2007). In September 2007, the D.C. Circuit remanded the case back to EPA for further proceedings "in light of Massachusetts v. EPA." New York v. U.S. Envtl. Prot. Agency, No. 06-1322 (D.C. Cir., Sept. 24, 2007) (ordering remand for further proceedings). EPA has not yet taken any further action.

170 *See* U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-14 tbl.ES-7.

171 42 U.S.C. § 7411(h)(1) (2006).

172 SARGENT & LUNDY LLC, COAL-FIRED POWER PLANT HEAT RATE REDUCTIONS: FINAL REPORT at 2-1 to 6-4 (2009), *available at* http://www.epa.gov/airmarkt/resource/docs/coalfired.pdf.

173 MASS. INST. OF TECH. ENERGY INITIATIVE, RETROFITTING OF COAL-FIRED POWER PLANTS FOR CO2 EMISSIONS REDUCTIONS 24 (2009), *available at* http://web.mit.edu/mitei/docs/reports/meeting-report.pdf (citing EDWARD LEVY, CARBON CAPTURE AND SEQUESTRATION: A TECHNOLOGICAL SOLUTION FOR CONTINUED COAL USE IN A CARBON CONSTRAINED WORLD (2008)).

challenge of climate change—and responding to other pressing health, environmental, and justice challenges—these types of facilities simply must be phased out as expeditiously as possible. We should not be devoting any further private or public resources to the construction of new plants or the expansion of existing ones. Similarly, although scientists and engineers are researching the possibility of more aggressive rebuilds or retrofits of existing power plants to allow for fuel-switching, carbon sequestration, and the like,[174] this Article will not analyze these options because the billions of dollars that would be spent on these investments would be far better spent bringing alternative energy sources online at the scale necessary to meet baseload energy requirements and in the timeframe necessary to meet climate mitigation goals, both of which are feasible if adequate resources are devoted to the endeavor.[175]

2. Petroleum Refineries

Petroleum refineries are another key category as they are responsible for 514 teragrams of greenhouse gas emissions annually, or 7.3% of overall United States emissions.[176] Petroleum refineries are already regulated as an NSPS stationary source category.[177]

Work practice or operational standards would likely be appropriate for existing facilities in this context as well. The United States Department of Energy has found that efficiency and other operational measures at petroleum refineries using readily available technologies and processes could result in energy savings totaling 12% of each plant's total energy consumption, i.e., a reduction of roughly sixty teragrams of greenhouse gas emissions.[178] Some examples of efficiency-enhancing measures appropriate for refineries include 1) improving the heat integration between atmospheric and vacuum towers, 2) fouling mitigation, 3) ultra-low emission process heaters with advanced fire heater design, 4) aggressive combustion/burner tuning and process optimization programs for existing process heaters, 5) reduced reliance on flaring, 6) electricity cogeneration using excess fuel gas, and 7) carbon capture and sequestration in conjunction with steam methane

174 *See generally id.* at 2, 5–6 (describing research and policy issues associated with retrofitting coal plants with carbon capture and sequestration equipment, efficiency improvements, and biomass co-firing equipment, as well as rebuilding coal plants and repowering at coal plant sites).

175 *See* Interview with Daniel Kammen, *supra* note 41.

176 *See* Envtl. Roadmapping Initiative, Petroleum Refining: Impacts, Risks and Regulations, http://ecm.ncms.org/ERI/new/IRRpetref.htm (last visited Nov. 21, 2010).

177 See 40 C.F.R. §§ 60.100–60.109, 60.100a–60.109a, 60.590–60.593, 60.590a–60.593a (2009) for the current NSPS standards for petroleum refineries.

