Cars and Climate: What Can EPA Do to Control Greenhouse Gases from Mobile Sources?

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Summary

As Congress considers legislation to reduce the greenhouse gas (GHG) emissions that contribute to climate change, attention has focused on "cap-and-trade" legislation. Such legislation would set a national cap on GHG emissions, with allowances (permits) to emit limited amounts of the gases distributed or auctioned to affected parties. Recently, there has also been discussion of taxes on greenhouse-gas-emitting substances (generally referred to as a "carbon tax"), which proponents argue would provide greater transparency and a clearer price signal.

Enacting greenhouse gas controls is not simply a choice between cap-and-trade and carbon tax options, however. A third set of options, using the more traditional regulatory approaches of the Clean Air Act (CAA), is available. Unlike a cap-and-trade system or a carbon tax, regulation under the Clean Air Act does not require new Congressional action. The ability to limit GHG emissions already exists under various CAA authorities that Congress has enacted, a point underlined by the Supreme Court in an April 2007 decision (*Massachusetts v. EPA*).

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 whatever) 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 Administration has made clear that its preference would be for Congress to address the climate issue through new legislation. Nevertheless, it is moving forward on several fronts to define how the Clean Air Act might be used.

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. Administrator Jackson proposed such an endangerment finding, April 17, 2009. A 60-day public comment period began April 24 with publication of the proposed finding in the *Federal Register*. Once an endangerment finding is finalized, the agency can proceed to regulate emissions from various sources of GHGs.

EPA has received 10 petitions asking that it make endangerment findings and proceed to regulate emissions of greenhouse gases. Nine of the 10 petitions address mobile sources, including motor vehicles, aircraft, ships, nonroad vehicles and engines, and fuels, under Title II of the Clean Air Act. This report discusses EPA's authority under Title II and provides information regarding the mobile sources that might be regulated under this authority. Among these sources, motor vehicles (passenger cars and light trucks, including SUVs) are the initial targets for regulation, both because a petition addressing these sources began EPA's consideration of the endangerment issue, and because these are the most significant GHG emission sources among those covered by Title II. EPA proposed GHG emission standards for new motor vehicles September 28, 2009, and expects to finalize them in time for their application to Model Year 2012 vehicles.

Regulation of GHGs from mobile sources might also lead the agency to establish controls for stationary sources, such as electric power plants. That option, the authority for which would come from different parts of the Clean Air Act, is addressed in CRS Report R40585, *Climate Change: Potential Regulation of Stationary Greenhouse Gas Sources Under the Clean Air Act*.

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Introduction

In the 111th Congress, climate change legislation is among the leadership's highest priorities. 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. 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."

Not all parties are in agreement that controls on GHGs are desirable. Some argue that the science behind climate change is too uncertain; they oppose controls unless, at some future time, more is known about trends in climate variables and the impact of specific pollutants. Others, who agree in principle that the science dictates GHG reductions be made, raise a number of arguments, including issues concerning international commitments (i.e., whether China, India, and other developing countries will be subject to binding agreements) and the timing of a control regime (e.g., whether a major regulatory initiative is appropriate during the worst economic climate since the Great Depression). Still others can be expected to raise objections about the form and substance of specific legislative proposals, many of which are among the broadest regulatory measures that Congress has ever considered.

Proponents of legislation counter that the threat of climate change is too important for action to be delayed, and that energy-efficiency and lower GHG emissions can be the building blocks of a program to restore the economy as well as to protect the environment.

Option 1: Cap-and-Trade[1]

As debate has proceeded, attention has focused primarily on cap-and-trade legislation[2] that would set a national cap on emissions. Under a cap-and-trade program, the government would either distribute (on the basis of historic emissions or other factors) or auction off allowances to emit greenhouse gases; a combination of these approaches, in which some allowances are distributed and some auctioned is included in both the House-passed cap-and-trade bill (H.R. 2454) and the bill approved by the Senate Environment and Public Works Committee (S. 1733). Over time, the cap on emissions and hence the number of allowances available would be reduced, forcing sources to reduce their emissions or buy allowances from an ever-shrinking, and presumably more expensive, pool. A shrinking cap and rising prices for allowances would provide incentives for utilities and energy companies to develop less-carbon-intensive energy supplies, for manufacturers to develop more energy-efficient production processes, for the transportation sector to be made more fuel-efficient, and for greener residential, commercial, and institutional buildings.

