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HEAT EXPANDS ALL THINGS:  
THE PROLIFERATION OF GREENHOUSE GAS REGULATION  
UNDER THE OBAMA ADMINISTRATION

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Case Research Paper Series in Legal Studies  
Working Paper 2011-4  
March, 2011

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*Forthcoming in* HARVARD JOURNAL OF LAW & PUBLIC POLICY

Abstract

The Obama Administration has been moving aggressively to control greenhouse gas emissions under the Clean Air Act and other pre-existing statutory authority. Much of this new regulation was facilitated—if not mandated—by the Supreme Court’s decision in *Massachusetts v. EPA*. These regulatory initiatives mark a dramatic expansion of federal environmental controls on private economic activity. These efforts are unwise. Regulating greenhouse gases under the Clean Air Act, in particular, will impose substantial regulatory costs for minimal environmental gain. Extensive GHG regulation will not produce much actual climate change mitigation. Mitigating the threat of anthropogenic climate change requires an alternative approach—one that is not authorized under existing law and that does not require dramatic expansions of the federal regulatory state. This article, prepared for a symposium issue of the *Harvard Journal of Law & Public Policy*, surveys and analyses the Obama Administrations greenhouse gas regulatory initiatives, and suggests an alternative approach to climate change policy.

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*Jonathan H. Adler\**

During his campaign for the White House, Barack Obama called for decisive action to address the threat of global climate change. Specifically, then-Senator Obama called for reducing, by 2050, greenhouse gas (GHG) emissions in the United States by 80 percent through the imposition of a “cap-and-trade” regime.<sup>1</sup> He pledged that, as President, legislation to achieve this goal would be among his top priorities.<sup>2</sup>

Congressional leaders also endorsed decisive action on climate change. In 2009, the House of Representatives enacted a far-reaching climate bill that included a cap-and-trade system and endorsed the 80 percent reduction goal.<sup>3</sup> The Senate refused to follow suit, however, and it appears quite unlikely that a cap-and-trade bill or other meaningful climate legislation will pass Congress in the next two years.<sup>4</sup> But the death of cap-and-trade does not mean the death of greenhouse gas regulation.

Although Congress has not put climate change legislation on President Obama’s desk, the Obama Administration has been moving ahead with various regulatory measures to control GHG

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<sup>1</sup> See *The Obama-Biden Plan*, [http://change.gov/agenda/energy\\_and\\_environment\\_agenda/](http://change.gov/agenda/energy_and_environment_agenda/) (last visited Feb. 21, 2011); see also Barack Obama, United States Senator, “Real Leadership for a Clean Energy Future,” Portsmouth, N.H. (Oct. 8, 2007), available at [http://www.barackobama.com/2007/10/08/remarks\\_of\\_senator\\_barack\\_obam\\_28.php](http://www.barackobama.com/2007/10/08/remarks_of_senator_barack_obam_28.php).

<sup>2</sup> See John M. Broder, *Obama Affirms Climate Change Goals*, N.Y. TIMES, Nov. 19, 2008, <http://www.nytimes.com/2008/11/19/us/politics/19climate.html>.

<sup>3</sup> The American Clean Energy and Security Act sought to reduce GHG emissions by three percent below 2005 levels by 2012, 17 percent below 2005 levels by 2020, and 83 percent below 2005 levels by 2050. It is unlikely this level of reductions would have been achieved.

<sup>4</sup> See Darrell Samuel Sohn, *Democrats Pull the Plug on Climate Bill*, POLITICO, July 22, 2010, <http://www.politico.com/news/stories/0710/40109.html>.

emissions anyway.<sup>5</sup> Using authority under the Clean Air Act and other existing environmental statutes, the Environmental Protection Agency and other agencies have been expanding existing regulatory programs to cover GHG emissions and address climate change concerns. Several measures are already in place and others are in the regulatory pipeline, while citizen suit litigation could produce still more.

These initiatives will produce a dramatic expansion of federal environmental controls on private economic activity. Taken together, these controls could represent the largest expansion of federal environmental regulation in decades, and yet they have never been explicitly endorsed, let alone authorized, by Congress. Worse still is that there is little reason to believe that these measures will do much of anything to reduce the threats posed by global climate change. Extensive GHG regulation will not produce much actual climate change mitigation.

Federal regulation of GHGs is not entirely the Obama Administration's doing. Federal regulatory authority over GHGs was facilitated—if not mandated—by the Supreme Court's decision in *Massachusetts v. EPA*.<sup>6</sup> Yet the Obama Administration has not resisted this newfound authority. To the contrary, the EPA and other agencies have embraced their opportunity to extend regulatory authority into new fields and rejected legislative proposals to cabin their newfound power.

The extension of federal regulatory authority to control GHG emissions under existing statutory frameworks is a mistake. Such regulation will impose substantial regulatory costs for minimal environmental gain. Centralized regulatory authority offers little hope of controlling the planetary thermostat. Mitigating the threat of anthropogenic climate change requires an

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<sup>5</sup> See U.S. DEPARTMENT OF STATE, U.S. CLIMATE ACTION REPORT 2010 39 (2010) (“Since assuming office, President Obama has moved quickly to establish new federal policies and measures designed to reassert American leadership in solving the global climate challenge.”), available at <http://www.state.gov/g/oes/rls/rpts/car5/index.htm>.

<sup>6</sup> 549 U.S. 497 (2007).

alternative approach—one that is not authorized under existing law and that does not require dramatic expansions of the federal regulatory state.

Part I of this Article explains how the push for GHG regulation is not new—an environmentalist petition filed in 1999 eventually led to the Supreme Court decision authorizing federal regulation of GHGs under the Clean Air Act. Part II outlines how the Obama Administration has been using this authority. The Clean Air Act is not the only source of federal regulatory authority over GHGs, however. Part III provides a brief overview of some of the other regulatory initiatives undertaken by the Obama Administration to limit GHG emissions or otherwise address the threat of global climate change.

The expansion of federal regulation does not guarantee an increase in environmental protection. In the case of GHGs, expansive regulatory action is unlikely to reduce the threat of climate change. Rather, as Part IV explains, such efforts are likely to be futile in the near to medium term. If policymakers wish to reduce the threat of climate change, they need to chart an alternative course. Part V explains why the best approach to climate change mitigation should focus on technological innovation and diffusion so as to make significant GHG emission reductions possible and affordable.

#### I. MASSACHUSETTS V. EPA AND THE ROAD TO EPA REGULATION

Extensive scientific research suggests human activity is having a demonstrable effect on the global climate system.<sup>7</sup> Anthropogenic emissions have increased the concentration of carbon

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<sup>7</sup> See William Collins, et al., *The Physical Science behind Climate Change*, SCI. AM., Aug. 2007, at 68 (noting that the 2007 IPCC report concluded it was “very likely” that human activity was responsible for most of late 20th Century warming, whereas the 2001 IPCC report concluded that human responsibility was only “likely”); see also INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007—THE PHYSICAL SCIENCE BASIS: CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL

dioxide and other GHGs in the atmosphere, which has contributed to a gradual warming of the atmosphere.<sup>8</sup> The precise nature and degree of the human contribution is unknown, and may even be unknowable given the complexity of the global climate system.<sup>9</sup> Nonetheless, even so-called “skeptics” accept that anthropogenic emissions contribute to global warming, even as they dispute the magnitude of the threat.<sup>10</sup>

The road to federal regulation of GHGs under the Clean Air Act began in 1999 when a handful of environmentalist organizations petitioned the EPA to control GHG emissions from new motor vehicles under Section 202 of the Act.<sup>11</sup> EPA General Counsel Jonathan Cannon had recently told a congressional committee that he believed the agency had the authority to regulate GHG emissions but had no intent to do so at that time.<sup>12</sup> The petition aimed to force the EPA’s hand. According to the environmentalist groups, global warming threatened human health and welfare, obligating the agency to act.

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ON CLIMATE CHANGE 665 (2007) (“Greenhouse gas forcing has *very likely* caused most of the observed global warming over the last 50 years.”); NATIONAL RESEARCH COUNCIL, ADVANCING THE SCIENCE OF CLIMATE CHANGE (2010) (“[C]limate change is occurring, is caused largely by human activities, and poses significant risks for—and in many cases is already affecting—a broad range of human and natural systems.”).

<sup>8</sup> See Collins et al., *supra* note 7, at 65 (“Over the past 20 years, evidence that humans are affecting the climate has accumulated inexorably, and with it has come ever greater certainty across the scientific community in the reality of recent climate change and the potential for much greater change in the future.”).

<sup>9</sup> This uncertainty need not preclude action to mitigate the threat of climate change. The case for taking action to address rising atmospheric concentrations of greenhouse gases need not be premised upon apocalyptic climate projections. See, e.g., ROGER PIELKE, JR., THE CLIMATE FIX: WHAT SCIENTISTS AND POLITICIANS WON’T TELL YOU ABOUT GLOBAL WARMING (2010); Jonathan H. Adler, *Taking Property Rights Seriously: The Case of Climate Change*, 26 SOC. PHIL. & POL’Y 296 (2009).

<sup>10</sup> See PATRICK J. MICHAELS & ROBERT C. BALLING, JR., CLIMATE OF EXTREMES: GLOBAL WARMING SCIENCE THEY DON’T WANT YOU TO KNOW 11–20 (2009); see also ROY W. SPENCER, CLIMATE CONFUSION: HOW GLOBAL WARMING HYSTERIA LEADS TO BAD SCIENCE, PANDERING POLITICIANS AND MISGUIDED POLICIES THAT HURT THE POOR (2008); John R. Christy, *The Global Warming Fiasco*, in GLOBAL WARMING AND OTHER ECO-MYTHS: HOW THE ENVIRONMENTAL MOVEMENT USES FALSE SCIENCE TO SCARE US TO DEATH (Ronald Bailey, ed., 2002); PATRICK J. MICHAELS AND ROBERT C. BALLING, JR., THE SATANIC GASES: CLEARING THE AIR ABOUT GLOBAL WARMING (2000).