178 *See* Comments on Proposed Amendments to the Current Standards of Performance for Petroleum Refineries, from Envtl. Integrity Project & Sierra Club, to U.S. Envtl. Prot. Agency 13 (Aug. 27, 2005), *available at* http://www.environmentalintegrity.org/pdf/publications/Refinery_GHG_Comments.pdf (citing OFFICE OF INDUS. TECHNOLOGIES ENERGY EFFICIENCY & RENEWABLE ENERGY, U.S. DEP'T OF ENERGY, MARTINEZ REFINERY COMPLETES PLANT-WIDE ENERGY ASSESSMENT 1 (2002), *available at* http://www1.eere.energy.gov/industry/bestpractices/pdfs/bp_cs_martinez.pdf).

reforming or gasification.[179] Since energy efficiency measures by definition reduce the need for energy, the cost of these measures will be offset to a large extent by fuel savings, as we have seen with the rule for light-duty vehicles.

3. Concentrated Animal Feeding Operations

Concentrated animal feeding operations (CAFOs)[180] emit high quantities of methane and nitrous oxide through the enteric fermentation of ruminant farm animals, as well as related manure treatment, storage, and disposal practices.[181] Both methane and nitrous oxide are potent greenhouse gases, with global warming potentials 21 and 310 times that of carbon dioxide, respectively.[182] The agricultural sector as a whole is responsible for approximately 428 teragrams of greenhouse gas emissions, or 6% of overall United States emissions, each year.[183] Enteric fermentation and manure management are responsible for nearly half of these emissions, 203 teragrams annually,[184] and the vast majority of these are generated through the operation of CAFOs.[185] Although these facilities are not currently listed as an NSPS stationary source category, their high emissions and increasingly mechanized and confined operations may lead them to be designated as such in the future, as urged by numerous citizen groups in a recent petition to EPA.[186]

As discussed above, NSPS standards can be based on "design, equipment, work practice or operational" measures, rather than traditional "end-of-pipe" controls.[187] Many aspects of CAFO operations can be adjusted to minimize greenhouse gas emissions, including the anaerobic nature of manure storage conditions, the animals' diet, the acidity and temperature of the manure during storage, and the length of time the manure is kept in storage.[188] One study conducted by the United States Department of Agriculture in 2006 at major pig confinement facilities, for example, showed that switching from a traditional anaerobic lagoon/spray irrigation technique to a dual wastewater treatment and manure composting approach resulted

179 *See* Comments on Proposed Amendments to the Current Standards of Performance for Petroleum Refineries, *supra* note 178, at 13–14.

180 CAFOs are defined for regulatory purposes as an animal feeding operation that exceeds certain numbers of animals raised in a confined area. *See* 40 C.F.R. § 122.23(b)(2), (4), (6) (2009).

181 *See* CAFO Petition, *supra* note 158, at 14–15, 17–19; U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-5 tbl.ES-2.

182 U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-3 tbl.ES-1.

183 *Id.* at 6-1.

184 *See id.* at ES-5 tbl.ES-2. The sum of 140.8 teragrams CO2 Eq. due to methane emissions from enteric fermentation, 45 teragrams CO2 Eq. due to methane emissions from manure management, and 17.1 teragrams CO2 Eq. due to NO2 emissions from manure management is equal to 202.9 teragrams CO2 Eq.

185 *See* CAFO Petition, *supra* note 158, at 26–27.

186 CAFO Petition, *supra* note 158, at 23.

187 *Id.* at 63.

188 *See id.* (citing U.S. ENVTL. PROT. AGENCY, EMISSIONS FROM ANIMAL FEEDING OPERATIONS: DRAFT 2–14 (2001), *available at* www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf).

in a 97% reduction in greenhouse gas emissions.[189] If this rate of reduction could be achieved at all CAFOs, it would mean a reduction of approximately 197 teragrams of greenhouse gas emissions annually.

