



Climate Change: Potential Regulation of Stationary Greenhouse Gas Sources Under the Clean Air Act

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Summary

In the 111th Congress, both the House and Senate committees of jurisdiction are expected to give climate change legislation high priority. The House Energy and Commerce Committee has already held hearings on draft legislation, and expects to hold markup before Memorial Day. The schedule for Senate action is less certain, but presumably it will follow House consideration. With the inauguration of President Obama, there is a proponent of greenhouse gas (GHG) legislation in the White House, as well, markedly improving the prospects for enacting some sort of legislation to reduce GHG emissions.

Although new legislation to address greenhouse gases is a leading priority of the President and many members of Congress, the ability to limit these emissions already exists under various Clean Air Act authorities that Congress has enacted, a point underlined by the Supreme Court in an April 2007 decision, *Massachusetts v. EPA*. Indeed, the EPA has already begun the process that could lead to greenhouse gas regulations for motor vehicles in response to that court decision.

Thus, controlling GHGs could follow a two-track approach, with Congress and the Administration pursuing new legal authority (for cap-and-trade, carbon tax, or other mechanisms) at the same time that the Administration, through the Environmental Protection Agency (EPA), exercises existing authority under the Clean Air Act to begin regulation of greenhouse gas emissions.

The key to using the Clean Air Act's authority is for the EPA Administrator to find that GHG emissions are air pollutants that endanger public health or welfare. The Administrator proposed such an endangerment finding April 17, 2009, beginning a public comment period that is expected to run through June. It should be noted, despite EPA's apparent commitment to move forward with an endangerment finding, that EPA Administrator Jackson and others in the Administration have made clear their preference that Congress address the climate issue through new legislation.

If an endangerment finding is finalized, the agency could proceed to set GHG emission standards for motor vehicles. (A separate report, CRS Report R40506, *Cars and Climate: What Can EPA Do to Control Greenhouse Gases from Mobile Sources?*, discusses the endangerment finding and possible controls on mobile source GHGs.) The finding might also lead the agency and state permitting authorities to establish controls for stationary sources, including electric power plants and other industrial sources that account for the largest share of GHG emissions.

This report discusses EPA's authority to control GHG emissions from stationary sources under the Act, and the various options that EPA could exercise. Of these, perhaps the strongest basis for establishing a traditional regulatory approach would be Section 111 of the CAA, which provides authority to set New Source Performance Standards and, under Section 111(d), requires the states to control emissions from existing sources of the same pollutants. Other sections of the Act, not previously used, might provide authority to establish a cap-and-trade system for GHG emissions.

The report is not a legal analysis. Our intention is to describe legal issues and arguments that have been raised and to discuss potential EPA approaches to their resolution, without drawing legal conclusions.

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Introduction

In the 111th Congress, both the House and Senate committees of jurisdiction are expected to give climate change legislation high priority. The House Energy and Commerce Committee has already held hearings on draft legislation, and expects to hold markup before Memorial Day. The schedule for Senate action is less certain, but presumably it will follow House consideration. With the inauguration of President Obama, there is a proponent of greenhouse gas (GHG) legislation in the White House, as well, markedly increasing the probability for enacting some sort of legislation to reduce GHG emissions. The President has said that a new energy, environment, and climate policy will be “a leading priority of my presidency, and a defining test of our time.”

Although new legislation to address greenhouse gases is a leading priority of the President and many members of Congress, the ability to limit these emissions already exists under various Clean Air Act (CAA) authorities that Congress has enacted, a point underlined by the Supreme Court in an April 2007 decision (discussed below). Indeed, the U.S. Environmental Protection Agency (EPA) has already begun the process that could lead to greenhouse gas regulations for mobile sources in response to court decisions.

If EPA moves to regulate greenhouse gases from mobile sources, legal and policy drivers would be activated that could lead to regulation of stationary sources as well. The legal drivers are beyond the scope of this report, which is focused on the policy options and control alternatives available to EPA if it were to use existing authorities to regulate greenhouse gases from stationary sources.

Indeed, stationary sources are the major sources of the country’s greenhouse gas emissions. Overall, 72% of U.S. emissions of greenhouse gas come from stationary sources (the remainder come from mobile sources). As indicated in Table 1, relatively large sources of fossil-fuel combustion and other sources are responsible for about one-half the country’s total emissions. If EPA were to embark on a serious effort to reduce greenhouse gas emissions, stationary sources, and in particular large stationary sources, would have to be included. This concentration of greenhouse gas emissions is even more important from a policy standpoint: reductions in greenhouse gas emissions from these sectors are likely to be more timely and cost-effective than attempts to reduce emissions from the transport sector.

This report discusses three major paths and two alternate paths of statutory authorities that have been identified by EPA and others as possible avenues the agency might take in addressing greenhouse gas emissions under existing CAA provisions. After discussing the approaches, we identify categories of control options EPA could consider, including an EPA-coordinated cap-and-trade program. Then we discuss the administrative difficulties in using the Clean Air Act for greenhouse gas control, particularly New Source Review and Title V permitting requirements. Finally, we conclude by putting the issue into the context of previous environmental challenges the CAA has faced.

Table 1. Selected U.S. Stationary Sources of Greenhouse Gases

Source	2007 Emissions	% of Total GHGs
Electricity Generation (CO₂, CH₄, N₂O)		
Coal-fired	1977.7	27.8%
Natural gas-fired	374.1	5.3%
Fuel Oil-fired	55.4	0.8%
Industrial fossil-fuel combustion (CO₂, CH₄, N₂O) Mostly Petroleum refineries, chemicals, primary metals, paper, food, and nonmetallic mineral products		
Coal-fired	108.1	1.5%
Natural gas-fired	385.6	5.4%
Fuel Oil-fired	353.3	5.0%
Industrial Processes		
Iron and Steel Production (CO ₂ , CH ₄)	74.3	1.0%
Cement Production (CO ₂)	44.5	0.6%
Nitric Acid Production (N ₂ O)	21.7	0.3%
Substitution of Ozone Depleting Substances (HFCs)	108.3	1.5%
Other		
Natural Gas Systems (CO ₂ , CH ₄)	133.4	1.9%
Waste Incineration (CO ₂ , N ₂ O)	21.2	0.3%
TOTAL	3657.6	51.3%

Source: EPA inventory, April 2009.

The Entry Point: *Massachusetts vs. EPA*

A regulatory approach using existing Clean Air Act authorities has been under consideration at EPA for more than a decade. In 1998, EPA's General Counsel, Jonathan Cannon, concluded in a memorandum to the EPA Administrator that greenhouse gases were air pollutants within the Clean Air Act's definition of the term, and therefore could be regulated under the Act.¹ Relying on the Cannon memorandum as well as the statute itself, on October 20, 1999, a group of 19

¹ Memorandum from Jonathan Z. Cannon, EPA General Counsel, to Carol M. Browner, EPA Administrator, EPA's Authority to Regulate Pollutants Emitted by Electric Power Generation Sources (April 10, 1998).

organizations petitioned EPA to regulate greenhouse gas emissions from new motor vehicles under Section 202 of the Act.² Section 202 gives the EPA Administrator broad authority to set “standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles” if in her judgment they contribute to air pollution which “may reasonably be anticipated to endanger public health or welfare.”

EPA denied the petition in 2003³ on the basis of a new General Counsel memorandum issued the same day in which the General Counsel concluded that the CAA does not grant EPA authority to regulate CO₂ and other GHG emissions based on their climate change impacts.⁴ The denial was challenged by Massachusetts, eleven other states, and various other petitioners in a case that ultimately reached the Supreme Court. In an April 2, 2007 decision (*Massachusetts v. EPA*), the Court found by 5-4 that EPA *does* have authority to regulate greenhouse gas emissions, since the emissions are clearly “air pollutants” under the Clean Air Act’s definition of that term.⁵ The Court’s majority concluded that EPA must, therefore, decide whether emissions of these pollutants from new motor vehicles contribute to air pollution that may reasonably be anticipated to endanger public health or welfare. If it makes this finding of endangerment, the Act requires the agency to establish standards for emissions of the pollutants.⁶

The Advance Notice of Proposed Rulemaking (ANPR)

For nearly two years following the Court’s decision, the Bush Administration’s EPA did not respond to the original petition nor make a finding regarding endangerment. Its only formal action following the Court decision was to issue a detailed information request, called an Advance Notice of Proposed Rulemaking (ANPR), on July 30, 2008.⁷

The ANPR occupied 167 pages of the *Federal Register*. Besides requesting information, it took the unusual approach of presenting statements from the Office of Management and Budget, four Cabinet Departments (Agriculture, Commerce, Transportation, and Energy), the Chairman of the Council on Environmental Quality, the Director of the President’s Office of Science and Technology Policy, the Chairman of the Council of Economic Advisers, and the Chief Counsel for Advocacy at the Small Business Administration, each of whom expressed their objections to

² The lead petitioner was the International Center for Technology Assessment (ICTA). The petition may be found on their website at <http://www.icta.org/doc/ghgpet2.pdf>.

³ The agency argued that it lacked statutory authority to regulate greenhouse gases: Congress “was well aware of the global climate change issue” when it last comprehensively amended the Clean Air Act in 1990, according to the agency, but “it declined to adopt a proposed amendment establishing binding emissions limitations.” *Massachusetts v. EPA*, 549 U.S. 497 (2007).

⁴ Memorandum from Robert E. Fabricant, EPA General Counsel, to Marianne L. Horinko, EPA Acting Administrator, EPA’s Authority to Impose Mandatory Controls to Address Global Climate Change Under the Clean Air Act (August 28, 2003).

⁵ *Massachusetts v. EPA*, 549 U.S. 497 (2007). The majority held: “The Clean Air Act’s sweeping definition of ‘air pollutant’ includes ‘any air pollution agent or combination of such agents, including any physical, chemical ... substance or matter which is emitted into or otherwise enters the ambient air....’ ... Carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons are without a doubt ‘physical [and] chemical ... substances[s] which [are] emitted into ... the ambient air.’ The statute is unambiguous.”