Although cap-and-trade has drawn the most attention (and appears to be the choice of most congressional leaders and the Obama Administration), others have suggested that this approach is

[1] For a more detailed discussion of cap-and-trade approaches to GHG emission control, see CRS Report RL33799, *Climate Change: Design Approaches for a Greenhouse Gas Reduction Program.* For additional information on allowance allocation methods, see CRS Report RL34502, *Emission Allowance Allocation in a Cap-and-Trade Program: Options and Considerations*.

[2] Now also being called "cap-and-tax" by some opponents, or "cap-and-dividend" by some supporters.

overly complicated. It would require the development of an entirely new administrative structure. Its costs are uncertain: the experience with emission allowance markets to date suggests that there could be substantial allowance price volatility. And the markets it creates may not be transparent: it could give rise to an array of financial instruments and trading mechanisms that would reward traders and would require strong regulatory oversight to mitigate potential market manipulation.

Option 2: A Carbon (or GHG) Tax[3]

Many cap-and-trade critics suggest that a carbon (or greenhouse gas) tax may be a more straightforward approach. By imposing a tax tied to the global warming potential of various fuels and greenhouse gas emissions, there would be clear signals to utilities, manufacturers, other businesses, government agencies, and consumers, leading them to lower-carbon choices. If the tax were imposed "upstream" (i.e., on fuel producers and importers, utilities, and/or major emitters of other GHGs), the additional cost could then be passed through to consumers of all kinds.

A carbon tax has critics of its own. The principal argument against it is that it is an instrument designed to fix the price of GHG control, whereas a cap-and-trade system establishes the quantity of GHGs emitted. If the chosen price (i.e., the tax level) insufficiently reduces emissions, Congress or a regulatory authority would need to adjust the tax level, thus negating one of the tax's supposed advantages, its cost certainty. With consensus forming among proponents of GHG control that emissions need to be ratcheted down as much as 80% over a 40-year period, the tax would need a transparent escalator provision to create additional emission reduction incentives.

From a political point of view, Congress has found it difficult to impose new taxes or to adjust those in place. Yet carbon tax proponents presume that if the tax is ineffective, it will be adjusted.[4] It is also unclear how a carbon tax would mesh with the international commitments to limit emissions that are being negotiated: if a treaty is agreed to, it is likely to establish numerical limits on emissions, not specify the cost of an effective limit.

Option 3: Regulation Under Existing Authority

However these arguments play out, enacting greenhouse gas controls is not simply a choice between cap-and-trade and carbon tax options. A third set of options, using the more traditional regulatory approaches of the Clean Air Act (CAA) and other legislation, is available. These approaches could be strengthened through new legislation, but unlike a cap-and-trade system or carbon tax, regulation does not necessarily require new congressional action. The ability to limit GHG 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 (discussed below).

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 whatever) at the same time that the Administration, through the Environmental Protection Agency (EPA),

[3] For a more detailed discussion of a carbon tax approach to GHG emission control, see CRS Report R40242, *Carbon Tax and Greenhouse Gas Control: Options and Considerations for Congress.*

[4] The reverse assumption, that a cap would *not* be adjusted even if it caused significant economic dislocation, is presumed by cap-and-trade proponents. Both assumptions would likely be tested.

exercises existing authority under the Clean Air Act to begin regulation of greenhouse gas emissions.

The Entry Point: *Massachusetts vs. EPA*

The regulatory approach 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.[5] Relying on the Cannon memorandum as well as the statute itself, on October 20, 1999, a group of 19 organizations petitioned EPA to regulate greenhouse gas emissions from new motor vehicles under Section 202 of the act.[6] 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 August 28, 2003,[7] on the basis of a new General Counsel memorandum the same day, in which it concluded that the CAA does not grant EPA authority to regulate CO_2 and other GHG emissions based on their climate change impacts.[8] The denial was challenged by Massachusetts, 11 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.[9] 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.[10]

[5] 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.

[6] 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.

[7] 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).

[8] 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.

[9] 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."

[10] 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.