4. Landfills

Landfills offer a golden opportunity for greenhouse gas reductions under the NSPS program because the technological solutions are not just cost-effective, they also generate power and serve as a source of income for facility owners. Landfills are responsible for over 126 teragrams of greenhouse gas emissions annually, primarily in the form of methane.[190] Landfills are already a listed source category under the NSPS program.[191]

Several members of the waste sector have already implemented landfill gas-to-energy projects, and these have been demonstrated to be feasible for both small and large landfills.[192] For instance, at one small landfill next to a school in Illinois, a microturbine cogeneration system sells excess energy to the local utility and produces enough heat to heat the school, saving the school $100,000 in energy costs annually.[193] Another small project in North Carolina is expected to save $7.1 million over fifteen years due to electricity savings.[194] A large-scale facility in Los Angeles is home to two landfill gas-to-energy projects producing a total of 7.1 megawatts of electricity, enough to power 4500 homes.[195] In Oregon, a slightly smaller landfill produces enough methane to generate 5.66 megawatts of energy and power 4000 homes.[196] In such projects, there is a strong economic incentive to recover as much energy as possible. This suggests that an NSPS based on gas-to-energy projects could reduce the vast majority of methane emissions from landfills. Assuming roughly a 90% reduction, or 113 teragrams annually, this would make another significant dent in overall United States industrial emissions.

189 *See id.* at 65 (citing M.B. Vanotti et al., *Greenhouse Gas Emission Reduction and Environmental Quality Improvement from Implementation of Aerobic Waste Treatment Systems in Swine Farms*, 28 WASTE MGMT. 759, 759–66 (2008)).

190 *See* U.S. ENVTL. PROT. AGENCY, *supra* note 38, ES-5 tbl.ES-2.

191 *See* 40 C.F.R. §§ 60.30c–.36c (2009).

192 *See* Notice of Intent to File Suit for: (1) EPA's Failure to Conduct the Mandatory 8-year Review and Revision of the New Source Performance Standards for Municipal Solid Waste Landfills Pursuant to Section 111(b)(1)(B) of the Clean Air Act and (2) Unreasonable Delay in Revising Emission Guidelines for Municipal Solid Waste Landfills Pursuant to Section 111(d) of the Clean Air Act, from Envtl. Def. Fund, to U.S. Envtl. Prot. Agency 5 (Oct. 23, 2008), *available at* http://edf.org/documents/8713_NOILandfillNSPSOct2008.pdf (citing U.S. Envtl. Prot. Agency, Landfill Methane Outreach Program, http://www.epa.gov/lmop/index.html (last visited Nov. 21, 2010)).

193 *See id.* at 4–5.

194 *See id.* at 5.

195 *See id.*

196 *See id.*

5. Coal Mines

Coal mines, including both active and abandoned mines, generate approximately sixty-eight teragrams of greenhouse gas emissions each year, primarily as methane.[197] Coal mines are not currently included among the listed NSPS categories. In June 2010, however, a coalition of environmental groups petitioned EPA to list them as a source category and begin regulating their methane emissions, along with other harmful air pollutants.[198]

According to the petition and the EPA reports cited therein, it is technologically feasible to capture or flare methane from coal mines, rather than allowing it to be released into the atmosphere.[199] Because methane is a valuable fuel (natural gas), mining companies already have an economic incentive to recover methane, and many of them are already doing so.[200] Twenty-three mines are now operating methane drainage and recovery systems in Alabama, Colorado, Pennsylvania, Virginia, and West Virginia.[201] EPA has estimated that, even if only the largest "gassy" underground mines captured all of their methane, the United States could keep 3.6 to 11.3 million teragrams of greenhouse gases out of the atmosphere each year.[202]

Another option, for mines where capture is not viable, is flaring. At a conference sponsored by EPA in September 2007, one of the presenters demonstrated that methane flaring at mine sites was "[s]imple, low cost and reliable to operate" with "[l]ow maintenance requirements."[203] Methane from coal mines can also be used to generate electricity on-site to facilitate mining operations, and it can be compressed into liquefied natural gas and transported by truck for use as fuel in other locations.[204]

These methods for controlling methane emissions are highly cost-effective. EPA has estimated that almost half of all United States coal mine emissions can be eliminated at zero net cost, and almost 90% can be reduced at a cost of less than $15 per ton.[205] These efforts would reduce overall

197 *See* U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-5 tbl.ES-2.

198 *See* Coal Mine Petition, *supra* note 158, at 1.