⁶ For further discussion of the Court’s decision, see CRS Report RS22665, *The Supreme Court’s Climate Change Decision: Massachusetts v. EPA*, by Robert Meltz.

⁷ U.S. EPA, “Regulating Greenhouse Gas Emissions Under the Clean Air Act,” 73 *Federal Register* 44354, July 30, 2008.

regulating greenhouse gas emissions under the Clean Air Act. The OMB statement began by noting that, “The issues raised during interagency review are so significant that we have been unable to reach interagency consensus in a timely way, and as a result, this staff draft cannot be considered Administration policy or representative of the views of the Administration.”⁸ It went on to state that “... the Clean Air Act is a deeply flawed and unsuitable vehicle for reducing greenhouse gas emissions.”⁹ The other letters concurred. The ANPR, therefore, was of limited use in reaching a conclusion on the endangerment issue and, in any event, it presents the views of an Administration no longer in office.

The current Administration made review of the endangerment issue a high priority. On April 17, 2009, EPA proposed a finding that GHGs do endanger both public health and welfare and that GHGs from new motor vehicles contribute to that endangerment.¹⁰ Publication of the proposal in the *Federal Register* on April 24 began a 60-day public comment period. In addition, public hearings will be held May 18 in Arlington, VA, and May 21 in Seattle, WA.

Potential Implications for Stationary Sources

While there has been considerable speculation in the literature about the meaning of *Massachusetts v. EPA* for stationary sources, there have also been several attempts to invoke the various authorities of the Clean Air Act to begin controlling greenhouse gas emissions from stationary sources.¹¹ Among the legal initiatives currently underway are the following:

- In 2006, the EPA revised the New Source Performance Standard (NSPS) for electric utilities and other steam generating units without including any CO₂ standard, or other requirement. Led by New York, several states filed a petition for review of the new NSPS, challenging the omission of any CO₂ requirement. In September 2007 the D.C. Circuit Court of Appeals remanded the case back to EPA for further proceedings “in light of *Massachusetts v. EPA*.”¹²
- In 2007, EPA Region 8 granted a Prevention of Significant Deterioration (PSD) permit authorizing construction of a waste-coal-fired electric generating plant near Bonanza, Utah. Appealing the decision, the Sierra Club argued to the Agency’s Environmental Appeals Board (EAB) that because the Court had found in *Massachusetts v. EPA* that CO₂ was an air pollutant under the Act, and that EPA has imposed CO₂ monitoring and reporting requirements, the Bonanza plant was required to install Best Available Control Technology (BACT) for CO₂ emissions. The EAB rejected the Sierra Club’s interpretation of the PSD-NSR language, but remanded it back to Region 8 for reconsideration of a CO₂ BACT requirement.¹³ In another PSD-NSR (New Source Review) case, EPA Region 9

⁸ “Regulating Greenhouse Gas Emissions Under the Clean Air Act,” 73 *Federal Register* 44356, July 30, 2008.

⁹ *Ibid.*

¹⁰ Environmental Protection Agency, “Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act,” PrePublication Copy, April 17, 2009, at <http://epa.gov/climatechange/endangerment/downloads/GHGEndangermentProposal.pdf>.

¹¹ For a legal discussion of these initiatives, see CRS Report RL32764, *Climate Change Litigation: A Survey*, by Robert Meltz.

¹² *New York v. EPA*, No 06-1322 (D.C. Cir., September 24, 2007)

¹³ The Board rejected the Region’s argument that it was limited by an historical agency interpretation to read “subject to regulation” as meaning “subject to a statutory or regulatory provision that requires actual control of emissions of that (continued...) ”

filed a motion with the EAB in April 2009 for a voluntary remand of the PSD permit for the Desert Rock coal-fired power plant in New Mexico to allow for a reconsideration of its permit to include a CO₂ limitation. Region 9 wants to reconsider its decision not to require Desert Rock to install “carbon-ready” integrated gasification combined-cycle technology instead of allowing current pulverized-coal technology.¹⁴

- In 2009, the Environmental Integrity Project, an environmental group, filed a complaint with the D.C. Circuit Court to force the EPA to review nitrous oxide (N₂O) emissions from nitric acid plants.¹⁵ The group argues that EPA has not reviewed the NSPS for such plants since 1984, despite the statutory requirements for periodic reviews.

It should be noted that amidst this legal activity and EPA’s apparent commitment to move forward with an endangerment finding, EPA Administrator Jackson and others in the Administration have made clear that their preference would be for Congress to address the climate issue through new legislation. In the press release announcing the proposed endangerment finding, the agency stated, “Notwithstanding this required regulatory process, both President Obama and Administrator Jackson have repeatedly indicated their preference for comprehensive legislation to address this issue and create the framework for a clean energy economy.”

Potential Paths for GHG Stationary Source Control

When looking at the CAA from the point of view of reducing GHGs from stationary sources, three existing paths are available. As indicated in Table 2, the three paths are (1) to regulate GHGs as criteria air pollutants, (2) to regulate GHGs as hazardous air pollutants, or (3) to regulate GHGs as designated air pollutants. Each of these paths are discussed below, along with two lesser explored trails: Section 115 and Title VI.

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pollutant.” Since EPA has yet to issue a CAA regulation requiring actual control of CO₂ emissions, Region 8 argued, BACT for CO₂ is not required. Hence, the Board remanded the permit to the Region for it to reconsider whether to impose a CO₂ BACT limit. Deseret Power Electric Cooperative, PSD Appeal No. 07-03 (E.A.B. November 13, 2008).

¹⁴ For more information on Desert Rock’s PSD-NSR permit, see <http://www.epa.gov/region09/air/permit/desert-rock/>.

¹⁵ Complaint at 2, *Environmental Integrity Project v. EPA*, No. 1:09-cv-00218 (D.C. Circuit, filed February 4, 2009).

Table 2. Simplified Requirements under Title I for Most Stationary Sources

	Section 109 (NAAQS)	Section 112 (Air Toxics)	Sections 111(d)/129 (Designated Pollutants)
Minimum Controls	New/Modified Source: EPA-determined NSPS under Sec. 111	New Source: EPA-determined MACT under Sec. 112	New/Modified Source: EPA-determined NSPS under Sec. 111
	Existing Source: Depends on area's attainment status/ visibility provisions	Existing Source: Less stringent EPA- determined MACT	Existing Source: State determination under EPA standards issued under Sec. 111(d)
Implementing Provisions	State Implementation Plans under Sec. 110 New Source Review (NSPS, PSD, nonattainment) Sec. 126 Petitions	Statutory list under Sec. 112(b)(1) EPA determination under Sec. 112(b)(2) or (b)(3)	Designated Pollutant Plans under Sec. 111(d)/129 New Source Review (PSD)

Notes: NAAQS stands for National Ambient Air Quality Standard and is discussed below. MACT stands for Maximum Achievable Control Technology and is discussed after the discussion of NAAQS.

Path 1: Regulating GHG through National Ambient Air Quality Standards (NAAQS)

Importance of NAAQS

The backbone of the Clean Air Act is the creation of National Ambient Air Quality Standards (NAAQS). The need to attain NAAQS, which are set at levels designed to protect public health without consideration of costs or economic impact, is the driving force behind much of clean air regulation.

The authority for NAAQS is found in Sections 108 and 109 of the Act. Under Section 108, EPA is to identify air pollutants that, in the Administrator's judgment, endanger public health or welfare, and whose presence in ambient air results from numerous or diverse sources. Under Section 109, EPA is required to set NAAQS for the identified pollutants.

Section 109 requires the EPA Administrator to set both primary and secondary NAAQS. Primary NAAQS must be set at a level that will protect public health with an adequate margin of safety. Secondary NAAQS are required to protect public welfare from "any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air." Public welfare covers damage to crops, vegetation, soils, wildlife, water, property, building materials, etc., and such broader variables as visibility, climate, economic values, and personal comfort and well-being.

Over the years, EPA has identified six air pollutants or categories of air pollutants for NAAQS: sulfur dioxide (SO₂), particulate matter (PM_{2.5} and PM₁₀), nitrogen dioxide (NO₂), carbon monoxide (CO), ozone, and lead. These six are referred to as "criteria" pollutants. Each of the criteria pollutants was identified for NAAQS regulation in the 1970s. Since that time, although

the specific standards (the allowed concentrations) have been reviewed and modified, no new criteria pollutants have been identified.

NAAQS and Controlling GHGs

If carbon dioxide (CO₂) or other greenhouse gases were identified as criteria pollutants, NAAQS would then have to be set. CO₂, the most important greenhouse gas, is arguably an air pollutant that endangers public health or welfare,¹⁶ and its presence in ambient air results from numerous or diverse sources. Thus, it meets the basic criteria of Section 108. But setting a NAAQS for CO₂ raises a number of potential issues, four of which are discussed in the following sections.

Setting a Standard

An initial difficulty would arise in choosing a level at which to set a NAAQS. Primary and secondary NAAQS are expressed as concentrations of the pollutant in ambient air that endanger public health or welfare. For the six current criteria pollutants, the focus has been on setting *primary* (health-based) standards—i.e., identifying a concentration in ambient air above which ambient concentrations of the pollutant contribute to illness or death. These standards are based on both concentration-response studies undertaken in laboratory conditions (often animal studies, but some involving humans), and on epidemiology that demonstrates a correlation between greater exposure to the pollutant and higher rates of morbidity and mortality.

For CO₂ at current and projected levels, there are not the same direct linkages between higher concentrations and health as there are for each of the current NAAQS. A person exposed to current ambient levels of CO₂ will not be sickened. Nor is it likely that one could demonstrate a connection between CO₂ and morbidity or mortality through epidemiology, in part because CO₂ concentrations are relatively uniform across the globe and change very slowly. The argument that can be made is more indirect: that higher levels of CO₂ are likely over time to cause higher temperatures, and higher temperatures and associated changes in climate-related processes are likely to have health consequences.