The ANPR

In nearly two years following the Court's decision, the Bush Administration's EPA did not respond to the original petition or 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.[11]

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 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."[12] It went on to state that "... the Clean Air Act is a deeply flawed and unsuitable vehicle for reducing greenhouse gas emissions."[13] 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 power.[14]

The Obama Administration's Approach

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.[15] Publication of the proposal in the *Federal Register*, April 24, began a 60-day public comment period. In addition, public hearings were held in mid-May in Arlington, VA, and Seattle, WA.

The proposed endangerment finding was followed in a matter of weeks by an announcement that the Administration had reached agreement with representatives of the auto industry, California, EPA (which had developed its own GHG emission standards for motor vehicles), the National Highway Traffic Safety Administration (NHTSA administers fuel economy standards for cars and trucks), and others. Under the agreement announced by the President, May 19, EPA and NHTSA will integrate corporate average fuel economy (CAFE) standards for new cars and light trucks with national greenhouse gas emission standards to be issued by EPA.

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[11] U.S. EPA, "Regulating Greenhouse Gas Emissions Under the Clean Air Act," 73 *Federal Register* 44354, July 30, 2008.

[12] Ibid., p. 44356.

[13] Ibid.

[14] In December 2007, EPA staff did reach a conclusion that greenhouse gas emissions contribute to air pollution that may reasonably be anticipated to endanger public welfare and prepared a draft endangerment finding stating so; but the Bush Administration chose not to release it. The draft Bush-era finding was eventually released to the public by the Obama Administration's EPA, October 13, 2009. See "Bush EPA Planned Endangerment Finding Based on Public Welfare, Document Shows," *Daily Environment Report*, October 15, 2009, p. A-1. The text of the Bush-era draft can be found at http://www.epa.gov/foia/docs/2007_Draft_Proposed_Endangerment_Finding.pdf.

[15] U.S. EPA, "Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act," 74 *Federal Register* 18886, April 24, 2009.

The objective of the new GHG standards will be to reach reduction levels similar to those adopted by the state of California, although the specifics of the requirement may be different.[16] A formal set of proposed standards appeared in a joint EPA-NHTSA notice in the September 28, 2009 *Federal Register*.[17] Publication of the proposal began a 60-day public comment period, with public hearings in late October in Detroit, New York, and Los Angeles. The joint standards must be finalized by March 31, 2010, in order to take effect with 2012 model year vehicles.

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."[18] Nevertheless, in response to the *Massachusetts v. EPA* decision and other petitions and lawsuits, the agency is moving forward on several fronts to define how the Clean Air Act may be used.

Going After Mobile Sources: Title II Authorities

Although there are a number of ways in which the Clean Air Act could be used to regulate greenhouse gas emissions, this report focuses on the authorities in Title II of the act, which deals with mobile sources of air pollution. As noted in our discussion of *Massachusetts v. EPA*, it was a petition to EPA that it control GHG emissions from new motor vehicles that precipitated much of the discussion of the agency's Clean Air Act authority to control GHGs, and brought the issue to the Supreme Court. The Court dealt with this petition by reversing EPA's denial of it and remanding it for the agency to decide whether the pollutants in question endanger public health or welfare.

Since then, the agency has received nine more petitions asking it to regulate GHGs, all but one focused on mobile sources and their fuels (see **Table 1**). In addition to new motor vehicles, these petitions cover aircraft, ocean-going ships and their fuels, motor fuels in general, and nonroad vehicles and engines – a category that includes construction equipment, farm equipment, logging equipment, outdoor power equipment, forklifts, marine vessels, recreational vehicles, and lawn and garden equipment.

[16] The proposed regulation would require light-duty vehicles to meet an estimated combined average emissions level of 250 grams/mile of CO_2 in model year 2016. Under the CO_2 fleet average standard proposed under the Clean Air Act, EPA expects manufacturers to take advantage of an option to generate CO_2-equivalent credits by reducing emissions of hydrofluorocarbons (HFCs) and CO_2 through improvements in their air conditioner systems, as well as by improving fuel economy. NHTSA is to set corresponding fuel economy standards, achieving a combined fuel economy of 34.1 miles per gallon for cars and light trucks by 2016, with intermediate standards beginning in the 2012 model year. 74 *Federal Register* 49468, September 28, 2009. For additional information, see CRS Report R40166, *Automobile and Light Truck Fuel Economy: The CAFE Standards*, by Brent D. Yacobucci and Robert Bamberger.