199 *Id.* at 22 (citing U.S. ENVTL. PROT. AGENCY, U.S. METHANE EMISSIONS 1990–2020: INVENTORIES, PROJECTIONS, AND OPPORTUNITIES FOR REDUCTIONS, at 4-2 (1999), *available at* http://www.epa.gov/methane/reports/04-coal.pdf; U.S. ENVTL. PROT. AGENCY, IDENTIFYING OPPORTUNITIES FOR METHANE RECOVERY AT UNITED STATES COAL MINES: PROFILES OF SELECTED GASSY UNDERGROUND COAL MINES 2002–2006, at 5–11 (2008), *available at* http://www.epa.gov/cmop/docs/profiles_2003_final.pdf).

200 *Id.* at 9, 22.

201 *Id.* at 22.

202 *See id.* (note conversion from million metric tons to teragrams) (citing U.S. ENVTL. PROT. AGENCY, IDENTIFYING OPPORTUNITIES FOR METHANE RECOVERY AT UNITED STATES COAL MINES: PROFILES OF SELECTED GASSY UNDERGROUND COAL MINES 2002–2006, *supra* note 201, at 1-4 to 1-5).

203 *Id.* (quoting Neil Butler, Project Manager, Harworth Power Ltd., Remarks at the 2007 U.S. Coal Mine Methane Conference (Sept. 26, 2007) (Powerpoint slides may be downloaded at http://epa.gov/cmop/conf/cmm_conference_sept07.html)).

204 *Id.*

205 *See id.* (noting that, if you factor in the health benefits of eliminating methane as an ozone precursor, the net benefits of such a rule could be as much as $240 per ton of methane reduced).

United States greenhouse gas emissions by another sixty-seven teragrams per year.

6. Cement Plants

Cement plants are another good candidate for NSPS controls. They emit approximately forty-one teragrams of greenhouse gases each year.[206] Cement plants are currently designated as a stationary source category under the NSPS program.[207]

According to a 2008 report prepared for EPA, some of the measures available or under development to curb their emissions include 1) energy efficiency (precalciner kiln, roller mill, fluidized bed kiln), 2) fuel switching (waste fuels, biogas, biomass), 3) power recovery (drying with gas turbine, power recovery), 4) feedstock change (slags, pozzolanes), 5) product change (blended cement, geopolymers), and 6) carbon capture and sequestration (oxyfuel combustion in kiln).[208] Experts have concluded that "[s]ubstantial potential for energy efficiency improvement exists in the cement industry, and in individual plants."[209]

In response to a Sierra Club lawsuit,[210] EPA has recently revised the NSPS for Portland cement plants with respect to conventional pollutants, but postponed consideration of greenhouse gas controls.[211] In doing so, however, EPA has noted that, "based on our initial evaluation it appears that there are cost-effective control strategies for this source category that would provide an appropriate basis for establishing a standard of performance for [greenhouse gas] emissions," and that "the Agency is working towards a proposal for [greenhouse gas] standards from Portland cement facilities."[212]

In setting an NSPS standard for cement plants, EPA will analyze these and other technologies and set a performance standard based on what is reasonable, achievable, and cost-effective, as it has been doing for conventional pollutant emissions from industrial categories for many decades, and as it has recently done for mobile sources. Based on a rough assumption that implementation of some combination of the more than forty measures discussed in the 2008 report would be capable of achieving greenhouse gas reductions on the order of 50%, this would result in the elimination of about twenty teragrams of greenhouse gas emissions each year.

206 U.S. ENVTL. PROT. AGENCY, *supra* note 38, at ES-4 tbl.ES-2.

207 *See* 40 C.F.R. §§ 60.60–.66 (2009).

208 ERNST WORRELL & CHRISTINA GALITSKY, ENERGY EFFICIENCY IMPROVEMENTS AND COST SAVINGS OPPORTUNITIES FOR CEMENT MAKING 16–48 (Mar 2008) *available at* http://www.energystar.gov/ia/business/industry/LBNL-54036.pdf.

209 *Id.* at iii.