If EPA concluded that this connection between CO₂, higher temperatures, and human health were sufficient to justify establishing a primary NAAQS, it would still be difficult to pick out a specific CO₂ concentration for a standard. Among scientists concerned about greenhouse gas concentrations, some argue for a level of 350 parts per million (ppm) as the concentration that must be attained,¹⁷ others argue for 450 ppm, and some for levels of 550-600 ppm. Current

¹⁶ We say “arguably” because EPA has not yet made this endangerment finding (although it has proposed doing so), and there are climate skeptics who would dispute whether such a finding is justified. On the other hand, the vast majority of the climate science community, as represented by the Intergovernmental Panel on Climate Change, have concluded that “[w]arming of the climate system is unequivocal ...,” and “[m]ost of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations.” Further, “Most impacts are expected to be adverse (e.g., lower agricultural productivity in many regions, drought, rising sea levels, spread of disease vectors, greater needs for cooling).” See CRS Report RL34266, *Climate Change: Science Highlights*, by Jane A. Leggett. Within EPA, it would appear that the relevant staff concluded that an endangerment finding was justified in 2007, but the agency took no action as the result of the involvement of other agencies and the White House. See Testimony of Jason Burnett, Former Associate Deputy Administrator, EPA, at Senate Environment and Public Works Committee, “Regulation of Greenhouse Gases under the Clean Air Act,” Hearing, September 23, 2008.

¹⁷ The argument for 350 ppm is based largely on concern over melting glaciers, polar ice caps, and sea level, not direct (continued...)

concentrations in the Earth's atmosphere are about 385 ppm, increasing by 1 or 2 ppm per year. The mechanics of implementing a standard will be discussed in greater detail below, but it is important to note here that unless one chose a standard at or below the current ambient level, establishing a primary NAAQS would have no consequence. It is only if ambient concentrations of the pollutant exceed the standard that action must be taken.

A further point regarding the setting of a NAAQS is the importance of distinguishing primary from secondary standards. If one were to set a NAAQS for CO₂ or other GHGs, it is perhaps the secondary NAAQS that is most relevant to the discussion. As noted above, secondary NAAQS are designed to prevent damage to crops, vegetation, soils, wildlife, water, property, building materials, etc. and such broader variables as visibility, climate, economic values, personal comfort and well-being.

EPA—under both Democratic and Republican Presidents—has generally given short shrift to the setting of secondary NAAQS: most have been set at a level identical to the primary standard, with little discussion of the agency's reasoning. In part, this is because secondary NAAQS have no deadlines attached to their attainment and there is no enforcement mechanism or penalty for failure to attain them.

Thus, it would hardly be worth the effort to establish a NAAQS for GHGs unless one could establish a defensible case for a specific primary standard that was below ambient levels. Primary NAAQS, unlike their secondary kin, do have deadlines: there are consequences for a failure to attain them in a timely manner.

Identifying Nonattainment Areas

If a CO₂ or GHG NAAQS were set by EPA, the next step would be to identify nonattainment areas (i.e., areas where ambient concentrations of CO₂ and/or other GHGs exceed the NAAQS). The procedure for doing so is specified under Section 107 of the Act. For the six current criteria pollutants, there are distinct local and regional concentrations of each pollutant that can generally be linked to stationary or mobile sources in the area. In some cases, the sources may be relatively distant, with pollutants (or precursors) emitted hundreds of miles away. But with all of the current criteria pollutants, there are significant variations in local and regional concentrations, and only those areas with pollutant readings higher than the NAAQS are designated “nonattainment.”

For CO₂, this would not be the case. Concentrations are relatively homogeneous across the entire country—indeed, across the world. Thus, the entire United States would need to be designated nonattainment if concentrations exceeded the standard.

Developing State Implementation Plans

A third element of NAAQS that appears ill-suited to the regulation of GHGs is the mechanism used to bring about compliance with NAAQS, the State Implementation Plan (SIP) provisions in Section 110 and Sections 171-179B. SIPs describe the sources of pollution in a nonattainment area and the methods that will be used by the area to reduce emissions sufficiently to attain the

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public health considerations.

standard. They are required to be developed and submitted to EPA for each nonattainment area within three years of its designation.

SIPs build on some national standards (for new motor vehicles and new or modified power plants, for example), but they assume that most sources of the pollution to be controlled are local, and therefore, that the measures needed to reach attainment are measures tailored to local conditions. To the extent that significant emission sources are located in other states, downwind states are authorized under Section 126 to petition EPA for controls on such upwind sources.

If pollution is uniform throughout the country, there is no reason why the measures taken to reduce it should vary from locality to locality. Nor will a nonattainment area be able to demonstrate that its pollution control measures will have any measurable impact on the ambient concentration of most greenhouse gases. Thus, State Implementation Plans tailored to each nonattainment area would be ill-suited to the nature of the problem.

Attaining the Standard

It is also unlikely that any state or nonattainment area on its own could demonstrate reasonable further progress toward attainment of the standard (as is required by Section 172), particularly within the 5- to 10-year period specified in Section 172 for attainment of a NAAQS. Greenhouse gases accumulate in the atmosphere, and some can take hundreds of years to diminish, even if current global emissions decline. Global emissions are increasing. Individual states and nonattainment areas would have little chance of reversing this trend through any set of actions they might undertake on their own.

Path 2: Regulating GHGs through Section 112 as Hazardous Air Pollutants

Importance of Section 112

As revised by the 1990 CAA amendments, Section 112 contains four major provisions: Maximum Achievable Control Technology (MACT) requirements for major sources; health-based standards to be imposed for the residual risks remaining after imposition of MACT standards; standards for stationary “area sources” (small, but numerous sources, such as gas stations or dry cleaners, that collectively emit significant quantities of hazardous pollutants); and requirements for the prevention of catastrophic releases. The MACT and area source provisions would appear to be the most relevant, if GHGs were to be controlled under this section.

The MACT provisions require EPA to set standards for sources of the listed pollutants that achieve “the maximum degree of reduction in emissions” taking into account cost and other non-air-quality factors. MACT standards for new sources “shall not be less stringent than the most stringent emissions level that is achieved in practice by the best controlled similar source.” The standards for existing sources may be less stringent than those for new sources, but generally must be no less stringent than the average emission limitations achieved by the best performing 12% of existing sources. Existing sources are given three years following promulgation of standards to achieve compliance, with a possible one-year extension; additional extensions may be available for special circumstances or for certain categories of sources.

In addition to the technology-based standards for major sources of hazardous air pollution, Section 112 requires EPA to establish standards for stationary “area sources” (small, but numerous, sources such as gas stations or dry cleaners, that collectively emit significant quantities of hazardous air pollutants). In setting these standards, EPA can impose less stringent “generally available” control technologies, rather than MACT.

Section 112 and Controlling GHGs

Could EPA regulate GHG emissions as hazardous air pollutants under Section 112? In its comments on the ANPR, the Bush Administration’s Department of Energy stated that “... it is widely acknowledged that a positive endangerment finding could lead to ... the listing of one or more greenhouse gases as hazardous air pollutants (HAP) under section 112.”¹⁸ EPA, on the other hand, was more circumspect in its analysis, stating:

The effects and findings described in section 112 are different from other sections of the CAA addressing endangerment of public health discussed in previous sections of today’s notice. Given the nature of the effects identified in section 112(b)(2), we request comment on whether the health and environmental effects attributable to GHG fall within the scope of this section.¹⁹

The language of Section 112 refers to pollutants that may present a threat of adverse human health effects or adverse environmental effects. This language might be broad enough that GHGs could be categorized as hazardous air pollutants and subjected to the regulatory tools provided by the section, but because the section was written to apply to carcinogenic and other toxic air pollutants present in emissions in small quantities, there would be questions as to whether Congress intended the use of the section’s authority for pollutants such as GHGs. The legislative history of the Act makes clear that it was designed primarily to regulate pollutants commonly referred to as “air toxics.” Hazardous air pollutants are defined as “any pollutant listed pursuant to subsection [112](b).” Congress provided an initial list of 189 hazardous air pollutants in that subsection, and it established criteria and procedures for revising the list in Section 112(b)(2). In the 18 years since the criteria were established, EPA has not added any substances to the list.

The procedures for revising the list provide that the Administrator may do so “by rule,” adding pollutants that may present, through inhalation or other routes of exposure, a threat of adverse human health effects, or, through a variety of routes of exposure, adverse environmental effects. The human health effects language is qualified with wording that suggests the type of pollutants Congress had in mind when it drafted this section: substances that include, but are not limited to, ones known or reasonably anticipated to be carcinogenic, mutagenic, teratogenic, neurotoxic, acutely or chronically toxic, or which cause reproductive dysfunction.

The section is also not well-suited to the most common GHGs, such as CO₂, that are emitted in very large quantities. For example, it defines a major source as one that emits 10 tons per year or more of any hazardous air pollutant. Annual CO₂ emissions in the United States are about 6 billion metric tons, and hundreds of thousands, perhaps millions of sources (including large residential structures) might qualify as major sources if CO₂ were listed as a hazardous air pollutant under this section.

¹⁸ 73 *Federal Register* 44367, July 30, 2008.

¹⁹ *Ibid.*, p. 44493.

Section 112 might be useful, if at all, for regulating small volume chemicals that are very potent greenhouse gases: sulfur hexafluoride (SF₆), for example. SF₆ has a global warming potential 22,800 times as great as CO₂ and accounted for about one-quarter of one percent of total U.S. GHG emissions in 2007, when measured by its global warming potential. SF₆ emissions were 16.5 million metric tons of CO₂-equivalent in that year. Actual emissions expressed as SF₆, however, were only 690 metric tons. Nitrogen trifluoride (NF₃), another chemical with low emission levels but high global warming potential, might be another candidate, if EPA chose this regulatory route. Section 112 generally considers a major source of emissions to be one that emits more than 10 tons per year of a hazardous air pollutant, and it allows the Administrator to establish a lesser quantity as the major source threshold, based on the potency of the air pollutant or other relevant factors.

Once the source categories for hazardous air pollutants are identified, Section 112 establishes a presumption in favor of regulation of the designated pollutants; it requires regulation unless EPA or a petitioner is able to show “that there is adequate data on the health and environmental effects of the substance to determine that emissions, ambient concentrations, bioaccumulation or deposition of the substance may not reasonably be anticipated to cause any adverse effects to human health or adverse environmental effects.”