<sup>11</sup> The GHGs specifically at issue are: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>).

<sup>12</sup> Memorandum from Jonathan Z. Cannon, General Counsel, Environmental Protection Agency, to Carol M. Browner, Adm’r, Environmental Protection Agency (April 10, 1998), *available at* <http://www.virginialawreview.org/inbrief/2007/05/21/cannon-memorandum.pdf>.

The petition remained unanswered until 2003. Neither the Clinton nor Bush Administrations was particularly eager to unleash the power of the Clean Air Act on GHGs. Tired of waiting, the environmentalist petitioners and several northeastern states threatened to sue the agency for its failure to act. In response, the EPA initiated a notice-and-comment rulemaking on the petition. After several months, the EPA denied the petition, declaring that it lacked statutory authority to regulate GHGs as pollutants under the Act and that, even if the agency had such authority, it would decline to exercise it as there were more effective ways of addressing the threat posed by global warming.<sup>13</sup> The Act was written to address conventional air pollutants, such as particulates and ozone smog, not globally dispersed emissions, such as carbon dioxide, the EPA reasoned, and coordinated international efforts made more sense than haphazard regulation built on an Act written for a different purpose.

The environmentalist and state petitioners were neither convinced by the EPA's analysis nor content to wait for Congressional action on global warming. Instead, they filed suit, joined by a large number of states and interest groups.<sup>14</sup> A three-judge panel of the U.S. Court of Appeals for the D.C. Circuit split three ways, ultimately rejecting their claims, teeing the case up for the Supreme Court.<sup>15</sup>

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<sup>13</sup> See Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,925 (Sept. 8, 2003).

<sup>14</sup> The state petitioners were California, Connecticut, Illinois, Maine, Massachusetts, New Jersey, New Mexico, New York, Oregon, Rhode Island, Vermont, and Washington. Other government parties were the District of Columbia, American Samoa, New York City, and Baltimore. The environmentalist petitioners were the Center for Biological Diversity, Center for Food Safety, Conservation Law Foundation, Environmental Advocates, Environmental Defense, Friends of the Earth, Greenpeace, International Center for Technology Assessment, National Environmental Trust, Natural Resources Defense Council, Sierra Club, Union of Concerned Scientists, and U.S. Public Interest Research Group. See *Massachusetts v. EPA*, 549 U.S. 497, 505 nn.2–4 (2007). Various businesses supported the state and environmentalist petitioners, including the Aspen Skiing Corporation, Calpine, and Entergy, as did some trade associations and groups representing renewable energy interests. See *Massachusetts v. EPA*, 549 U.S. 497, 510 n.15 (2007). See generally Stuart Buck & Bruce Yandle, *Bootleggers, Baptists, and the Global Warming Battle*, 26 HARV. ENVTL. L. REV. 177 (2002) (discussing business support for GHG emission control policies).

<sup>15</sup> *Massachusetts v. EPA*, 415 F.3d 50 (D.C. Cir. 2005).

*Massachusetts v. EPA*, decided in 2007, is arguably the most consequential Supreme Court decision of the past five years. Among other things, the Court held, 5-4, that the EPA had authority to regulate GHGs as air pollutants under the Clean Air Act and that the Bush Administration had failed to provide an adequate explanation for its refusal to regulate in denying the environmentalists' petition.<sup>16</sup> The Court concluded there was no ambiguity in the Act of the sort that could trigger *Chevron* deference and “greenhouse gases fit well within the Clean Air Act's capacious definition of ‘air pollutant.’”<sup>17</sup> Writing for the majority, Justice John Paul Stevens explained that the Act's “broad language” was designed to ensure sufficient “flexibility” so as to ensure the Clean Air Act would not become obsolete.<sup>18</sup> He further brushed aside concerns the Act's complex regulatory structure was a poor fit for global climate control, even though it had been designed and refined to combat localized air pollution problems.<sup>19</sup>

Assuming that carbon dioxide and other GHGs constituted air pollutants subject to regulation under the Act, the Bush Administration's refusal to regulate was arbitrary and unmoored from its statutory obligations. In denying the environmentalist and state petition, the EPA did not deny the reality of human contributions to global climate change, nor did it minimize the threat. To the contrary, the EPA endorsed President Bush's remarks that the United States “must address” the threat of climate change and noted other policy initiatives intended to “reduce the risk” of global warming.<sup>20</sup> The EPA simply noted its preference for a “different

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<sup>16</sup> *Massachusetts v. EPA*, 549 U.S. 497 (2007).

<sup>17</sup> *Id.* at 532.

<sup>18</sup> *Id.*

<sup>19</sup> *Id.* at 532–33.

<sup>20</sup> Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,929–52,931 (Sept. 8, 2003). The majority in *Massachusetts v. EPA* took note of the EPA's concessions and “attach[ed] considerable significance” to Agency statements that global warming is a problem that must be addressed. *See Massachusetts v. EPA*, 547 U.S. at 526.



policy approach” that was a better fit for the nature of the problem.<sup>21</sup> Trying to use the Clean Air Act to regulate global atmospheric concentrations of carbon dioxide and other GHGs did not “make sense,” according to the agency, and would have constituted “an inefficient, piecemeal approach” to the problem.<sup>22</sup> A better approach, according to the EPA, would be to pursue international agreements so as to ensure global cooperation on a global concern.

The EPA was likely correct as a policy matter.<sup>23</sup> The United States is not capable of controlling, let alone reducing, atmospheric concentrations of GHGs on its own—under the Clean Air Act or otherwise. The global atmosphere is a global commons, and it can only be protected through concerted global action. Yet the relevant statutory language did not permit the EPA to consider broader policy concerns or engage in a roving inquiry as to whether it is desirable to adopt regulatory controls on GHGs. It had to exercise its discretion within the Act’s statutory limits.<sup>24</sup>

Under the Clean Air Act, the EPA is required to regulate motor vehicle emissions of any “air pollutant” which in the “judgment” of the Administrator “cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.”<sup>25</sup> Therefore, if GHGs are “air pollutants,” the only question for the EPA is whether their emission contributes to public endangerment.<sup>26</sup> While the Court did not order the EPA to issue an

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<sup>21</sup> Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,929–52,931 (Sept. 8, 2003).

<sup>22</sup> Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,931 (Sept. 8, 2003).

<sup>23</sup> See Arnold W. Reitze, Jr. *Federal Control of Greenhouse Gas Emissions*, 40 ENV. L. 1261, 1323 (2010) (“The CAA is not a tool designed to deal with GHG emissions, or more specifically CO<sub>2</sub>.”); see also Arnold W. Reitze, Jr., *Federal Control of Carbon Dioxide Emissions: What Are the Options?*, 36 B.C. ENVTL. AFF. L. REV. 1 (2009); Jason Scott Johnston, *Climate Change Confusion and the Supreme Court: The Misguided Regulation of Greenhouse Gas Emissions Under the Clean Air Act*, 84 NOTRE DAME L. REV. 1 (2008).

<sup>24</sup> 547 U.S. at 533 (“[T]he use of the word ‘judgment’ is not a roving license to ignore the statutory text. It is but a direction to exercise discretion within defined statutory limits.”).

<sup>25</sup> See 42 U.S.C. § 7521(a)(1) (2003).

<sup>26</sup> 547 U.S. at 533 (“Under the clear terms of the Clean Air Act, EPA can avoid taking further action only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation

endangerment finding, that result was a *fait accompli*. After years of agency pronouncements and studies detailing the potential harms of global warming, on top of studies by the National Academy of Sciences and other respected authorities, the agency had little room to claim before the Court that global warming was not a threat. After *Massachusetts v. EPA*, the question of whether the EPA would regulate GHGs eventually was essentially obviated, replaced only by a question of when.<sup>27</sup>

## II. ENDANGERMENT AND ITS CONSEQUENCES

The Obama Administration wasted little time before moving ahead with GHG regulation. After a notice-and-comment rulemaking, the EPA made a formal finding on December 7, 2009 that GHG emissions from new motor vehicles caused or contributed to air pollution that could be reasonably interpreted to endangered public health or welfare.<sup>28</sup> This finding was the trigger for the regulation of GHG emissions from new motor vehicles under Section 202 of the Act, and much else as well. Once a substance is regulated as a pollutant under one portion of the Act, other provisions are triggered as well. Still other provisions of the Clean Air Act contain virtually identical endangerment language, all but ensuring further regulation of GHGs under the Act once an initial determination of endangerment had been made.

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as to why it cannot or will not exercise its discretion to determine whether they do.”). Under the Court’s holding, it is possible that the EPA could have tried to withhold its judgment, perhaps by explaining that it was not going to make or reject an endangerment finding at this time because it was devoting resources to other concerns. Yet this would have been a difficult position for the agency to maintain due to repeated public pronouncements about the threat of climate change—pronouncements that all-but-endorsed an actual endangerment finding.