210 *See* Complaint at 2, 5–6, Sierra Club v. U.S. Envtl. Prot. Agency, No. C06-5288 (N.D. Cal. Aug. 29, 2006).

211 *See* National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants, 75 Fed. Reg. 54,970, 54,996 (Sept. 9, 2010) (to be codified at 40 C.F.R. pts. 60, 63).

212 *Id.* at 54,997.

7. Nitric Acid Plants

Nitric acid plants further illustrate the potential for NSPS regulations to achieve quick reductions from inexpensive and readily available technologies. The nitric acid industry is the largest industrial source of nitrous oxide, a powerful greenhouse gas with a global warming potential 310 times that of carbon dioxide.[213] This industry is responsible for nineteen teragrams of greenhouse gas emissions annually,[214] and it is already regulated under the NSPS program.[215]

EPA has identified at least seven off-the-shelf technologies capable of reducing nitrous oxide emissions by an average of 90%, including non-selective catalytic reduction (NSCR); Grand Paroisse, BASF, and HITK high temperature catalytic reduction methods; and Krupp Uhde and ECN low temperature catalytic reduction methods.[216] NSCR, for example, has been in use since the 1970s in about 20% of United States nitric acid plants as a means to control conventional nitrogen dioxide emissions.[217] Until recently, its side effect of controlling nitrous oxide has been seen as incidental.[218] A variety of control technologies such as these have also been successfully implemented outside the United States as a means to comply with climate-related obligations under the Kyoto Protocol. The best news about nitrous oxide control technologies is that they are extremely cost-effective, ranging from $2 to $6 per ton of carbon dioxide equivalent eliminated.[219]

Taken together, the greenhouse gas reductions that could be achieved from just the seven stationary source categories discussed above are impressive. By promulgating NSPS regulations based on the reasonably available and cost-effective (or even cost saving) technologies, work practices, and other measures discussed above, EPA could eliminate 594 teragrams per year from the total of 3747 for all stationary sources. The remaining sixty-plus stationary source categories regulated under the NSPS

213 *See* U.S. ENVTL. PROT. AGENCY, *supra* at note 38, at ES-5 tbl.ES-2, ES-3 tbl.ES-1.

214 *See id.* at ES-5 tbl.ES-2.

215 40 C.F.R. §§ 60.70–.74 (2009). In response to a deadline suit brought by Environmental Integrity Project and Sierra Club, EPA has committed to reviewing the out of date NSPS standard for nitric acid plants by November 2010. U.S. Envtl. Prot. Agency, Review of New Source Performance Standards for Nitric Acid Plants – Subpart G, http://yosemite.epa.gov/opei/rulegate.nsf/byRIN/2060-AQ10 (last visited Nov. 21, 2010). It remains to be seen, however, whether EPA will incorporate any limitation on nitrous oxide emissions.

216 *See* Notice of Intent to Sue for Violation of Nondiscretionary Duty to Review New Source Performance Standards for Nitric Acid Plants Every Eight Years Under Section 111 of Clean Air Act, from Sierra Club & Envtl. Integrity Project, to U.S. Envtl. Prot. Agency 11 (Oct. 7, 2008), *available at* http://www.environmentalintegrity.org/pdf/newsreports/NoticeofIntent.pdf (citing U.S. ENVTL. PROT. AGENCY, INTERNATIONAL ANALYSIS OF METHANE AND NITROUS OXIDE ABATEMENT OPPORTUNITIES, app.C (2003); U.S. ENVTL. PROT. AGENCY, INVENTORY OF UNITED STATES GREENHOUSE GAS EMISSIONS AND SINKS: 1990 – 2006, at 4-19 to 4-20 (2008)).

217 *Id.* at 11 (citation omitted).