Path 3: Regulating GHGs through Sections 111 as Designated Air Pollutants

Given the difficulties in following the first two paths, much of the attention, including EPA’s, has been on the third path. The term “designated pollutant” is a catch-all phrase for any air pollutant that isn’t either a criteria air pollutant under Section 108 or a toxic air pollutant under Section 112. Examples of these include fluorides from phosphate fertilizer manufacturing or primary aluminum reduction, or sulfuric acid mist from sulfuric acid plants.

Importance of Section 111

The authority to regulate such pollutants is Section 111.²⁰ Section 111 establishes New Source Performance Standards (NSPS), which are emission limitations imposed on designated categories

²⁰ In addition to using Section 111, in its July 2008 Advance Notice of Proposed Rulemaking EPA discussed at some length the possibility of using Section 129 of the act to regulate GHG emissions from solid waste combustion units. This would seem to be among the more unlikely routes to regulation of GHGs.

Section 129 is structured differently from most of the other CAA authorities discussed here: there is no provision for an endangerment finding, and there is no blanket authority for the Administrator to regulate pollutants that endanger public health or welfare; there is, instead, a specific list of 10 types of pollution for which the Administrator shall establish standards, with no provision for adding pollutants to the list.

Furthermore, waste incineration is a relatively small source of GHG emissions. According to the latest EPA *Inventory of Greenhouse Gas Emissions and Sinks*, incineration of waste emitted 20.8 million metric tonnes of CO₂ in 2007, less than 0.3% of total U.S. GHG emissions.

To the extent that Section 129 provides broader authority to the Administrator, it does so by referencing Section 111: “The Administrator shall establish performance standards and other requirements pursuant to Section 111 and this section for each category of solid waste incineration units.” Thus, the authority the Administrator has over waste combustion units is addressed in our discussion of EPA’s authority over stationary sources in general under Section 111.

of major new (or substantially modified) stationary sources of air pollution. A new source is subject to NSPS regardless of its location or ambient air conditions.²¹

Section 111 provides authority for EPA to impose performance standards on stationary sources—directly in the case of new (or modified) sources, and through the states in the case of existing sources (Section 111(d)). The authority to impose performance standards on new and modified sources refers to any category of sources that the Administrator judges “causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare” (Sec. 111(b)(1)(A)). In establishing these standards, the Administrator has the flexibility to “distinguish among classes, types, and sizes within categories of new sources” (Sec. 111(b)(2)).

The performance standards themselves are to reflect “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” (Sec. 111(a)(1)). Both the Administrator and the individual states have the authority to enforce the NSPS.

Controlling GHG through Section 111

Section 111 appears to provide a strong basis for EPA to establish a traditional regulatory approach to controlling greenhouse gas emissions from large stationary sources. As noted, the section gives EPA considerable flexibility with respect to the source categories regulated, the size of the sources regulated, the particular greenhouse gases regulated, along with the timing and phasing in of regulations. This flexibility extends to the stringency of the regulations with respect to costs, and secondary effects, such as nonair quality, health and environmental impacts, along with energy requirements. This flexibility is encompassed within the Administrator’s authority to determine what control systems she determines have been “adequately demonstrated.” As discussed later, this determination has been used to authorize control regimes that extended beyond the merely commercially available to those technologies that have only been demonstrated, and thus are considered by many to have been “technology-forcing.”

In sum, Section 111 has several advantages in considering greenhouse gas controls including that it (1) has flexibility with respect to the size of the source controlled (Section 111(b)(2)), (2) can prioritize its schedule of performance standards (Section 111(f)(2)), (3) can consider costs and other factors in making determinations, and (4) has discretion with respect to determining technology that has been adequately demonstrated. Essentially, using Section 111, EPA can determine who gets controlled, when they get controlled, how much they get controlled, and at what price.

²¹ The federal focus on new facilities arose from several factors. First, it is generally less expensive to design in to new construction necessary control features than to retrofit those features on existing facilities not designed to incorporate them. Second, uniform standards for new construction ensures that individual states will not be tempted to slacken environmental control requirements to compete for new industry. NSPS was also seen as enhancing the potential for long-term growth, ensuring competitiveness between low and high sulfur coals, and creating incentives for new control technologies. See Senator Edmund Muskie, Senate Consideration of the Report of the conference Committee (August 4, 1977), in U.S. Senate, Committee on Environment and Public Works, *A Legislative History of the Clean Air Act Amendments of 1977* (95th Congress, 2d session; Serial No. 95-15) (1979), vol. 3, p. 353.

Going Off the Beaten Path: Regulating under Section 115 or Title VI

Section 115: International Pollution

On the face of it, Section 115 would appear the ideal provision to address the global issue of climate change. It is focused on international problems and has unique international triggers. Specifically, Section 115 could be invoked by EPA on one of two bases.

First, EPA could act if it receives reports, surveys, or studies from “any duly constituted international agency” that gives EPA:

reason to believe that any air pollutant or pollutants emitted in the United States cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare in a foreign country....²²

Unlike the endangerment triggers under other sections of the Act, the endangerment finding under Section 115 refers to international effects based on data from internationally recognized sources. Many would argue that reports by the Intergovernmental Panel on Climate Change (IPCC) would fit this requirement. A United Nations body, created by the World Meteorological Organization and United Nations Environment Programme, the group and its results are referenced by EPA in its ANPR and its proposed endangerment finding.

Second, in addition to a unique international endangerment trigger, Section 115 can be invoked without any EPA endangerment finding at all. Specifically, EPA is directed to act “whenever the Secretary of State requests him to do so with respect to such pollution [that endangers public health or welfare in a foreign country] which the Secretary of State alleges is of such a nature...” (Section 115(a)). Thus, an allegation by the Secretary of State is sufficient cause for EPA to act.

The action called for under Section 115 is implemented through Section 110(a)(2)(H)(ii) that requires states to revise their SIPs to prevent or eliminate the endangerment identified. Apparently, based on this reference to SIPs, EPA states in its ANPR that Section 115 could only be exercised if EPA were to promulgate a NAAQS for greenhouse gases.²³ However, this is arguable. Section 110(a)(2)(H)(ii) states that SIPs must be crafted to provide for revisions:

...whenever the Administrator finds on the basis of information available to the Administrator that the plan is substantially inadequate to attain the national ambient air quality standard which it implements *or to otherwise comply with any additional requirements established under this Act.* [emphasis added]

In their article arguing in favor of using Section 115 to address climate change, Martella and Paulson state their opposition to EPA’s blanket assertion that a greenhouse gas NAAQS would be necessary to invoke Section 115:

... based on the plain language of the statute, however, this is unlikely to have been what Congress intended. Section 115 is not in any way limited to criteria pollutants. In fact, the

²² Section 115(a)

²³ 73 *Federal Register* 44483, July 30, 2008.

opposite is true. It applies specifically to “any air pollution.” Clean Air Act Section 110(a)(2)(H)(ii) makes it clear that SIP must provide for the revision of the plan not only when the plan is inadequate to attain a NAAQS, but also to otherwise comply with any additional requirements, such as a revision required by Section 115.²⁴ [footnotes omitted]

The above actions are prefaced on a condition of reciprocity; Section 115 applies “only to a foreign country which the Administrator determines has given the United States essentially the same rights with respect to the prevention or control of air pollution occurring in that country as is given that country by this section.” (Section 115(c)) EPA notes in its ANPR that reciprocity with one or more affected countries may be sufficient to trigger Section 115.²⁵ Many countries currently attempting to comply with the Kyoto Protocol, such as the European Union, could argue that their efforts to reduce greenhouse gases are being hindered by absent or inadequate U.S. controls. Such countries could argue they meet the criteria under Section 115(c) with respect to reciprocity and point to international studies supporting their position. Secondly, countries at substantial risk from climate change, such as low-lying island countries, could argue endangerment from the lack of U.S. action. Thirdly, countries that only contribute a *de minimis* level of emissions, such as virtually all of Africa, could argue that their low emissions meet the criterion for U.S. action.

Subject to the limitations of the SIP process, EPA notes that Section 115 would provide it with some flexibility in program design. Martella and Paulson take a much more expansive view of the flexibility available, arguing:

While designating SIPs as the implementation vehicle, Section 115 otherwise does not impose strictures on the contours and requirements of any prospective program(s) to reduce greenhouse gas emissions.... A Section 115-based program could therefore include model thresholds and source categories set by EPA, similar to the Northeast Ozone Transport.

Additionally, EPA could develop a holistic model plan to be implemented by the states. Multiple model approaches also could be presented to the states allowing each state to pick the most appropriate solution for its particular mix of greenhouse gas sources....

Additionally, Section 115 provides a mechanism to limit the scope of the program in terms of the sources....²⁶

Because EPA asserts that invoking Section 115 would require a greenhouse gas NAAQS, the action would also invoke NSR under Part C and Title V permitting requirements. One of Martella and Paulson’s primary arguments in favor of Section 115 is their belief that Section 115’s unique endangerment requirements (or no endangerment requirement if the Secretary of State alleges endangerment) should not trigger PSD-NSR or Title V permitting requirements.²⁷

Finally, it should be noted that Section 115 has never been implemented, and many countries would prefer a negotiated settlement on climate change, rather than this approach.

²⁴ Roger Martella and Matthew Paulson, “Regulation of Greenhouse Gases Under Section 115 of The Clean Air Act,” *Daily Environment Report*, March 9, 2009, pp. 12-17.

²⁵ 73 *Federal Register* 44483, July 30, 2008.

²⁶ Martella and Paulson, previously cited, pp. 15-16.

²⁷ *Ibid.*, p. 11.

Title VI: Stratospheric Ozone Protection

Added to the Clean Air Act in 1990, Title VI is the country's implementing legislation for the Montreal Protocol and succeeding agreements to address ozone depletion by human-made substances. Some of the substances that deplete the ozone layer also contribute to climate change (e.g., CFCs, HCFCs). In addition, some substances chosen as substitutes for ozone depleting chemicals are themselves greenhouse gases (e.g., HFC-134a, PFCs). Finally, the process of making acceptable substitutes for more powerful ozone-depleting chemicals (e.g., HCFC-22) produces greenhouse gases as a byproduct of production (e.g., HFC-23).