<sup>27</sup> This was also the view of EPA Administrator Lisa Jackson, who maintained that the EPA was obligated to regulate GHGs in the wake of *Massachusetts v. EPA*. See Letter from Lisa P. Jackson, Adm’r, Environmental Protection Agency, to Jay Rockefeller, United States Senator (Feb. 22, 2010) (“As a result of the Court’s decision, EPA became obligated to treat greenhouse-gas emissions as air pollution under the Clean Air Act and to engage with the best available science in determining whether those emissions endanger Americans’ health or welfare.”).

<sup>28</sup> Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (2009) (final rule).

The EPA’s endangerment finding will be very difficult to challenge in court.<sup>29</sup> The language of Section 202 is fairly precautionary. The EPA is not required to prove that global warming is upon us, let alone that it threatens environmental catastrophe. Nor is the agency required to show that the net effects of climate change on human health are negative, or that regulation of GHG emissions would be worthwhile. Indeed, the agency is precluded from considering costs at this stage. All the EPA must show is that it *could* reasonably anticipate that global warming threatens public health or “welfare,” an expansive term the Act explicitly defines to include effects on climate, “economic values” and “personal comfort and well-being.”<sup>30</sup> Reviewing courts will not substitute their reading of the relevant scientific evidence for that of the EPA, so it’s also no use arguing the agency placed too much weight on one study while discounting another. Thus, even if courts were convinced the threat from anthropogenic warming was rather small and that positive effects of a modestly warmer climate could outweigh any negative effects, this would not justify overturning the EPA’s judgment.

The first immediate consequence of the endangerment finding was the adoption by the EPA of more stringent regulations governing automotive fuel economy as a means of reducing GHG emissions from new cars and trucks. Section 202 provides that the EPA “shall” promulgate regulations limiting emissions of regulated pollutants from new cars and trucks once an endangerment finding is made, so this regulation was inevitable. On April 1, 2010, the EPA and the National Highway Traffic Safety Administration (NHTSA) promulgated regulations requiring automakers to improve the fuel economy and reduce GHG emissions from light-duty

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<sup>29</sup> At the time of this writing, several petitions for review have been filed by various states, trade associations, and anti-regulatory organizations.

<sup>30</sup> 42 U.S.C. § 7602(h) (2003) (“[A]ll language referring to effects on welfare includes, but is not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants.”).

vehicles (i.e. cars and light trucks).<sup>31</sup> These rules effectively require automakers to produce vehicles with an average fuel efficiency of 35.5 miles per gallon by 2016.<sup>32</sup> According to the EPA and NHTSA’s estimates, this will reduce light-duty vehicle GHG emissions by approximately 21 percent compared to a business-as-usual scenario by 2030.<sup>33</sup> These regulations could increase new vehicle prices by \$1,000, by the EPA’s own estimates, though this cost could be offset by increased fuel savings, and could spur vehicle downsizing resulting in a negative impact on overall auto safety.<sup>34</sup> These rules will be followed with additional regulations governing larger motor vehicles. In November 2010, the EPA and NHTSA proposed regulations to increase fuel economy and reduce GHG emissions from medium- and heavy-duty vehicles, including larger trucks, vans, buses, and tractors.<sup>35</sup>

The new fuel economy rules are only the first of several regulatory measures set in motion by the endangerment finding. While the EPA made its finding under Section 202, other provisions of the Act have virtually identical endangerment language. For example, Section 111, which governs emissions for newly built or modified industrial facilities, likewise requires the agency to set standards for stationary sources of emissions that cause or contribute to “air pollution which may reasonably be anticipated to endanger public health or welfare.”<sup>36</sup> If

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<sup>31</sup> Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25,323 (2010).

<sup>32</sup> *Id.* at 25330.

<sup>33</sup> *Id.* at 25328.

<sup>34</sup> For a discussion of the potential safety consequences of automotive fuel economy regulations, see Robert W. Crandall & John D. Graham, *The Effect of Fuel Economy Standards on Automobile Safety*, 32 J. L. & ECON. 97 (1989).

<sup>35</sup> Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 75 Fed. Reg. 74,152 (2010). The regulation covers on-road vehicles with a gross vehicle weight of 8,500 pounds or more, excluding trailers.

<sup>36</sup> 42 U.S.C. § 7411 (requiring the Agency to set emission performance standards for stationary sources that “cause[] or contribute[] significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare”).

greenhouse gases satisfy the requirements of Section 202, they almost surely satisfy Section 111 as well.

Section 111 requires that EPA impose emission control requirements—“new source performance standards” or NSPS—for those categories of stationary sources that contribute “significantly” to the air pollution at issue.<sup>37</sup> If the EPA determines that a given category of sources, such as coal-fired steam turbines,<sup>38</sup> cement kilns,<sup>39</sup> copper smelters,<sup>40</sup> or pulp mills,<sup>41</sup> contributes “significantly” to the accumulation of GHGs in the atmosphere, it is required to establish a “standard of performance” that represents the best-demonstrated technology for reducing emissions from that category of sources, taking into account the costs of imposing such controls.<sup>42</sup> These controls must be adopted by new and modified sources within the relevant categories.<sup>43</sup> The EPA is also required to “review and, if appropriate, revise” these standards “at least every 8 years.”<sup>44</sup> The EPA has not yet promulgated NSPS for GHGs for any source category, but the consideration of such standards is ongoing.<sup>45</sup>

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<sup>37</sup> *Id.* It should be noted that this section only applies if there is no National Ambient Air Quality Standard for the emissions in question. So, should the EPA classify carbon dioxide or other GHGs as criteria air pollutants, as discussed below, *infra* notes \_\_\_ and accompanying text, then these provisions would not be in force.

<sup>38</sup> See 40 C.F.R. §§ 60.40da–60.47da (standards of performance for fossil-fuel fired steam generators for which construction is commenced after August 17, 1971).

<sup>39</sup> See 40 C.F.R. §§ 60.60–60.66 (standards of performance for Portland cement plants).

<sup>40</sup> See 40 C.F.R. §§ 60.160–60.166 (standards of performance for copper smelters).

<sup>41</sup> See 40 C.F.R. §§ 60.280–60.285 (standards of performance for kraft pulp mills).

<sup>42</sup> See 42 U.S.C. § 7411(a)(1) (defining “standard of performance” 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 determines has been adequately demonstrated”).

<sup>43</sup> See 42 U.S.C. § 7411(b)(1). While this provision, by its terms, only applies to “new” sources, Section 111 of the Act defines “new source” to mean “any stationary source, the construction *or modification* of which is commence after the publication of regulations . . . prescribing a standard of performance under this section which will be applicable to such source.” See 42 U.S.C. §7411(a)(2) (emphasis added). This definition aims to discourage regulated entities extending the life of existing sources through retrofits and other modifications so as to avoid the NSPS requirements for new sources.

<sup>44</sup> See 42 U.S.C. § 7411(b)(1)(B).

<sup>45</sup> See, e.g., 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) (discussing consideration of performance standards for GHGs).

In addition, until GHGs are regulated as criteria air pollutants subject to National Ambient Air Quality Standards,<sup>46</sup> Section 111 requires the EPA to issue guidelines to states for the creation of standards for existing sources for which NSPS have been promulgated.<sup>47</sup> States are required to establish and impose emission standards for existing sources similar to those the EPA sets for new and modified sources. In applying these standards to any given source, however, the state may “take into consideration, among other factors, the remaining useful life of the existing source to which such standard applies.”<sup>48</sup> If a state fails to adopt an NSPS plan that meets with EPA approval, the agency must impose a regulatory plan of its own.<sup>49</sup>

A more significant effect of the endangerment finding and the promulgation of GHG emission controls for new motor vehicles is the triggering of the Clean Air Act’s new source review and Title V permitting requirements. Section 165 of the Act governs so-called “major” stationary sources of air pollution.<sup>50</sup> Under this section, companies are required to adopt emission controls—the “best available control technology” or “BACT”—for all emissions subject to regulation by any part of the Act if they construct or modify any facility that qualifies as a “major” stationary source.<sup>51</sup> Construction or modification of a facility makes it a “new” source for purposes of this regulation, which is part of what’s commonly referred to as “New Source Review.” Older facilities are grandfathered in, but only so long as they do not make any

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<sup>46</sup> See *infra* notes 80-90 and accompanying text.

<sup>47</sup> See 42 U.S.C. § 7411(d).

<sup>48</sup> See 42 U.S.C. § 7411(b)(1)(B).

<sup>49</sup> See 42 U.S.C. § 7411(d).

<sup>50</sup> See 42 U.S.C. § 7475.

<sup>51</sup> See 42 U.S.C. § 7475(a)(4).

modifications that could increase emissions of regulated pollutants.<sup>52</sup> Other related provisions require major sources to file permits demonstrating their regulatory compliance.

The Clean Air Act defines a “major” source for purposes of the PSD provisions as a facility that emits or has the potential to emit 250 tons per year of a regulated pollutant, or 100 tons per year for some specified facilities.<sup>53</sup> For purposes of Title V’s permitting requirements, “major sources” are those facilities that emit or have the potential to emit over 100 tons per year.<sup>54</sup> For traditional air pollutants, such as sulfur dioxide or nitrogen oxides, these thresholds mean that only the biggest and dirtiest facilities are subject to federal controls—several thousand facilities nationwide. This is not the case with GHGs, however, especially carbon dioxide. Carbon dioxide is emitted in far greater quantities than traditional pollutants. Indeed, some efforts to control traditional pollutants increase carbon dioxide emissions by design, as increased carbon dioxide emissions are a consequence of more complete combustion. Many industrial facilities emit more than 250 tons of carbon dioxide per year, but so do many commercial and residential buildings as well.