218 *Id.*

219 *See id.* at 12 (citing U.S. ENVTL. PROT. AGENCY, GLOBAL MITIGATION OF NON-CO2 GREENHOUSE GASES at IV-7 to IV-8 (2006); EUROPEAN COMM'N, REFERENCE DOCUMENT ON BEST AVAILABLE TECHNIQUES FOR THE MANUFACTURE OF LARGE VOLUME INORGANIC CHEMICALS–AMMONIA, ACIDS AND FERTILIZERS 124–25 (2006)).

program are responsible for about 3153 teragrams of greenhouse gas emissions. If similar measures could reduce emissions from these categories by an average of just 15%, this would eliminate another 473 teragrams of greenhouse gas emissions. Overall, this would add up to a reduction of roughly 1067 teragrams, or over 28% of all greenhouse gas emissions from stationary sources, as shown in the table below:

Table 2. Potential for Early Reduction of Greenhouse Gas Emissions from Stationary Sources Through the Use of the Clean Air Act

Stationary Source Category	Primary GHG Pollutant	Reduction of Stationary Source Emissions	Actual GHG Reductions (Teragrams CO2 Eq.)
Electricity Generation	Carbon dioxide	3.2%	120
Petroleum Refineries	Carbon dioxide	1.6%	60
CAFOs	Methane and Nitrous oxide	5.3%	197
Landfills	Methane	3.0%	113
Coal Mines	Methane	1.8%	67
Cement Plants	Carbon dioxide	0.5%	20
Nitric Acid Plants	Nitrous oxide	0.5%	17
All Other NSPS Categories	Multiple	12.6%	473
Total		28.5%	1067

C. The Potential of the Sectoral Approach

When added together, the reductions readily achievable through EPA regulations under the mobile source program (approximately 591 teragrams) and under the NSPS program (approximately 1067 teragrams) amount to about 1658 teragrams. This represents a 24% reduction from the 7000 teragrams of overall United States emissions, leaving us with an annual emission rate of 5342 teragrams. To put this in perspective, the 1990 baseline is 6127 teragrams, and the new annual emission rate achievable right away under the Clean Air Act's sectoral programs would put us at 12.8% below this baseline. If EPA continues to promulgate regulations at a fairly rapid clip, as

it has been doing for the past two years, it seems reasonable to anticipate that United States greenhouse gas emissions would, at a minimum, peak by 2015 as urged by the IPCC, and could even be moving steadily downward by then. By 2020, we would be well on our way to achieving the 50% to 85% reductions necessary to stave off catastrophic climate impacts.

Under the sectoral approach, EPA will essentially be asking each industry to do its fair share to respond to the climate crisis. While facilities will be asked to invest capital in making efficiency upgrades, implementing work practice changes, and undertaking other measures, these costs will be offset to a large degree by fuel savings. A key advantage of this broad, national, industry-by-industry approach is that it is not likely to give certain facilities a competitive advantage over others within the same industry, as is often the case with the state-by-state and facility-by-facility approaches taken under the Clean Air Act.[220] The benefits to society and the natural environment are even more apparent. Time is of the essence in responding to climate change, and the sectoral programs of the Clean Air Act will allow EPA to rise to the occasion.

V. CONCLUSION

For all the reasons discussed above, it would be disastrous if we allow our legislators to eliminate or preempt EPA's authority under the Clean Air Act to address the problem of climate change. Any program adopted by Congress is likely to include extensive concessions to industry and to rely on trading programs, carbon taxation, or other measures whose efficacy is not yet proven. By contrast, EPA has demonstrated that it is capable of adopting reasonable and cost-effective rules, and there are many sectors where the technological solutions are readily available and only need regulatory prompting to encourage their widespread use. We do not have time to waste, and we do not have the luxury of tossing aside powerful tools that can be brought to bear on the climate crisis. EPA's actions would be fully compatible with carefully crafted legislation designed to bring about a deeper transformation of the United States energy system. Indeed, the enormous challenge ahead of us simply cannot be met if we do not immediately reduce emissions wherever possible in the short-term and simultaneously start building a new economy and way of life that will be sustainable over the long-term.

220 *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, 1729–30 (2007) (explaining that grandfathering associated with the Clean Air Act's construction permitting system gives existing facilities a competitive advantage over new facilities and, hence, an exaggerated incentive to engage in rent-seeking behavior to avoid regulatory controls).