Beyond these chemical relationships, there is continuing research on the atmospheric relationship between the stratosphere (and the ozone layer) and climate change.

There are two provisions of Title VI that could be used to address greenhouse gas emission under certain conditions. They are discussed below.

Section 612: Safe Alternatives Policy

As noted above, some substitutes for ozone-depleting substances are greenhouse gases, such as HFCs and PFCs. Section 612 authorizes EPA to the maximum extent practicable, to identify substitutes for ozone-depleting chemicals that reduce overall risks to human health and the environment. Specifically, Section 612(c) requires the EPA to make it unlawful to replace an ozone-depleting substance with any substitute substance which EPA determines "may present adverse effects to human health or the environment" where EPA has identified an available, less harmful substitute. The resulting program is called the Significant New Alternatives Policy (SNAP). With appropriate substitutes identified, SNAP could be used to reduce emissions of HFCs and PFCs without invoking any other provisions of the CAA.

Section 615: Authority of Administrator

Like Section 115, Section 615 is potentially a powerful mechanism to control greenhouse gas emissions under certain circumstances. Like Section 115, it has a unique endangerment finding requirement and even broader discretionary authority for EPA to respond. Section 615 states:

If, in the Administrator's judgment, any substance, practice, process, or activity may reasonably be anticipated to affect the stratosphere, especially ozone in the stratosphere, and such effect may reasonably be anticipated to endanger public health or welfare, the Administrator shall promptly promulgate regulations respecting the control of such substance, practice, process or activity, and shall submit notice of the proposal and promulgation of such regulation to the Congress.

Invoking Section 615 in the case of greenhouse gases would involve a two-part judgment by the EPA: First, that greenhouse gases may reasonably be anticipated to affect the stratosphere (particularly the ozone layer) and, second, that the effect on the stratosphere may reasonably be anticipated to endanger public health or welfare. In its ANPR, EPA determined that it was beyond the scope of its ANPR to assess and analyze the available scientific information on the effects of greenhouse gases on the stratosphere.

If EPA were to judge the scientific data adequate to meet the two-part test, the authority available would be broad and deep. As stated by EPA in its ANPR: "... depending on the nature of any

finding made, section 615 authority may be broad enough to establish a cap-and-trade program for the substance, practice, process or activity covered by the finding....”²⁸

Potential Control Approaches for Stationary Sources

In its Technical Support Document for its ANPR, EPA takes a narrow view of the alternatives available to it in imposing greenhouse gas performance standards.²⁹ For existing electric generating sources, the EPA focuses on incremental improvements in the heat rates of existing units through options that “are well known in the industry” with an overall improvement in efficiency likely to be less than 5%. For new electric generating sources, EPA noted the availability of more efficient supercritical coal units, the future availability of ultra-supercritical units, and the possibility of limited biomass co-firing.

Continuing along this line of reasoning, EPA also suggested that it could develop regulations that anticipate future technology. For example, a phase-in approach to applying CO₂ standards to powerplants would be to mandate that “carbon-ready” generating technology be required for new construction. The objective would be to anticipate the widespread need for some form of carbon capture technology in the future by preparing for it with compatible fossil-fuel combustion technology now. The technology most discussed is integrated-gasification, combined-cycle (IGCC). As noted earlier, EPA is considering this option with respect to the *Desert Rock* PSD-NSR permit reconsideration. With respect to some of the carbon capture technology under development, IGCC has certain advantages over pulverized coal technology. However, just how much IGCC is “carbon ready” is subject to debate. EPA states in its ANPR that it believes such a staged approach is available to it under section 111:

EPA believes that section 111 may be used to set both single-phase performance standards based upon current technology and to set two-phased or multi-phased standards with more stringent limits in future years. Future-year limits may permissibly be based on technologies that, at the time of the rulemaking, we find adequately demonstrated to be available for use at some specified future date.³⁰

The technical support document does not mention some more aggressive options. These include a fuel-neutral standard or a technology-based standard. For example, for carbon dioxide emissions from a newly-constructed powerplant, a fuel-neutral standard could follow the example set by the 1997 and 2005 NO_x NSPS and the 2005 NO_x NSPS for modified existing sources. Under those regulations, the NO_x emissions standard is the same, regardless of the fuel burned—solid, liquid, or gaseous.³¹ This standard is much more expensive for coal-fired facilities to comply with than for natural-gas fired facilities, thus encouraging the lower-carbon gas-fired technologies. Likewise, EPA could choose to set a newly-constructed powerplant standard based on the performance of natural gas burnt in a combined-cycle configuration – the fuel and technology of

²⁸ 73 *Federal Register* 44519, July 30, 2008.

²⁹ U.S. Environmental Protection Agency, *Technical Support Document for the Advanced Notice of Proposed Rulemaking for Greenhouse Gases; Stationary Sources, Section VII* (June 5, 2008), final draft.

³⁰ 73 *Federal Register* 44490, July 30, 2008.

³¹ Under Sec. 60.44Da(d)(1), the 1997-2005 NSPS is set at 1.6 lb per megawatt-hour gross energy output, based on a 20-day rolling average; it is lowered to 1.0 lb per megawatt-hour gross energy output for powerplants commencing construction after February 28, 2005 (Sec. 60.44Da(e)(1)). Under Section 60.44Da(e)(3), the 2005 NSPS for modified sources is at either 1.4 lb. A fuel-neutral standard is also set for reconstructed powerplants.

choice for construction of new powerplants for the last two decades. If EPA wanted to encourage the rollover of the existing coal-fired powerplant fleet to natural gas, nuclear, or renewable sources, it could apply a fuel-neutral standard to modified sources as well. For example, a CO₂ emission standard of 0.8 lb. per kilowatt-hour output could be met by a new natural gas-fired, combined-cycle facility, as well as any non-emitting generating technology, such as nuclear power or renewables. In contrast, the standard would require a 60% reduction in emissions from a new coal-fired facility – forcing the development of a carbon control technology, such as carbon capture and storage (CCS), in order for a new coal-fired facility to be built or modified.

The viability of these options, or even more aggressive technology-forcing standards, would depend on how EPA determined whether a technology had been “adequately-demonstrated” and the seriousness of its costs and energy requirements. As discussed below, EPA has used the NSPS to encourage the installation of pollution control equipment on powerplants, even while the equipment’s development status was still being debated.

Forcing Commercialization of Technology Through a Regulatory Requirement: An Example from the SO₂ New Source Performance Standards

It is an understatement to say that the new source performance standards promulgated by the EPA were technology-forcing. Electric utilities went from having no scrubbers on their generating units to incorporating very complex chemical processes. Chemical plants and refineries had scrubbing systems that were a few feet in diameter, but not the 30- to 40-foot diameters required by the utility industry. Utilities had dealt with hot flue gases, but not with saturated flue gases that contained all sorts of contaminants. Industry, and the US EPA, has always looked upon new source performance standards as technology-forcing, because they force the development of new technologies in order to satisfy emissions requirements.³²

The most direct method to encourage adoption of carbon capture technology would be to mandate it. Mandating a performance standard on stationary sources is not a new idea: The process of forcing the development of emission controls on coal-fired powerplants is illustrated by the 1971 and 1978 SO₂ NSPS for coal-fired electric generating plants. As noted earlier, the Clean Air Act states that NSPS should reflect “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 reductions and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.”³³ In promulgating its first utility SO₂ NSPS in 1971, EPA determined that a 1.2 pound of SO₂ per million Btu of heat input performance standard met the criteria of Sec. 111—a standard that required, on average, a 70% reduction in new powerplant emissions, and could be met by low-sulfur coal that was available in both the eastern and western parts of the United States, or by the use of emerging flue gas desulfurization (FGD) devices.³⁴

³² Donald Shattuck, et al., *A History of Flue Gas Desulfurization (FGD)—The Early Years*, UE Technical Paper (June 2007), p. 3.

³³ 42 U.S.C. 7411, Clean Air Act, Sec. 111(a)(1).

³⁴ 40 CFR 60.40-46, Subpart D—Standards of Performance for Fossil-Fuel-Fired Steam Generator for Which Construction is Commenced After August 17, 1971.

At the time the 1971 Utility SO₂ NSPS was promulgated, there was only one FGD vendor (Combustion Engineering) and only three commercial FGD units in operation—one of which would be retired by the end of the year.³⁵ The number of units and vendors would increase rapidly, not only because of the NSPS, but also because of the promulgation of the SO₂ NAAQS, the 1973 Supreme Court decision preventing significant deterioration of pristine areas,³⁶ and state requirements for stringent SO₂ controls, which opened up a market for retrofits of existing coal-fired facilities in addition to the NSPS focus on new facilities. Indeed, most of the growth in FGD installations during the early and mid-1970s was in retrofits. Taylor estimates that between 1973 and 1976, 72% of the FGD market was in retrofits.³⁷ By 1977, there were 14 vendors offering full-scale commercial FGD installation.³⁸

However, despite this growth, only 10% of the new coal-fired facilities constructed between 1973 and 1976 had FGD installations. In addition, the early performance of these devices was not brilliant.³⁹ In 1974, American Electric Power (AEP) spearheaded an ad campaign to have EPA reject FGD devices as “too unreliable, too impractical for electric utility use” in favor of tall stacks, supplementary controls, and low-sulfur western coal.⁴⁰ This effort was ultimately unsuccessful as the Congress chose to modify the NSPS requirements for coal-fired electric generators in 1977 by adding a “percentage reduction” requirement. As promulgated in 1979, the revised SO₂ NSPS retained the 1971 performance standard but added a requirement for a 70%-90% reduction in emissions, depending on the sulfur content of the coal.⁴¹ At the time, this requirement could be met only through use of an FGD device. The effect of the “scrubber requirement” is clear from the data provided in **Figure 1**. Based on their analysis of FGD development, Taylor, Rubin, and Hounshell state the importance of demand-pull instruments:

Results indicate that: regulation and the anticipation of regulation stimulate invention; technology-push instruments appear to be less effective at prompting invention than demand-pull instruments; and regulatory stringency focuses inventive activity along certain technology pathways.⁴²

³⁵ Margaret R. Taylor, *The Influence of Government Actions on Innovative Activities in the Development of Environmental Technologies to Control Sulfur Dioxide Emissions from Stationary Sources*, Thesis, Carnegie Institute of Technology (January 2001), pp. 37, 40.