Applying the Clean Air Act’s stationary source regulation and permitting provisions to all facilities with the potential to emit over 250 tons per year of carbon dioxide would cause the EPA’s existing program to explode. According to the EPA:

If PSD and Title V requirements apply at the applicability levels provided under the CAA, many small sources would be burdened by the costs of individualized

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<sup>52</sup> This aspect of the New Source Review rules creates a disincentive to modernize and replace older facilities. Insofar as newer and modified facilities could be expected to be more efficient and to emit less per unit of output, grandfathering can create incentives that are counter-productive for pollution control.

<sup>53</sup> See 42 U.S.C. § 7479(1).

<sup>54</sup> 42 U.S.C. § 7661(2) adopts the definition provided in 42 U.S.C. § 7602(j), defining a “major” source as “any stationary facility or source of air pollutants which directly emits, or has the potential to emit, one hundred tons per year or more of any air pollutant.” For regulation of hazardous air pollutants, 42 U.S.C. § 7661(2) incorporates the even more stringent definition contained in 42 U.S.C. § 7412.

PSD control technology requirements and permit applications. In addition, State permitting authorities would be paralyzed by enormous numbers of these permit applications’ the numbers are orders of magnitude greater than the current inventory of permits and would vastly exceed the current administrative resources of the permitting authorities.<sup>55</sup>

The precise number of facilities that would be subject to these regulatory requirements is unclear, but there is no question that it would be substantial. In proposing to impose its regulatory controls on GHG emissions, the EPA estimated that a strict application of Section 165 would increase the number of required air pollution permits “more than 140-fold.”<sup>56</sup> According to the EPA, the number of facilities required to submit PSD applications would increase from 280 per year to over 40,000 per year.<sup>57</sup> The number of facilities subject to Title V permitting requirements would increase from approximately 15,000 to around six million.<sup>58</sup>

This explosion in regulatory requirements would burden both the public and private sector. Processing just one permit for a new or modified industrial source can require over 300 person-hours for a regulatory agency, and can cost several hundred thousand dollars for the facility seeking the permit.<sup>59</sup> Permitting residential and commercial buildings should be less difficult, but is still estimated to require approximately 60 person-hours per permit.<sup>60</sup> As a consequence, the EPA estimates that applying the PSD requirements to GHGs will cost

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<sup>55</sup> Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 74 Fed. Reg. 55,292, 55,294 (2009) (proposed rule).

<sup>56</sup> 74 Fed. Reg. 55,301 (2009).

<sup>57</sup> *Id.* If anything, this is a conservative estimate, as it is just based upon a 250-tons-per-year threshold, and does not include those facilities subject to a 100 tons-per-year threshold.

<sup>58</sup> 74 Fed. Reg. 55,295 (2009).

<sup>59</sup> 74 Fed. Reg. 55,301 (2009).

<sup>60</sup> *Id.*



regulatory agencies over \$250 million per year.<sup>61</sup> The costs of applying Title V’s permitting requirements are even greater. Even assuming most Title V permits can be processed quickly and require fewer than 45 person-hours, the “massive influx” of six million permit applications “would overwhelm permitting authorities’ administrative resources.”<sup>62</sup> According to the EPA, “the total nationwide additional burden for permitting authorities for title V permits from adding GHG emissions at the 100-tpy threshold would be 340 million hours, which would cost over \$15 billion.”<sup>63</sup>

As incredible as it may seem, the EPA’s estimate of the costs of applying the Clean Air Act to “major” stationary sources may be unduly conservative. A study commissioned by the U.S. Chamber of Commerce estimated the 250 ton threshold would encompass over one million businesses nationwide.<sup>64</sup> Based upon an analysis of sector-specific energy use data from the Energy Information Association and U.S. Census, the Chamber study concluded that nearly 200,000 manufacturing facilities, approximately 20,000 farms, and at least *one million* commercial buildings would be covered, including a substantial percentage of hospitals, hotels, and large restaurants.<sup>65</sup> Even ten percent of churches and other places of worship could qualify. On average, the Chamber study reported, “a building with over 40,000 square feet uses enough hydrocarbons to become a regulated source.”<sup>66</sup>

The EPA is well aware of the regulatory nightmare—and political backlash—enforcement of Section 165 could create, so it has proposed to “tailor” its GHG regulation so as

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<sup>61</sup> *Id.*

<sup>62</sup> 74 Fed. Reg. 55,302 (2009).

<sup>63</sup> *Id.*

<sup>64</sup> See U.S. CHAMBER OF COMMERCE, A REGULATORY BURDEN: THE COMPLIANCE DIMENSION OF REGULATING CO<sub>2</sub> AS A POLLUTANT (2008).

<sup>65</sup> *Id.*

<sup>66</sup> *Id.* at 11. See also Reitze, *Greenhouse Gas Emissions*, *supra* note 23, at 1302 (summarizing industry estimates of number of facilities subject to PSD for greenhouse gas emissions).

to limit its applicability. In September 2009, the EPA proposed to set a new threshold of 25,000 tons per year for the imposition of these requirements, even though the statute sets an express limit of 250.<sup>67</sup> Under this proposed threshold, the EPA estimates that fewer than 15,000 facilities would need to obtain permits for their greenhouse gas emissions, and most of these are already subject to New Source Review regulation for other emissions.<sup>68</sup> EPA Administrator Lisa Jackson explained the proposal was a “common sense rule that is carefully tailored to apply to only the largest sources.”<sup>69</sup> However commonsensical, the regulatory proposal was at odds with the plain text of the act.<sup>70</sup> Nonetheless, Administrator Jackson signaled her willingness to adopt an even more elastic reading of the statute if necessary.<sup>71</sup>

The EPA justified its elastic reading of the Act on the grounds that a lower threshold is “not feasible” for greenhouse gases. There’s no statutory text to support this decision, so the EPA relied on the doctrines of “administrative necessity” and of avoidance of “absurd results.”<sup>72</sup> According to the EPA, applying the Clean Air Act as written to greenhouse gas emissions would “extensively disrupt” existing regulatory programs, and perhaps make them “impossible” to administer. Yet the EPA was not able to identify any case in which something as clear as a numerical statutory threshold was cast aside due to concerns about implementability. Indeed, it is rather common for Congress to enact statutory requirements that agencies lack the resources to fulfill and courts do not afford them relief. In this specific case, the Clean Air Act’s text is quite

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<sup>67</sup> See Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 74 Fed. Reg. 55,292 (Oct. 27, 2009).

<sup>68</sup> *Id.* at 55,295.

<sup>69</sup> Press Release, Environmental Protection Agency, [New EPA Rule Will Require Use of Best Technologies to Reduce Greenhouse Gases from Large Facilities/Small businesses and farms exempt](#) (Sept. 30, 2009).

<sup>70</sup> As the EPA acknowledged in its notice of the proposed rule, “the applicability provisions for PSD and title V are clear on their face.” 74 Fed. Reg. at 55,306.

<sup>71</sup> See Letter from Lisa P. Jackson, Adm’r, Environmental Protection Agency (Feb. 22, 2010), *available at* [http://epa.gov/oar/pdfs/lpj\\_letter.pdf](http://epa.gov/oar/pdfs/lpj_letter.pdf).

<sup>72</sup> 74 Fed. Reg. at 55,303–55,320.

explicit, and the Supreme Court expressly rejected the EPA’s claims that applying the Act to GHGs would be impossible or unadministrable in *Massachusetts v. EPA*.

The EPA’s final tailoring rule backed even farther away from the express text of the Clean Air Act.<sup>73</sup> Issued on May 13, this rule creates new temporary thresholds for the applicability of Section 165 and Title V of the Clean Air Act that will change over time. For the first six months of 2011, GHG permitting requirements would only apply to those stationary sources already subject to the PSD program, and BACT would only be required for those already-regulated facilities that increase their GHG emissions by 75,000 tons-per-year or more.<sup>74</sup> From July 2011 through June 2013, the permitting requirements would be extended to new construction projects that emit 100,000 tons or more of GHGs per year and modifications that increase GHG emissions by 75,000 tons or more per year.<sup>75</sup> At the same time, the EPA announced that sometime in 2011 it would begin another rulemaking, to be completed in 2012, to consider whether to extend the requirements to those facilities emitting 50,000 tons or more of GHGs per year, but that facilities emitting less than 50,000 tons per year would not be subject to BACT or Title V requirements prior to April 30, 2016 at the earliest.<sup>76</sup>

According to the EPA, this would represent a “common sense” approach to imposing regulatory requirements on stationary sources.<sup>77</sup> The problem for the EPA is that there is no basis for this timetable in the Act, nor does the statute delegate to the EPA the authority necessary to develop such a scheme. The EPA maintains that applying the numerical thresholds expressly

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<sup>73</sup> Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule: Final Rule, 75 Fed. Reg. 31514 (June 3, 2010).

<sup>74</sup> *Id.* at 31516.

<sup>75</sup> *Id.*

<sup>76</sup> *Id.*

<sup>77</sup> Some would argue there can be no “common sense” approach to climate change under the PSD provisions as they only impose controls on new and modified sources. Focusing exclusively on such sources makes it “impossible to have a least-cost solution” and creates an incentive to keep older, heavier emitting sources online longer. *See* Craig N. Oren, *Is the Clean Air Act at a Crossroads?* 40 ENV. L. 1231, 1245-46 (2010).

provided for in the statute is “not feasible” for GHGs because they are emitted in such higher volumes than traditionally regulated pollutants. The EPA is likely correct on this point, but that does not give it license to rewrite the Act, shifting the decimal point on a pollution threshold ever-rightward until only a politically acceptable number of facilities is subject to regulation.

While the EPA’s interpretation creates a reprieve for many thousands of facilities that would otherwise be subject to GHG regulation under the Act, its adoption increases the agency’s discretionary authority. If the numerical emission thresholds established in the Clean Air Act may be revised by the Agency in response to temporary political or economic concerns, then the Agency is the master of its domain and it is the Agency, not Congress, that effectively determines the scope of its own authority.<sup>78</sup> Thus even while eschewing the imposition of regulatory controls on large portions of the economy, the agency is expanding its authority and loosening the statutory reins imposed by Congress.

At the same time, the EPA is increasing its authority vis-à-vis state agencies over GHG regulation—at least where it fears that states will be insufficiently aggressive. Under the “cooperative federalism” model embodied in the Clean Air Act and most major federal environmental statutes, the PSD and Title V regulatory requirements are largely implemented by state environmental agencies, subject to EPA oversight.<sup>79</sup> Yet the EPA is concerned about state implementation of these programs as applied to GHG emissions. As a consequence, shortly after

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<sup>78</sup> For a lengthy discussion of why courts should not presume Congress has delegated agencies discretion to determine the scope of their own jurisdiction, and thus should not give *Chevron* deference where the scope of agency jurisdiction is at issue, see Nathan A. Sales & Jonathan H. Adler, *The Rest Is Silence: Chevron Deference, Agency Jurisdiction, and Statutory Silences*, 2009 U. ILL. L. REV. 1497 (2009).

<sup>79</sup> See Jonathan H. Adler, *When Is Two a Crowd? The Impact of Federal Action on State Environmental Regulation*, 31 HARV. ENVTL. L. REV. 67, 87 (2007) (summarizing “cooperative federalism” approach to environmental regulation).

promulgating the tailoring rule, the EPA put several states on notice that they would not have EPA authorization to implement these programs for GHGs.

It is difficult enough for the EPA to regulate GHGs under the applicable source-specific portions of the Act, but that is not all the agency has the obligation to do now that the endangerment finding has been made. In all likelihood, the EPA will also have to begin treating carbon dioxide and other GHGs as criteria air pollutants, triggering another set of regulatory requirements.

Under Section 108 of the Act, the EPA Administrator is required to create a list of criteria air pollutants that includes “each air pollutant, emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare” that is emitted into the ambient air by “numerous or diverse mobile or stationary sources.”<sup>80</sup> This endangerment standard is practically indistinguishable from that in Section 202. The only potential distinction is additional language in Section 108 providing that the pollutant in question must be one for which the EPA Administrator “plans to issue air quality criteria under this section,” but there is little reason to believe that the EPA could refuse to regulate greenhouse gases on this basis. In fact, this argument was flatly rejected by the U.S. Court of Appeals for the Second Circuit over thirty years ago in *Natural Resources Defense Council v. Train*.<sup>81</sup> The EPA had sought to argue that it could opt not to include lead as a criteria air pollutant because it did not plan to issue air quality criteria on lead and there were more cost-effective means of controlling lead emissions. The Second Circuit found the former argument wholly unpersuasive and the latter irrelevant given the text of the Act. As the rationale would

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<sup>80</sup> 42 U.S.C. § 7408.

<sup>81</sup> 545 F.2d 320, 325–26 (2d Cir. 1976).

apply equally to carbon dioxide, the EPA's argument must fail unless *NRDC v. Train* is overruled or otherwise legally modified.<sup>82</sup>

Once a pollutant is listed, the EPA must develop a criteria document and, under Section 109, establish National Ambient Air Quality Standards (NAAQS) for the pollutant.<sup>83</sup> Once the NAAQS is in place, Section 110 requires states to submit State Implementation Plans (SIPs) to ensure that every metropolitan area in the nation is required to meet.<sup>84</sup> Here is where the difficulties would begin, as the SIP process was designed for controlling localized, ambient pollution problems, not protecting the global atmosphere.<sup>85</sup> The problem with trying to set a NAAQS for greenhouse gases is that it simply makes no sense.<sup>86</sup> There is simply no way for state and local regulators to ensure that individual cities, or even larger regions, meet an air-quality standard for a globally dispersed atmospheric pollutant. Local emissions could be reduced to zero, and a given area would still violate the NAAQS if global emissions had not declined. It would be a pointless regulatory exercise.

The EPA might argue that the NAAQS regulatory regime is fundamentally ill-suited to greenhouse gas control. The Agency would have a point—albeit one rejected by the *Massachusetts* majority. The meaningful measure of greenhouse gas pollution levels is their concentration in the global atmosphere, not the locally ambient air. There is nothing any given jurisdiction can do to comply with a NAAQS for carbon dioxide unless emissions are controlled worldwide. No state could possibly meet a greenhouse gas NAAQS set in accordance with the

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<sup>82</sup> Some scholars argue that *NRDC v. Train* was wrongly decided and “is of limited authority.” See Oren, *supra* note 77, at 1252-53.

<sup>83</sup> 42 U.S.C. § 7409.

<sup>84</sup> 42 U.S.C. § 7410

<sup>85</sup> See generally Jonathan B. Wiener, *Think Globally, Act Globally: The Limits of Local Climate Policies*, 155 U. PA. L. REV. 101 (2007).

<sup>86</sup> Indeed, even some environmentalist organizations claim to oppose this approach. See Oren, *supra* note 77, at 1246 (“Then-counsel for the Sierra Club has said he would join industry in opposing the use of the ambient standard system” for greenhouse gas emission control.).

Act's requirements. Nonetheless, the *Massachusetts v. EPA* majority explicitly rejected the idea that recognizing greenhouse gases as pollutants under the CAA would produce any unintuitive or illogical results,<sup>87</sup> so this argument is foreclosed. At best, state failure to submit acceptable plans would eventually lead to the adoption of a Federal Implementation Plan under Section 179,<sup>88</sup> after years of litigation.<sup>89</sup>

The EPA may be in no hurry to develop a greenhouse gas NAAQS, but environmentalist groups could force its hand. On December 2, 2009, the Center for Biological Diversity (CBD) filed a petition with the EPA demanding it adopt a GHG NAAQS.<sup>90</sup> It was a petition of just this sort that set the greenhouse regulatory train in motion, and the CBD is more than ready to file suit if the EPA does not comply. If successful, the CBD will force the EPA to bring the full force of the Clean Air Act down on GHG emissions, and the resulting increase in regulatory expenditure in time and money will be substantial.

### III. SPREADING REGULATORY HEAT

Not all of the new regulatory initiatives to address the threat of climate change are related to the Clean Air Act. The EPA and other federal agencies have also begun to use additional sources of regulatory authority to control GHG emissions or otherwise address climate change concerns.<sup>91</sup> Some states have also sought to begin regulating GHGs, most notably California, and various states and environmentalist organizations still seek to use the courts to encourage or induce further regulatory efforts.

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<sup>87</sup> 127 S. Ct. at 1459–60.

<sup>88</sup> 42 U.S.C. § 7509.

<sup>89</sup> Jonathan Wiener, *Climate Policy After Mass v. EPA*, THE FACULTY BLOG (Apr. 3, 2007, 2:24 PM), [http://uchicagolaw.typepad.com/faculty/2007/04/climate\\_policy\\_.html](http://uchicagolaw.typepad.com/faculty/2007/04/climate_policy_.html).

<sup>90</sup> Petition from the Center for Biological Diversity to Lisa P. Jackson, Adm'r, Environmental Protection Agency, Petition to Establish National Pollution Limits for Greenhouse Gases Pursuant to the Clean Air Act (Dec. 2, 2009).

<sup>91</sup> See Margaret Kriz Hobson, *A Change of Weather*, NAT'L J., Dec. 19, 2009, at 36 (reporting on Obama Administration's "government-wide strategy of acknowledging and attempting to curb global warming").

Even beyond the confines of the Clean Air Act, the EPA is the primary regulatory agency concerned with climate change. Among the Obama Administration's first climate-related regulatory initiatives was a mandatory reporting requirement for greenhouse gas emissions for industrial facilities and other large emission sources. In a regulation finalized on September 22, 2009, the EPA required reporting by any facility responsible for emissions of 25,000 tons per year or more of GHGs as well as by firms in certain specified industries.<sup>92</sup> Although the regulation concerns emissions of GHGs into the air, the regulation was not adopted under the Clean Air Act. Rather, the authority for the reporting requirement was provided by the FY2008 Consolidated Appropriations Act,<sup>93</sup> signed into law by President Bush in December 2007.<sup>94</sup>

One might not think of climate change as a water pollution problem, but that might not stop climate-related regulation under the Clean Water Act.<sup>95</sup> In December 2007, the Center for Biological Diversity petitioned the EPA to revise federal water quality criteria for marine pH levels in response to ocean acidification that could be caused by increased atmospheric levels of carbon dioxide. The EPA agreed to respond to this petition in January 2009.<sup>96</sup> The Obama Administration subsequently settled the lawsuit and issued a memorandum calling upon states to take ocean acidification into account in state water quality programs.<sup>97</sup> Specifically, the EPA determined that states should identify those coastal waters impaired by ocean acidification, a step

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<sup>92</sup> The regulation also requires firm-wide reporting in certain industries, including vehicle and engine manufacturers and some fossil fuel suppliers.

<sup>93</sup> See H.R. 2764, Pub. L. No. 110-161, 121 Stat.1844, 2128 (2007).

<sup>94</sup> See 74 Fed. Reg. 16,448, 16,464 (2009).

<sup>95</sup> See generally Robin Kundis Craig, *Climate Change Comes to the Clean Water Act: Now What?* 1 WASH & LEE J. ENERGY, CLIMATE & ENV'T 9 (2010).