³⁶ *Fri v. Sierra Club*, 412 US 541 (1973). This decision resulted in EPA issuing “prevention of significant deterioration” regulations in 1974; regulations that were mostly codified in the 1977 Clean Air Amendment (Part C).

³⁷ Taylor, *ibid.*, p. 37.

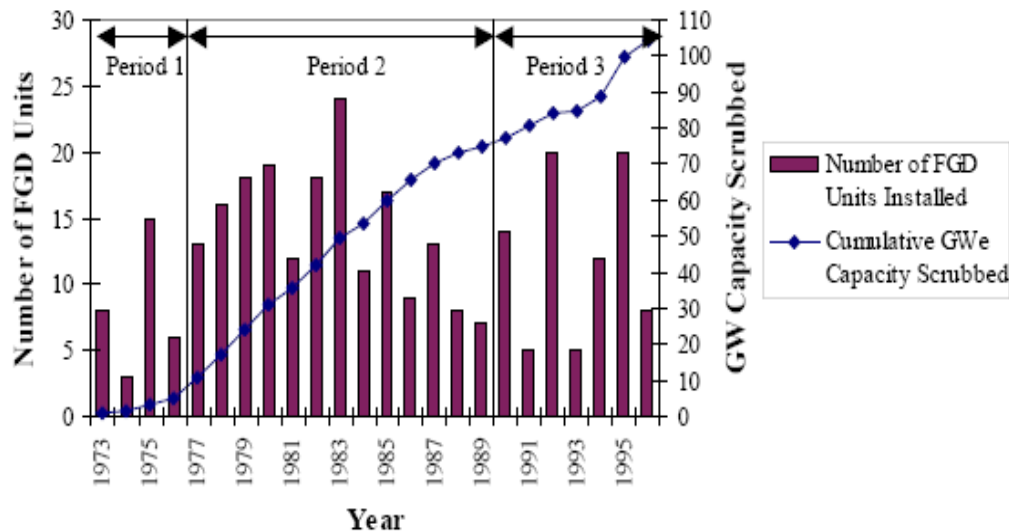
³⁸ Taylor, *ibid.*, p. 39.

³⁹ For a discussion of challenges arising from the early development of FGD, see Donald Shattuck, et al., *A History of Flue Gas Desulfurization (FGD)—The Early Years*, UE Technical Paper (June 2007).

⁴⁰ Examples include full-page ads in the Washington Post entitled “Requiem for Scrubbers,” “Scrubbers, Described, Examined and Rejected,” and “Amen.” For an example, see *Washington Post*, p. A32 (October 25, 1974).

⁴¹ 40 CFR 60.40Da-52Da, Subpart Da—Standards of Performance for Electric Utility Steam Generating Units for Which Construction is Commenced After September 18, 1978.

⁴² Margaret R. Taylor, Edward S. Rubin, and David A. Hounshell, “Control of SO₂ Emissions from Power Plants: A Case of Induced Technological Innovation in the U.S.,” *Technological Forecasting & Social Change* (July 2005), p. 697.

Figure 1. Number of FGD Units and Cumulative Gigawatt (GW) Capacity of FGD Units: 1973-1996

Source: Adapted by Taylor from Soud (1994). See Margaret R. Taylor, op. cit., 74.

Note: Numbers are archival through June 1994, then projected for 1994-96.

That government policy could force the development of a technology through creating a market should not suggest that the government was limited to that role, or that the process was smooth or seamless. On the latter point, Shattuck, et al., summarize the early years of FGD development as follows:

The Standards of Performance for New Sources are technology-forcing, and for the utility industry they forced the development of a technology that had never been installed on facilities the size of utility plants. That technology had to be developed, and a number of installations completed in a short period of time. The US EPA continued to force technology through the promulgation of successive regulations. The development of the equipment was not an easy process. What may have appeared to be the simple application of an equipment item from one industry to another often turned out to be fraught with unforeseen challenges.⁴³

The example indicates that technology-forcing regulations can be effective in pulling technology into the market—even when there remain some operational difficulties for that technology. The difference for carbon capture technology is that for long-term widespread development, a new infrastructure of pipelines and storage sites may be necessary in addition to effective carbon capture technology.⁴⁴ In the short-term, suitable alternatives, such as enhanced oil recovery needs and in-situ geologic storage, may be available to support early commercialization projects without the need for an integrated transport and storage system. Likewise, with economics more favorable for new facilities than for retrofits, concentrating on using new construction to introduce carbon capture technology might be one path to widespread commercialization. As an

⁴³ Shattuck, et. al., p. 15.

⁴⁴ See CRS Report RL33971, *Carbon Dioxide (CO₂) Pipelines for Carbon Sequestration: Emerging Policy Issues*, by Paul W. Parfomak and Peter Folger.

entry point to carbon capture deployment, a regulatory approach such as NSPS may represent a first step, as suggested by the SO₂ NSPS example above.

Potential for Cap-and-Trade

Whether EPA can set up a cap-and-trade program under the Clean Air Act is the subject of considerable debate in the literature.⁴⁵ Much of the debate surrounds the provisions of Section 111(d). However, there are other authorities in the Act that might serve as a basis for a EPA-coordinated cap-and-trade program.

Potential Under Section 111

EPA, along with other commenters, has linked the potential effectiveness of Section 111(d) to whether it can be interpreted to allow a cap-and-trade program for CO₂. As stated by EPA: “EPA also believes that because of the potential cost savings, it might be possible for the Agency to consider deeper reductions through a cap-and-trade program that allowed trading among sources in various source categories relative to other systems of emissions reduction.”⁴⁶ As noted, Section 111 explicitly allows EPA to take cost into consideration in developing performance standards. Whether that consideration could justify a trading program across different greenhouse gases, and across different source categories with different best available systems of emissions reduction is not known. A lead author of the winning brief in *Massachusetts v. EPA* makes a case against such authority:

Numerous parties have argued that section 111 does not authorize the creation of a cap-and-trade program. Among other things, section 111(h) provides a contingency plan in the event performance standards are “not feasible” to implement. In that case, section 111(h) gives EPA the authority to “promulgate a design, equipment, work practice, or operational standard, or combination thereof, which reflects the best technological system of continuous emissions reduction which ... the Administrator determines has been adequately demonstrated.” 42 U.S.C. Section 7411(h)(1). One of the ways a performance standard might prove “not feasible” is if “a pollutant or pollutants cannot be emitted through a conveyance designed and constructed to emit or capture such pollutants.” 42 U.S.C. 7411(h)(2)(A). Clearly, Congress thought the most likely scenario under section 111 was for pollutants to be “emitted through a conveyance designed and constructed to emit or capture such pollutant[s]” – an assumption at odds with the operation of a trading program. Other aspects of section 111 also point away from the creation of a trading program under this provision [reference omitted].⁴⁷

⁴⁵ See EPA, ANPR, pp. 44514-44516; Lisa Heinzerling, *Testimony Before the Subcommittee on Energy and Air Quality of the Committee on Energy and Commerce*, Hearing (April 10, 2008); Robert R. Nordhaus, “New Wine into Old Bottles: The Feasibility of Greenhouse Gas Regulation Under the Clean Air Act,” *N.Y.U. Environmental Law Journal* (2007), pp. 53-72; Inimai M. Chettiar and Jason A. Schwartz, *The Road Ahead: EPA’s Options and Obligations For Regulating Greenhouse Gases* (April 2009); and Elaine Ginocchio, et al., *The Boundaries of Executive Authority: Using Executive Orders to Implement Federal Climate Change Policy* (February 2008).

⁴⁶ U.S. Environmental Protection Agency, “Regulating Greenhouse Gas Emissions Under the Clean Air Act; Proposed Rule,” 73 Federal Register 44490, July 30, 2008.

⁴⁷ Lisa Heinzerling, *Testimony Before the Subcommittee on Energy and Air Quality of the Committee on Energy and Commerce*, House of Representatives (April 10, 2008), pp. 12-13.

In sum, whether this authority can be expanded to creating a comprehensive cap-and-trade program is under debate. Focused on existing sources, EPA used Sec. 111(d) to justify its promulgated rule (now vacated) to reduce mercury emissions from powerplants. Although some have argued that the court decision in this case repudiated EPA's reasoning, the case was actually not decided on the basis of Section 111(d).⁴⁸

Potential Under Other Sections

Three other sections of the Act, (Sections 110, 115, and 615) might also be considered as possible authority for establishing an economy-wide cap-and-trade program for GHG emissions, although each has its own weaknesses. Section 110 of the Act establishes requirements for State Implementation Plans (SIPs). While primarily designed to demonstrate how a state with nonattainment areas will bring those areas into attainment with NAAQS, the section also contains language that might serve as the basis for the use of broader GHG regulatory tools once emission standards were issued under any section of the Act. Specifically, Section 110(a)(2)(A) says that each SIP shall

... include enforceable emission limitations and other control measures, means, or techniques (including economic incentives such as fees, marketable permits, and auctions of emissions rights), as well as schedules and timetables for compliance, as may be necessary or appropriate to meet the applicable requirements of this Act

The predicate is that there must first be an applicable requirement under the Act. Thus, Section 110 would not be an authority that EPA could use to *initiate* regulation of GHGs. Also, although the section mentions economic incentives, marketable permits, and auctions, it is not clear that such authority could be used for economy-wide control measures. The precedents for the authority's use that EPA cited in the ANPR, for example, included such regulations as the NO_x SIP call, which established a cap-and-trade program for powerplant emissions of NO_x, and the Clean Air Interstate Rule, which also allowed trading of emission allowances by powerplants.