<sup>96</sup> See Letter from Benjamin H. Grumbles, Asst. Adm'r, EPA, to Ms. Miyoko Sakashita, Center for Biological Diversity (Jan. 16, 2009), available at [http://www.biologicaldiversity.org/campaigns/ocean\\_acidification/pdfs/EPA\\_Response\\_to\\_CBD\\_Ocean\\_Acidification\\_Petition.pdf](http://www.biologicaldiversity.org/campaigns/ocean_acidification/pdfs/EPA_Response_to_CBD_Ocean_Acidification_Petition.pdf).

<sup>97</sup> Memorandum from Denise Keehner, Director, Office of Wetlands, Oceans and Watersheds, EPA, to the Water Division Directors, Regions 1-10, Integrated Reporting and Listing Decisions Related to Ocean Acidification (Nov. 15, 2010).



that could lead to more stringent pollution control requirements under other portions of the Clean Water Act and delegated state programs.<sup>98</sup>

The EPA has also moved to give states more leeway to regulate GHG emissions, at least as long as states seek to be more stringent than the federal government. In December 2005, the California Air Resources Board (CARB) applied to the EPA for a waiver of preemption under the Clean Air Act for regulations CARB sought to impose on motor vehicle GHG emissions.<sup>99</sup> During the Bush Administration, the EPA denied California's request, citing a preference for nationally applicable regulation of motor vehicle emissions.<sup>100</sup> Immediately upon taking office, President Obama instructed the EPA to reconsider its prior decision.<sup>101</sup> The waiver was formally granted six months later, authorizing California, and other states by extension, to adopt more stringent motor vehicle GHG controls than the federal government.<sup>102</sup>

While the EPA is responsible for most climate change-related federal regulatory initiatives, it is not alone. Quite a few other agencies have also begun to implement measures to address GHG emissions under the Obama Administration.<sup>103</sup>

In October 2009, for example, President Obama issued Executive Order 13514 requiring all federal agencies to reduce their GHG emissions and improve their environmental

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<sup>98</sup> See, e.g., Craig, *supra* note 88, at 26–27 (discussing how impairment due to ocean acidification could result in more stringent NPDES permit requirements).

<sup>99</sup> See Letter from CARB to Stephen Johnson, Adm'r, EPA (Dec. 21, 2005).

<sup>100</sup> See Letter from Stephen Johnson, Adm'r, EPA, to Arnold Schwarzenegger, Governor, California (Dec. 19, 2007), available at <http://www.epa.gov/otaq/climate/20071219-slj.pdf>. For a discussion of the legal and policy issues surrounding California's waiver request, see Jonathan H. Adler, *Hothouse Flowers: The Vices and Virtues of Climate Federalism*, 17 TEM. POL. & CIV. RTS. L. REV. 443 (2008).

<sup>101</sup> See John M. Broder, *Obama Directs Regulators to Tighten Auto Rules*, N.Y. TIMES, Jan. 26, 2009, at A1.

<sup>102</sup> Press Release, EPA, EPA Grants California GHG Waiver (June 30, 2009), available at <http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceac8525735900400c27/5e448236de5fb369852575e500568e1b!OpenDocument>. For a fuller discussion of the legal and policy issues raised by California's request for a waiver of preemption, see Jonathan H. Adler, *Hothouse Flowers: The Vices and Virtues of Climate Federalism*, 17 TEMP. POL. & CIV. RTS. L. REV. 443, 453–62 (2008).

<sup>103</sup> See U.S. DEPARTMENT OF STATE, U.S. CLIMATE ACTION REPORT 2010, 39–75 (2010)

performance.<sup>104</sup> Among other things, this order required all federal agencies to set a GHG emission reduction target for 2020, to reduce vehicle fleet petroleum use by 30 percent by 2020, and implement a “net-zero-energy” building requirement by 2030. President Obama also directed the Department of Energy to set more stringent energy efficiency standards for appliances, including both commercial equipment and residential products, under the Energy Policy Act of 2005.<sup>105</sup>

The Council on Environmental Quality is another culprit, promulgating a draft guidance on the “Consideration of the Effects of Climate Change and Greenhouse Gas Emissions” under the National Environmental Policy Act.<sup>106</sup> This guidance outlines how federal agencies must evaluate and consider the potential climate change impacts and resulting GHG emissions of significant federal actions subject to regulation under NEPA.

The Interior Department launched a “coordinated strategy” to address the impact of climate change on lands and waters managed by agencies within the Department.<sup>107</sup> Secretarial Order No. 3289 created a “Climate Change Response Council,” among other things, that will require each bureau and office within the Department to incorporate climate change concerns into agency management plans and decision-making, including “major decisions regarding potential use of resources under the Department’s purview.”<sup>108</sup> Secretarial Order No. 3285 also “prioritized development of renewable energy on public lands and offshore waters to reduce our

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<sup>104</sup> Exec. Order No. 13,514 (2009), *available at* [http://www.whitehouse.gov/assets/documents/2009fedleader\\_eo\\_rel.pdf](http://www.whitehouse.gov/assets/documents/2009fedleader_eo_rel.pdf).

<sup>105</sup> Memorandum for the Secretary of Energy, Feb. 5, 2009, *available at* [http://www.whitehouse.gov/the\\_press\\_office/ApplianceEfficiencyStandards/](http://www.whitehouse.gov/the_press_office/ApplianceEfficiencyStandards/).

<sup>106</sup> 75 Fed. Reg. 8,046 (Feb. 18, 2010).

<sup>107</sup> See DEPARTMENT OF THE INTERIOR, SECRETARIAL ORDER NO. 3289, ADDRESSING THE IMPACTS OF CLIMATE CHANGE ON AMERICA’S WATER, LAND, AND OTHER NATURAL AND CULTURAL RESOURCES (2009) [hereinafter ORDER NO. 3289].

<sup>108</sup> *Id.* at 2–3.

dependence on foreign oil and to reduce greenhouse gas pollution.”<sup>109</sup> The Interior Department is responsible for managing approximately 20 percent of the nation’s land in addition to large portions of the Outer Continental Shelf.<sup>110</sup> The Forest Service is also considering how climate change concerns should alter its management of national forests.<sup>111</sup>

The Fish and Wildlife Service designated 187,000 square miles of “on-shore barrier islands, denning areas and offshore sea-ice” as critical habitat for polar bears, which are listed as threatened species.<sup>112</sup> Under the Endangered Species Act, federal agencies are required to consult with the Service when undertaking, funding, or permitting actions that could adversely critical habitat.

Finally, the Securities and Exchange Commission decided by a 3-2 vote to issue an interpretive guidance for public companies on how the SEC’s disclosure requirements apply to economic and legal risks relating to climate change. Among other things, the SEC concluded that public companies may have an obligation to disclose risks associated with proposed climate change legislation, regulation, and international agreements, the indirect economic consequences of such regulation, and potentially material impacts of climate change on their business.<sup>113</sup>

These measures, in addition to the regulatory mandates underway at the EPA, represent a dramatic assertion of federal regulatory authority to address the threat of climate change. The Administration is utilizing virtually every policy lever it can reach in this effort. The question,

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<sup>109</sup> See DEPARTMENT OF THE INTERIOR, SECRETARIAL ORDER NO. 3285, RENEWABLE ENERGY DEVELOPMENT BY THE DEPARTMENT OF THE INTERIOR (2009); see also ORDER NO. 3289, *supra* note 100, at 3–4.

<sup>110</sup> See Juliet Eilperin, *Interior Launches Climate Strategy*, WASH. POST, Sept. 15, 2009, at A3 (“Interior manages one-fifth of the nation’s land mass and nearly 1.7 billion acres on the Outer Continental Shelf.”).

<sup>111</sup> See Hobson, *supra* note 84, at 37.

<sup>112</sup> See generally Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States, 50 C.F.R. § 17 (2010).

<sup>113</sup> Commission Guidance Regarding Disclosure Related to Climate Change, Securities & Exchange Commission, Feb. 8, 2010, available at <http://www.sec.gov/rules/interp/2010/33-9106.pdf>.

though, is whether all of this federal regulatory activity will make a meaningful difference in addressing the threat of climate change.

#### IV. THE FUTILITY OF FEDERAL REGULATION

Federal efforts to control GHG emissions may be in full gear, but they are far from sufficient to meet the Administration’s stated “80 by 50” goal and will do little if anything to reduce the risks of global climate change. Existing environmental statutes were not designed to control GHG emissions and are not well-suited to achieve state climate policy goals. More stringent regulatory measures are not the answer either. Even dramatic near-to-medium term reductions in GHG emissions from the United States will fail to reduce the buildup of GHGs in the atmosphere. Unless atmospheric concentrations are controlled, global warming will continue apace.

Regulation of GHG emissions under the Clean Air Act, as discussed above, will impose a wide range of regulatory burdens throughout the economy, but is unlikely to come anywhere close to the aspirational goal of reducing emissions 80 percent by 2050. This is made clear when one looks at the projected or likely emissions reductions from various regulatory measures, none of which come close to achieving 80 percent reductions for covered facilities or technologies. New regulations on light-duty motor vehicles are expected to reduce automotive GHG emissions by 21 percent by 2030—only 25 percent of the needed reduction in the first twenty years.<sup>114</sup> Application of NSPS to coal-fired power plants could produce approximately 10 percent GHG

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<sup>114</sup> See Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25,328 (2010)..

emission reductions from those sources, according to one recent analysis.<sup>115</sup> As coal-fired power plants are responsible for nearly one-third of GHG emissions in the United States, this would represent a three percent reduction in aggregate GHG emissions<sup>116</sup>—a tiny portion of the proposed 80 percent reduction of the Obama Administration. Other analyses suggest this estimate is overly optimistic, and that NSPS is unlikely to reduce GHG emissions by more than five percent from existing facilities.<sup>117</sup> If the “80 by 50” goal is to be achieved, insufficient emission reductions in one sector will have to be made up elsewhere, and yet there does not appear to be any sector subject to EPA regulation capable of achieving emission reductions in excess of the “80 by 50” target.

The House-passed climate legislation endorsed by the Obama Administration would have greatly expanded federal regulation even further without solving the climate policy challenge. By one estimate it would have required nearly 150 federal agency rulemakings.<sup>118</sup> Another analysis of the bill concluded it required the EPA’s Administrator “to perform over six hundred tasks in connection with the operation of the law,” and created responsibilities for eleven more federal agencies and departments in addition to “multiple planning and reporting mandates for state governments.”<sup>119</sup> Yet despite all this regulatory effort, the bill would not have achieved its

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<sup>115</sup> See NATHAN RICHARDSON, ART FRAAS & DALLAS BURTRAW, GREENHOUSE GAS REGULATION UNDER THE CLEAN AIR ACT: STRUCTURE, EFFECTS, AND IMPLICATIONS OF A KNOWABLE PATHWAY, at 35 (Resources for the Future, Discussion Paper No. 10-23, 2010).

<sup>116</sup> *Id.*

<sup>117</sup> See Frank T. Litz & Nicholas M. Bianco, *What to Expect from EPA: Regulation of Greenhouse Gas Emissions Under the Clean Air Act*, 40 ENVTL. L. REP. 10480, 10482 Table II (2010).

<sup>118</sup> See E. Donald Elliott, *Lessons from Implementing the 1990 CAA Amendments*, 40 ENVTL. L. REP. 10592, 10592 (2010).

<sup>119</sup> See STEVEN F. HAYWARD & KENNETH P. GREEN, WAXMAN-MARKEY: AN EXERCISE IN UNREALITY, at 2 (American Enterprise Institute, Energy and Environmental Outlook No. 3, 2009).

stated goal of reducing GHG emissions by 80 percent,<sup>120</sup> let alone stemming anthropogenic global warming.

The unfortunate reality is that the “80 by 50” target is unrealistic given existing and projected technologies. Reducing emissions 80 percent below 2005 levels requires reducing emissions to their lowest point in a century.<sup>121</sup> Specifically, it means reducing emissions to the approximate level of 1910, when the nation’s population was only 92 million people and per capita income was below \$6,200.<sup>122</sup> By 2050, however, the population of the United States is expected to exceed 400 million, meaning that per capita emissions will need to be more than 75 percent below their 1910 level—somewhere in the neighborhood of 2.4 tons of carbon-dioxide-equivalent per year—or to levels not seen since the end of Reconstruction.<sup>123</sup> Even nations that derive much of their electricity from carbon-free sources, such as nuclear power, come nowhere close to this level.<sup>124</sup> 2.4 tons per year is close to the per capita GHG emissions of nations such as Grenada and Botswana.<sup>125</sup>

Even if the “80 by 50” goal were readily achievable through regulatory impositions, it would still be insufficient to stem the accumulation of GHGs in the atmosphere. The goal of atmospheric stabilization requires global action. Emissions anywhere on the globe contribute to

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<sup>120</sup> See Jesse Jenkins, *Analysis of Waxman-Markey ACES Climate Bill: Full Breakthrough Institute Collection*, BREAKTHROUGH BLOG (June 26, 2009, at 12:15 AM), [http://thebreakthrough.org/blog/2009/06/aces\\_analysis\\_full\\_breakthrough.shtml](http://thebreakthrough.org/blog/2009/06/aces_analysis_full_breakthrough.shtml); HAYWARD & GREEN, *supra* note 112. In most existing cap and trade programs credits “are heavily over-allocated and allow excessive banking of credits, undermining their effectiveness in achieving meaningful emission reductions.” Teresa B. Clemmer, *Staving Off the Climate Crisis: The Sectoral Approach Under the Clean Air Act*, 40 ENV. L. 1125, 1137-38 (2010); see also Lesley K. McAllister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*, 34 COLUM. J. ENVTL. L. 395 (2009).

<sup>121</sup> See HAYWARD & GREEN, *supra* note 112, at 3.

<sup>122</sup> *Id.* (per capita income in 2008 dollars). Hayward and Green’s calculations are based upon Department of Energy data.

<sup>123</sup> *Id.*

<sup>124</sup> France generates approximately 80 percent of its electricity with nuclear power, has much higher population density than the United States, and still has per capita emissions of over 6.5 tons per year. *Id.* at 3–4.

<sup>125</sup> *Id.* at 4.

the buildup of GHGs in the atmosphere, and it is the global atmospheric concentration of GHGs that drives climate change. Emissions in the United States could fall to zero and the climate problem would still not be solved if emissions continue to increase elsewhere. Indeed, even if all Western developed nations eliminated all net GHG emissions tomorrow, atmospheric concentrations would continue to climb for decades.<sup>126</sup>

The United Nations Framework Convention on Climate Change, agreed to in 1992, established the goal of stabilizing atmospheric concentrations of greenhouse gases at a level that avoids “dangerous interference with the climate system.”<sup>127</sup> While this level is not anywhere defined, it is generally accepted that this required stabilizing atmospheric concentrations to a level between 450 and 550 parts per million (ppm), if not lower, so as to avoid an average global temperature increase of 2 degrees Celsius.<sup>128</sup> Meeting such a goal requires more than marginal reductions in emissions from existing technologies. It would require truly revolutionary technological changes.<sup>129</sup> Simply allowing existing infrastructure to remain in place, even while

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<sup>126</sup> See INTERNATIONAL ENERGY AGENCY, WORLD ENERGY OUTLOOK 2008 48 (2008) (showing atmospheric GHG concentrations would still rise above 450ppm by mid-century even if OECD member nation emissions are excluded).

<sup>127</sup> United Nations Framework Convention on Climate Change, art. 2 May 9, 1992, 31 I.L.M. 849.

<sup>128</sup> See, e.g., S. Pacala & R. Socolow, *Stabilization Wedges: Solving the Current Climate Problem for the Next 50 Years with Current Technologies*, 305 SCI. 968, 968 (2004) (“Proposals to limit atmospheric CO<sub>2</sub> to a concentration that would prevent most damaging climate change have focused on a goal of 500 +/- 50 parts per million (ppm), or less than double the preindustrial concentration of 280 ppm.”). Some environmentalist organizations advocate a significantly lower target of 350 ppm, which would require even more ambitious measures. See Andrew C. Revkin, *Campaign Against Emissions Picks Number*, N.Y. TIMES, Oct. 24, 2009, at A8; see also 350.ORG, <http://www.350.org>.

<sup>129</sup> See, e.g., John Alic, et al., *A New Strategy for Energy Innovation*, 466 NATURE 316, 316 (2010) (“Limiting the concentration of carbon dioxide and other greenhouse gases in Earth’s atmosphere requires a technological and economic revolution.”); Scott Barrett, *The Coming Global Climate-Technology Revolution*, 23 J. ECON. PERSP. 53, 53 (2009) (“stabilizing concentrations will require a technological revolution—a ‘revolution’ because it will require fundamental change, achieved within a relatively short period of time”); Martin I. Hoffert, et al., *Advanced Technology Paths to Global Climate Stability: Energy for A Greenhouse Planet*, 298 SCI. 981, 981 (2002) (“Arguably, the most effective way to reduce CO<sub>2</sub> emissions with economic growth and equity is to develop revolutionary changes in the technology of energy production, distribution, storage, and conversion.”).

The challenge could be even greater than generally assumed, as it is possible that conventional estimates already incorporate unduly unrealistic assumptions about the rate of emission-reducing technological change in

stopping all additional development, would be enough by itself to approach the 450ppm lower bound.<sup>130</sup> And stopping global development is not an option.

GHG emissions have continued to increase with economic growth, despite gains in energy efficiency. Globally, emissions of carbon dioxide from fuel combustion, for example, increased 38 percent between 1990 and 2007.<sup>131</sup> Emissions in developing nations are climbing particularly rapidly in conjunction with much-needed economic development. In 2008, nearly 1.5 billion people around the world lacked access to electricity, including 809 million in Asia.<sup>132</sup> For affected nations, electrification is understandably a greater priority than emissions reduction. India and China, the first and fourth leading emitters of GHG, are essential to any atmospheric stabilization plan and yet have made clear that they will not participate in any regime which would require them to forego future economic growth.<sup>133</sup>

Because the atmosphere is a global commons, no country has much incentive to reduce its own emissions without the assurance that other nations will follow suit.<sup>134</sup> Worse, those countries most essential to the control of global emissions—the United States and China in

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business-as-usual scenarios. See Roger Pielke Jr., Tom Wigley & Christopher Green, *Dangerous Assumptions*, 452 NATURE 531, 531 (2008).

<sup>130</sup> See Stephen J. Davis, Ken Caldiera & H. Damon Matthews, *Future CO<sub>2</sub> Emissions and Climate Change from Existing Energy Infrastructure*, 329 SCI. 1330, 1330 (2010).

<sup>131</sup> See INTERNATIONAL ENERGY AGENCY, CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION: HIGHLIGHTS 44 (2010), available at <http://www.iea.org/co2highlights/CO2highlights.pdf>.