As stated in the ANPR:

EPA has often incorporated market-oriented emissions trading elements into the more traditional performance standard approach for mobile and stationary sources. Coupling market-oriented provisions with performance standards provides some of the cost advantages and market flexibility of market-oriented solutions while also directly incentivizing technology innovation within the particular sector, as discussed below. For example, performance standards for mobile sources under Title II have for many years been coupled with averaging, banking and trading provisions within a subsector. In general, averaging allows covered parties to meet their emissions obligation on a fleet- or unit-wide basis rather than requiring each vehicle or unit to directly comply. Banking provides direct incentives for additional reductions by giving credit for overcompliance; these credits can be used toward future compliance obligations and, as such, allow manufacturers to put technology improvements in place when they are ready for market, rather than being forced to adhere to a strict regulatory schedule that may or may not conform to industry or company

⁴⁸ *New Jersey v. EPA*, 517 F.3d 574 (D.C. Cir. 2008). The case was decided on whether EPA could delist electric generating units as a source of hazardous air pollutants without following the criteria laid out in Section 112(c). For a discussion see CRS Report RS22817, *The D.C. Circuit Rejects EPA's Mercury Rules: New Jersey v. EPA*, by Robert Meltz and James E. McCarthy.

developments. Allowing trading of excess emission reductions with other covered parties provides an incentive for reducing emissions beyond what is required.⁴⁹

The two other possible authorities for a cap-and-trade program, Sections 115 and Section 615, have never been used to control any pollutant, much less to establish a cap-and-trade program. Assuming Section 115 could be invoked without a supporting NAAQS, there might be sufficient flexibility to institute a cap-and-trade program. The program would have to be created by each state under Section 110 to comply with EPA-determined state GHG emission caps in response to Section 115. Because it would function through Section 110, EPA could not impose a cap-and-trade system on the states; rather, the states would have to voluntarily agree to cooperate in a EPA-coordinated cap-and-trade scheme.

As noted earlier, if Section 615 could be successfully triggered by the science, EPA's discretion in setting up a regulatory scheme would be substantial. As stated by EPA in its ANPR: "... depending on the nature of any finding made, section 615 authority may be broad enough to establish a cap-and-trade program for the substance, practice, process or activity covered by the finding..."⁵⁰

Implementation Issues

New Source Review

Any new or modified facility emitting (or potentially emitting) over 250 tons of any regulated pollutant must undergo preconstruction review and permitting, including the installation of Best Available Control Technology (BACT), except those pollutants regulated under Sections 112 and 211(o). New sources under the Prevention of Significant Deterioration provisions of Part C (PSD-NSR) must undergo preconstruction review and must install BACT as the minimum level of control.⁵¹ State permitting agencies determine BACT on a case-by-case basis, taking into account energy, environmental, and economic impacts. BACT cannot be less stringent than the federal NSPS, but it can be more so. More stringent controls can be required if modeling indicates that BACT is insufficient to avoid violating PSD emission limitations, or the NAAQS itself.

PSD-NSR is required for any pollutant "subject to regulation" under the Clean Air Act, but there are varying interpretations of what the phrase "subject to regulation" means. Environmental groups have argued that CO₂ is already subject to regulation because utilities are required under Section 821 of the Clean Air Act Amendments of 1990 to monitor and report CO₂ emissions to EPA. Others argue that an endangerment finding would make GHGs subject to regulation, and,

⁴⁹ ANPR, p. 44412.

⁵⁰ 73 *Federal Register* 44519, July 30, 2008.

⁵¹ The 1977 CAA broadened the air quality control regimen with the addition of the Prevention of Significant Deterioration (PSD) and visibility impairment provisions. The PSD program (Part C of Title I of the CAA) focuses on ambient concentrations of SO₂, NO_x, and PM in "clean" air areas of the country (i.e., areas where air quality is better than the NAAQS). The provision allows some increase in clean areas' pollution concentrations depending on their classification. In general, historic or recreation areas (e.g., national parks) are classified Class I with very little degradation allowed, while most other areas are classified Class II with moderate degradation allowed. States are allowed to reclassify Class II areas to Class III areas, which would be permitted to degrade up to the NAAQS, but none have ever been reclassified to Class III.

therefore, trigger PSD-NSR requirements for new sources. In its proposed endangerment finding, EPA noted its current interpretation of the law is that a final positive endangerment finding for motor vehicles under Section 202 would not *per se* make greenhouse gas emissions subject to PSD-NSR.⁵² However, the interpretive memorandum on which this conclusion is based,⁵³ issued in December 2008, is currently under review by the new Administration.

Issue of Case-by-Case BACT Determinations

Two aspects of the New Source Review provision create potential difficulties in using the CAA to control greenhouse gases. First, as noted earlier, PSD-NSR has specified thresholds for triggering its provisions: a “major emitting facility is generally defined as emitting or having the potential to emit 250 tons annually of a regulated pollutant (Sec. 169(1)).⁵⁴ With respect to greenhouse gases, this is a fairly low threshold. By comparison, several bills introduced in the 110th Congress set thresholds for inclusion in the reduction program at 10,000 metric tons annually.

The second administrative issue for PSD-NSR is the requirement that BACT be determined on a case-by-case basis. Combined with a 250 ton threshold, this could mean a massive increase in state-determinations of BACT. If the threshold was 250 tons annually, the resulting increased permit activity would be at least an order of magnitude, according to EPA (discussed below).

On this second issue, it should be noted that several commenters believe this would not be a major problem (unless a cap-and-trade program is implemented). As stated by the Institute for Policy Integrity:

Since including GHGs in the PSD program may greatly expand the number of permits issued, making case-by-case determinations for each individual source may stretch the resources of EPA and state permitting authorities. Moreover, traditional technological controls may not exist for every GHG emitted by every regulated facility. However, there is flexibility in the statute to resolve these problems.

⁵² See Proposed Endangerment Finding, footnote 29 (p. 106).

⁵³ Memorandum from EPA Administrator Stephen L. Johnson to Regional Administrators, “EPA’s Interpretation of Regulations that Determine Pollutants Covered by Federal Prevention of Significant Deterioration (PSD) Permit Program,” December 18, 2008, 19 pages, at http://www.epa.gov/nsr/documents/psd_interpretive_memo_12.18.08.pdf.

⁵⁴ It should be noted that, unlike the definition of major source, the definition of a major modification is defined by regulation, not statute. As defined under the 1970 CAA, a modification is “any physical change in, or change in the method of operation of, a stationary source which increases the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted”(Section 111(a)(4)). In subsequent regulations issued in 1975 with respect to NSPS, EPA defined modification as any physical or operational change that resulted in any increase in the maximum hourly emission rate of any controlled air pollutant.⁵⁴ EPA regulations also stated that any replacement of existing components that exceeded 50% of the fixed capital costs of building a new facility placed the plant under NSPS, regardless of any change in emissions. With the advent of National Ambient Air Quality Standards non-attainment provisions (Part D), PSD provisions (Part C), and NSR in 1977, a different approach to defining modification was appropriate as the focus was shifted from enforcing NSPS emission rates to achieving attainment and compliance with PSD. In promulgating regulations for the PSD and non-attainment programs, EPA defined “significant” increase in emissions in terms of tons per year emitted by a major source. For sulfur dioxide and nitrogen oxides, the threshold is 40 tons per year. Facilities exceeding that threshold are subject to NSR.

Given this history of setting *de minimis* emission increases for triggering NSR review for modifications, it is possible EPA could set a substantially higher level for at least carbon dioxide emissions, and perhaps other greenhouse gases, if it determined such thresholds were appropriate

Though BACT determinations are generally to be made on a case-by-case basis, the D.C. Circuit recognized in *Alabama Power* that exceptions can be made if “case-by-case determinations would, as a practical matter, prevent the agency from carrying out the mission assigned to it by Congress.” The development of “presumptive BACT” determinations should be permissible and may help streamline the permitting process [footnote omitted].⁵⁵

In addition, assuming PSD is triggered by regulation under Section 111, the BACT requirements may be identical to the NSPS determinations under Section 111. It is also likely that most small sources would not have an NSPS as EPA applied its discretion under Section 111 in determining the most cost-effective emissions reductions. With no NSPS floor for a BACT determination, it is possible that NSR requirements for sources not covered under Section 111 could be quite lax.

Title V and the Size Threshold

In the ANPR, EPA discussed the possibility that an endangerment finding and subsequent regulation of GHGs as air pollutants under any section of the Act could trigger Title V permit requirements, and that all facilities that have the potential to emit a GHG pollutant in amounts of 100 tons per year or more would be required to obtain permits. Under this reasoning, the regulation of CO₂ from motor vehicles under Section 202, for example, could lead to Title V permit requirements for CO₂ from powerplants and other sources. In the ANPR, the agency stated:

Using available data, which we acknowledge are limited, and engineering judgment in a manner similar to what was done for PSD, EPA estimates that more than 550,000 additional sources would require Title V permits, as compared to the current universe of about 15,000–16,000 Title V sources. If actually implemented, this would be more than a tenfold increase, and many of the newly subject sources would be in categories not traditionally regulated by Title V, such as large residential and commercial buildings.⁵⁶

Thus, like PSD-NSR, a major complication that Title V introduces is the potential for very small sources of greenhouse gases to need permits in order to operate. Furthermore, Title V requires that covered entities pay fees established by the permitting authority, and that the total fees be sufficient to cover the costs of running the permit program.

The potential for increased permitting activity has led to speculation on its potential extent. For example, some agricultural interests have spun the possibility that Title V could be invoked for emissions from agricultural activities and the requirement for permit fees into something they refer to as the “cow tax.” On November 18, 2008, for example, Cattle Network stated “EPA Proposes ‘Cow Tax.’” The article even generated specific amounts for the “tax”: \$175 per dairy cow and \$87.50 per beef cow.⁵⁷ EPA says that it has no plans to regulate agricultural activities’ GHG emissions. Indeed, the agency currently exempts most major agricultural sources from any Clean Air Act controls on conventional air pollutants under an arrangement known as the Air

⁵⁵ Inimai M. Chettiar and Jason A. Schwartz, *The Road Ahead: EPA’s Options and Obligations for Regulating Greenhouse Gases*, April 2009, p. 105.