<sup>132</sup> See *Access to Electricity*, IEA.ORG, <http://www.iea.org/weo/electricity.asp> (last visited Feb. 21, 2011).

<sup>133</sup> According to Indian Prime Minister Manmohan Singh, “developing countries cannot and will not compromise on development.” See Ravi Nessman, *India: Climate Deal Can’t Sacrifice Poor Nations*, GUARDIAN (UK), Oct. 22, 2009, <http://www.guardian.co.uk/world/feedarticle/8767757>; L. Barber, *Transcript: Wen Jiabao*, FIN. TIMES, Feb. 2, 2009, <http://www.ft.com/cms/s/0/795d2bca-f0fe-11dd-8790-0000779fd2ac.html> (“it’s difficult for China to take quantified emission reduction quotas at the Copenhagen conference, because this country is still at an early stage of development”). See also Robert W. Hahn, *Climate Policy: Separating Fact from Fantasy*, 33 HARV. ENVTL. L. REV. 557, 564 (2009) (“there is no simple way to get major developing countries, such as India and China, to participate in an agreement”).

<sup>134</sup> See Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243 (1968).



particular—have the least incentive to act.<sup>135</sup> While some countries may be willing to enact environmental policies for the benefit of other nations because it is the “right thing” to do, the more expensive such measures are likely to be, the less likely it is that any individual nation will take such autonomous action. Even assuming a degree of non-self-interested behavior in international affairs, there is a limit to how great a cost individual nations will bear for the benefits of other nations or the world at large.<sup>136</sup>

If planet-wide GHG emission reductions are to be achieved, the cost of emission reductions will have to decline dramatically. Western developed nations have shown themselves unwilling to implement costly emission control policies, and developing nations are even more resistant to sacrificing economic growth to forestall projected climate changes. Recall that the international phase-out of chlorofluorocarbons under the Montreal Protocol was not agreed to until *after* it became economical to do so.<sup>137</sup> Climate change is a far more difficult, and more costly, problem. The reality is that “when policies focused on economic growth confront policies focused on emissions reductions, it is economic growth that will win out every time.”<sup>138</sup> Unless and until it becomes easier—and far less costly—to meet the world’s economic and development needs while controlling GHG emissions, it will not happen.

## V. PLOTTING AN ALTERNATIVE COURSE

Reducing net emissions so as to reduce atmospheric GHG concentrations, while maintaining economic growth and expanding access to energy for those in developing nations,

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<sup>135</sup> See Cass R. Sunstein, *The World vs. the United States and China? The Complex Climate Change Incentives of the Leading Greenhouse Gas Emitters*, 55 UCLA L. REV. 1675 (2008).

<sup>136</sup> See Hahn, *supra* note 127, at 576 (“[D]omestic energy politics will constrain the approaches that particular countries will take to reducing emissions.”).

<sup>137</sup> Cass R. Sunstein, *Of Montreal and Kyoto: A Tale of Two Protocols*, 31 Harv. Envtl. L. Rev. 1, 5 (2007).

<sup>138</sup> PIELKE, *supra* note 9, at 46.

cannot be achieved with existing or readily foreseeable technologies.<sup>139</sup> According to a recent report of the National Academy of Sciences, atmospheric stabilization “will require scientific and engineering genius to create new energy systems that avoid emitting all but a small fraction of today’s GHGs while simultaneously powering global economic growth.”<sup>140</sup>

Centralized federal regulation is a poor match for the climate policy challenge. Regulatory requirements may work tolerably well at mandating the diffusion and adoption of viable technologies, but command-and-control regulation has a poor record at driving technological advancement in a desired direction, particularly where revolutionary innovations are required.<sup>141</sup> Market-based regulatory systems, including “cap and trade” systems, have not fared much better. The Clean Air Act’s acid rain program may well have reduced the cost of reducing sulfur dioxide emissions through the use of a tradable permit mechanism, but the program did not significantly drive technological innovation.<sup>142</sup> The emissions reduction targets imposed by the program were “well within the range of capabilities of existing technology,” and thus did more to encourage diffusion of pollution control innovations that were already available.<sup>143</sup>

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<sup>139</sup> Jason Scott Johnson, *A Looking Policy Disaster*, REG., Fall 2008, at 40 (“[R]eally large reductions in greenhouse gas emissions depend upon the widespread adoption of new technologies that are either not yet technologically and economically feasible – most prominently carbon capture and sequestration – or whose large-scale implementation possibilities are seeming inherently limited and are at best unclear . . .”).

<sup>140</sup> NAT’L ACAD. OF SCI., *LIMITING THE FUTURE MAGNITUDE OF CLIMATE CHANGE* ix (2010); see also Martin I. Hoffert, et al., *Advanced Technology Paths to Global Climate Stability: Energy for A Greenhouse Planet*, 298 SCI. 981, 981 (2002) (“Arguably, the most effective way to reduce CO<sub>2</sub> emissions with economic growth and equity is to develop revolutionary changes in the technology of energy production, distribution, storage, and conversion.”).

<sup>141</sup> See Jonathan H. Adler, *Eyes on a Climate Prize: Rewarding Energy Innovation to Achieve Climate Stabilization*, 35 HARV. ENV. L. REV. 1, 35-42 (2011).

<sup>142</sup> See David M. Driesen, *An Environmental Competition Statute*, in *BEYOND ENVIRONMENTAL LAW: POLICY PROPOSALS FOR A BETTER ENVIRONMENTAL FUTURE* 175–76 (Alyson C. Flournoy & David M. Driesen eds., 2010).

<sup>143</sup> See Lee Lane, *The Green Movement and the Challenge of Climate Change*, AEI ENERGY AND ENVIRONMENT OUTLOOK (Feb. 2009), at 3; Anne E. Smith, Jeremy Platt & A. Denny Ellerman, *The Costs of Reducing SO<sub>2</sub> Emissions—Not as Low as You Might Think*, (Center for Energy and Environmental Policy Research, Working Paper 98010, 1998).

If the United States and other nations of the world are to have any hope of stabilizing atmospheric concentrations of GHGs at a desirable level, dramatic technological innovation is required. Therefore, climate policy efforts should focus, first and foremost, on spurring and facilitating precisely that type of innovation. Regulatory mandates of the sort being pursued by the EPA under the Clean Air Act divert limited public and private resources and emphasize measures that provide few climate mitigation benefits.

A climate policy focused on technological innovation would eschew regulatory mandates and focus on creating incentives for innovation and accelerating the diffusion of low-carbon technologies. Such a policy agenda might include some of the following elements:

- *Technology-Inducement Prizes*: A more promising means of encouraging technological innovation than traditional *ex ante* R&D grants is the endowment of large financial prizes for those who successfully develop technologies capable of meeting identifiable climate-related needs, such as more powerful battery and power storage technologies, more efficient and reliable forms of renewable energy, more energy efficient infrastructure, and less costly carbon sequestration technologies.<sup>144</sup>
- *Reducing Barriers to Alternative Energy Sources*: New technologies often face sizable regulatory hurdles. This is as true with renewable energy sources as it has been with nuclear power. Proposed development of off-shore wind farms, tidal power, and other low- or zero-carbon energy sources have been delayed and made more costly by various regulatory requirements. If such technologies are to be adopted, regulatory barriers to their adoption must be reduced.

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<sup>144</sup> The value of technology inducement prizes in climate policy is discussed at length in Adler, *supra* note 141.

- *Encouraging Diffusion through Procurement:* Federal procurement provides the federal government with substantial power to drive the development and diffusion of technologies in the markets for various goods and services. The federal government should develop procurement guidelines that provide substantial incentive for the development and marketing of low-carbon technologies and services.
- *Shift the Tax Burden to from Labor and Wealth Creation to Carbon:* A sure way to increase the incentive to reduce the use of carbon-based fuels, increase energy efficiency, and provide incentives on the margin for the development and adoption of climate-friendly technologies is to place a price on carbon. The easiest way to do this would be to replace existing taxes on labor and wealth creation, including some payroll, income and corporate taxes, with taxes on the carbon content of fuels.<sup>145</sup>

This is not an exhaustive list of potential policy measures, but it provides an idea of the sorts of things policymakers could do to emphasize and accelerate the development and diffusion of climate-friendly technologies to make atmospheric stabilization an economically and practically viable alternative.

## CONCLUSION

Global climate change may be the most difficult environmental challenge humanity has ever faced. Addressing concerns about global warming without unnecessarily curtailing

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<sup>145</sup> See Michael J. Waggoner, *The House Erred: A Carbon Tax Is Better than Cap and Trade*, TAX NOTES, Sept. 21, 2009; Reuven S. Avi-Yonah & David M. Uhlmann, *Combating Global Climate Change: Why a Carbon Tax Is a Better Response to Global Warming than Cap and Trade*, 28 STAN. ENV. L. J. 3 (2009).

individual liberty and economic growth is an even greater challenge, though. Because carbon dioxide and other GHGs are so ubiquitous, it is difficult for governments to control GHG emissions without controlling large portions of the economy and suppressing future economic growth.

The Obama Administration has moved aggressively to curtail GHG emissions. These efforts are likely to impose substantial costs and expand federal regulatory power, but are unlikely to significantly mitigate, let alone prevent, global climate change. Even substantial emission reductions will not alter the climate's trajectory to any meaningful degree, and those measures capable of stabilizing the atmosphere today are unthinkable in a liberal society. If the threat of global climate change is to be addressed at an acceptable cost to economic liberty and human prosperity, policymakers must chart a new course that emphasizes technological innovation and provides incentives to adopt low-carbon technologies as they become available. Only this approach has the hope of keeping us free and cool.