⁵⁶ 73 *Federal Register* 44511, July 30, 2008.

⁵⁷ Cattle Network, November 18, 2008, at <http://www.cattlenetwork.com/Content.asp?ContentID=269579>.

Compliance Agreement.⁵⁸ Thus, it would seem unlikely that the agency would now make a priority of subjecting small agricultural sources to GHG requirements.

However, the need to deal with the size issue has been noted by EPA and other commenters. Alternatives to lessen the extent and cost of these provisions fall into three categories: (1) legal or regulatory interpretations that increase EPA's flexibility to determine what sources would need permits and when; (2) the expanded use of general permits; (3) interpretation of different endangerment findings to exclude Title V and/or PSD-NSR.

Legal or Regulatory Interpretations that Increase Flexibility

EPA noted two possible legal theories under which it could avoid imposing PSD-NSR or Title V permitting requirements on small sources. Under "the judicial doctrine of administrative necessity," the agency stated that it might be able "to craft relief in the form of narrowed source coverage, exemptions, streamlined approaches or procedures, or a delay of deadlines."⁵⁹ The agency also stated that in rare cases, the courts will apply statutory provisions in a manner other than that indicated by the plain meaning, if "absurd, futile, strange, or indeterminate results" would be produced by literal application.

If EPA has the authority, such as under Section 111, it will almost certainly focus on the large sources first. As noted in the introduction, when it comes to stationary sources, size matters. Twenty-eight percent of the country's GHGs comes from an Energy Information Administration (EIA) estimated 670 coal-fired electric powerplants. Farms, by contrast, number more than 2 million, and emit less than 4% of total GHGs. EPA could argue that either administrative necessity or "strange," perhaps "absurd" results (to use EPA's terms) justified priorities and resources being focused on the former with the latter being either substantially delayed or possibly ignored. Methane (CH₄) provides another interesting contrast in potential priorities. For example, about 1.8% of GHG emissions, in the form of methane, are generated by 1,800 landfills; a slightly larger amount (2.4%) is emitted by roughly a million cattle and swine operations. As stated by the Institute for Policy Integrity:

Courts grant agencies much more leeway in deferring full implementation of a statute than in creating permanent exemptions. Invoking the doctrine of administrative necessity, EPA should be able to justify expanding NSR permit applicability to the largest sources first, and then gradually including smaller sources. The timeline set for phasing in smaller sources could not take longer than reasonably necessary given EPA's administrative burdens, but EPA will have a good deal of discretion to determine its own resources and capability [footnotes omitted].⁶⁰

A second means of reducing the administrative burden is to increase the effective size of an affected source by defining "potential to emit" in terms of potential actual emissions. In particular, EPA suggested in its ANPR that determining the potential to emit in terms of actual usage instead of maximum potential could have some benefit in some cases. For example, if a small boiler's potential to emit was based on actual usage of 1000 hours a year, instead of

⁵⁸ See CRS Report RL32947, *Air Quality Issues and Animal Agriculture: EPA's Air Compliance Agreement*.

⁵⁹ 73 *Federal Register* 44512, July 30, 2008. Also see ensuing discussion through page 44514.

⁶⁰ Inimai M. Chettiar and Jason A. Schwartz, *The Road Ahead: EPA's Options and Obligations for Regulating Greenhouse Gases*, (April 2009), p. 104.

continuous potential usage (8760 hours), the effective size of the boiler under NSR would increase 8.76 times.⁶¹

General Permits

Perhaps the most straightforward method of reducing administrative burden is for EPA to adopt a general permit scheme for PSD-NSR and Title V. For categories with numerous similar sources of emissions, the Clean Air Act provides in Section 504(d) that the permitting authority—be it EPA or a delegated state agency—may issue a “general permit” covering all sources in the category. This provision substantially reduces the administrative burden of issuing permits, allowing notice and opportunity for public hearing on the category as a whole and the provisions of the general permit, rather than requiring the same for each individual source. General permits have been widely used by the agency under the Clean Water Act, and are used by about half the states for control of various air pollution sources. Thus, there is precedent for their use in a Clean Air Act greenhouse gas control program for multiple, relatively minor sources of emissions.

A general permit does not relieve the permittee from filing a permit application or from complying with permit conditions, which would include some sort of monitoring and reporting requirements. But a permit application for a general permit can be relatively simple, and since there are few costs to issuing the permit, permit fees, which are required by Section 502(b) to cover the reasonable costs of the permit program, but are to be utilized only to cover such costs, would be relatively low. A sampling of states using general permit fees for other types of air pollutants found fees ranging from \$100 to \$350 per permittee.

Such an approach may also be available to small sources potentially caught under PSD-NSR. Both EPA in the ANPR and the Institute for Policy Integrity provide arguments for PSD-NSR general permits for small sources to avoid absurd results or respond to administrative necessity.⁶²

Section 304: Citizen Suits

If an endangerment finding triggered emissions standards or limitations under the CAA (e.g., Section 111, Part C), it would also bring into play Section 304, Citizen Suits. Section 304 allows any person to commence a civil action against any other person (including government entities and instrumentalities) for violation of an emissions standard or limitation under the Act. It also provides for suits against EPA for failing to perform a nondiscretionary act or duty. Most specifically, Section 304 provides for suits

... against any person who proposes to construct or constructs any new or modified major emitting facility without a permit required under part C of title I (relating to significant deterioration of air quality) or part D of title I (relating to non-attainment) or who is alleged to have violated (if there is evidence that the alleged violation has been repeated) or to be in violation of condition of such permit.⁶³

⁶¹ 73 *Federal Register* 44503, July 30, 2008..

⁶² 73 *Federal Register* 44507-44511, July 30, 2008; Inimai M. Chettiar and Jason A. Schwartz, *The Road Ahead: EPA's Options and Obligations for Regulating Greenhouse Gases*, (April 2009), pp. 103-106.

⁶³ Section 304(a)(3).

Citizen suits have been widely used by environmental groups to force the Administrator to undertake nondiscretionary duties and to enforce the Act's requirements against emitting facilities. Should the agency fail to move forward with GHG standards following an endangerment finding, suits seeking to force action would almost certainly be filed.

Conclusion

The current debate on the appropriateness of using the Clean Air Act to regulate greenhouse gas emissions is not the first such debate that has occurred when a new environmental challenge has been directed at the Act. During the 1980s, suggestions were made that acid rain and/or stratospheric ozone depletion could be addressed via then-existing provisions, rather than by new Amendments. For example, in 1985, the CRS stated the following with respect to addressing acid rain through the existing Clean Air Act:

*Various Clean Air Act provisions could be used to address acid precipitation, including issuing more stringent secondary ambient air quality standards, setting a sulfate standard, and enforcing SO₂ reductions more vigorously. (a) Typically, however, such actions require a demonstration of cause-effect relationship that has not been obtained, at least in the view of many policymakers; and/or they require actions under peripherally related provisions such as visibility protection—which are already subject to controversy on their own right. (b) Any such actions would likely be expensive, both in resources and in political/administrative capital. (c) Program administrators have therefore said they will not use the Clean Air Act aggressively and innovatively to combat acid precipitation without an explicit Congressional mandate and/or compelling new evidence linking specific damages to specific pollutants [emphasis in original].*⁶⁴

In both cases, the Congress moved to add new Titles to the Act (Title IV to address acid rain, and Title VI to address stratospheric ozone depletion). In the case of Title IV, a new market-based approach to reducing pollutants was introduced to implement a statutory reduction requirement (i.e., the SO₂ emissions cap) in hope that the cost would be optimized. The result was so successful that it was used by states and EPA to begin addressing interstate transport of smog (i.e., the NO_x SIP Call) and has been suggested by some as the optimal approach to controlling greenhouse gases.

However, controlling greenhouse gases is a substantially more complex environmental, technical, economic, and social issue than either acid rain or stratospheric ozone depletion are. It is possible that one size does not fit all in this debate. Some sources may not respond significantly to a market-based approach because they are not particularly price-sensitive. Others may be too small or dispersed to include. For example, the European Union's market-based approach covers only about 40% of the EU's emissions. Other instruments are used to address difficult sectors, such as transportation.

Thus, initiatives to use the current Clean Air Act could be designed as a substitute for what is perceived by some as a protracted congressional debate, or as a complementary effort to address sources or gases that a future market-based system may choose to exclude from its provisions. As

⁶⁴ *The Clean Air Act and Proposed Acid Rain Legislation: Can We Get There from Here?* CRS Report 85-50 ENR, by Larry B Parker, John E. Blodgett, Alvin Kaufman, and Donald Dulchinos, p. 9.

summarized in 2008 by Lisa Heinzerling in testimony to the Subcommittee on Energy and Air Quality of the House Energy and Commerce Committee:

... the Clean Air Act contains numerous provisions that might be used to regulate greenhouse gases. The advantages of using these provisions include: they can be deployed now; they use regulatory strategies that are familiar to, indeed are the bread and butter work of, the Environmental Protection Agency; they call for regulation of numerous and diverse sources and thus, taken as a group, they have an inherent fairness to them; they do not pose unusual enforcement difficulties or untoward administrative burdens.

There are also disadvantages to using existing Clean Air Act provisions to address climate change. Most of the provisions do not have statutory deadlines.... To the extent one favors cap-and-trade as a regulatory mechanism for addressing climate change, one might worry about the lack of clear authority for such a scheme under the existing statute. The NAAQS program is an ungainly framework for regulating globally harmful pollutants. PSD requirements are triggered for sources that are “large” when it comes to conventional pollution but “small” from the perspective of global pollutants.⁶⁵

A final endangerment finding would present EPA with many options. However, the ultimate decision on what the Nation’s greenhouse gas policy should be rests with the Congress. If it disagrees with any approach undertaken by EPA, it can override the agency’s decision, or respond as it did with acid rain and stratospheric ozone depletion—with new statutory authorities.

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⁶⁵ Testimony of Lisa Heinzerling, U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy and Air Quality, *Strengths and Weaknesses of Regulating Greenhouse Gas Emissions Under Existing Clean Air Act Authorities*, 110th Cong., 2nd sess., April 10, 2008, pp. 14-15.