[17] "Proposed Rulemaking To Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," 74 *Federal Register* 49454, September 28, 2009.

[18] "EPA Finds Greenhouse Gases Pose Threat to Public Health, Welfare / Proposed Finding Comes in Response to 2007 Supreme Court Ruling," Press Release, April 17, 2009, at http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/0ef7df675805295d8525759b00566924.

Table 1. Petitions for Regulation of Greenhouse Gas Emissions Under the Clean Air Act

Date	Subject	CAA Section	Petitioner
10/20/99	New Motor Vehicles	202(a)(1)	International Center for Technology Assessment (ICTA) and 19 other organizations
10/3/07	Ocean Going Vessels	213(a)(4)	California Attorney General
10/3/07	Marine Shipping Vessels and their Fuels	213(a)(4) and 211	Oceana, Friends of the Earth, and the Center for Biological Diversity
1/10/08	New Marine Engines and Vessels	213(a)(4)	South Coast Air Quality Management District
12/5/07	Aircraft	231	States of California, Connecticut, New Jersey, New Mexico, Pennsylvania, City of New York, District of Columbia, South Coast Air Quality Management District
12/5/07	Aircraft Engines	231(a)(2)(A) and 231(a)(3)	Friends of the Earth, Oceana, the Center for Biological Diversity, and the Natural Resources Defense Council
1/29/08	New Nonroad Vehicles and Engines and Rebuilt Heavy-Duty Engines, excluding Aircraft and Vessels	202(a)(3)(D) and 213(a)(4)	ICTA, Center for Food Safety, and Friends of the Earth
1/29/08	New Nonroad Vehicles and Engines, excluding Aircraft, Locomotives, and Vessels	202 and 213(a)(4)	States of California, Connecticut, Massachusetts, New Jersey, Oregon, and Pennsylvania
7/29/09	Fuels Used in Motor Vehicles, Nonroad Vehicles, and Aircraft	211 and 231	NYU Law School Institute for Policy Integrity
9/21/09	Concentrated Animal Feeding Operations	111(b) and (d)	Humane Society of the United States and 8 other organizations

Source: U.S. EPA and the petitioning organizations.

The specifics of the Clean Air Act sections that give EPA authority to regulate pollution from these sources vary somewhat, but it is generally believed that an endangerment finding and decision to regulate GHGs in response to any one of the petitions could trigger regulation in response to them all. With that in mind, we look at the authorities provided under Title II for the various categories of mobile sources, and what EPA's use of these authorities for conventional pollutants indicates with regard to its ability to regulate greenhouse gases. (A separate report, CRS Report R40585, *Climate Change: Potential Regulation of Stationary Greenhouse Gas Sources Under the Clean Air Act*, discusses the potential Clean Air Act regulatory tools for stationary sources.)

New Motor Vehicles

In general, Title II authorities, which address mobile sources of pollution, are better suited to the regulation of GHGs than most other parts of the act, because the language is written to provide a great deal of flexibility to the Administrator in setting emission standards. In Section 202 of the act, the Administrator is directed to "prescribe (and from time to time revise) ... standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." The Administrator can (in fact, must) use this authority to issue standards for any air pollutant for which she makes an endangerment finding under Section 202.[19]

For the most part, the pollutants for which standards were set under Section 202 have been either criteria pollutants[20] (carbon monoxide and nitrogen oxides) or emissions that served as precursors to the formation of a criteria pollutant (ozone) through chemical reactions in the atmosphere.[21] In 1986, EPA added emission standards for particulate matter under Section 202; in 2004, the agency added a standard for formaldehyde, a carcinogen.

The Administrator is given substantial leeway in the design and implementation of motor vehicle regulations. The act states that the Administrator may establish categories for purposes of regulation based on "gross vehicle weight, horsepower, type of fuel used or other appropriate factors." In addition, the Administrator may delay the effective date of regulations as long as she finds necessary "to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." Using this authority in regulating conventional pollutants, EPA has previously established different standards for cars than for SUVs, minivans, and light trucks; often, it has used weight or power classifications to set differing levels of emission standards, particularly for trucks; it has given manufacturers as much as four years lead time to develop emission controls; and it has set different standards based on the type of fuel an engine uses. Except for specific conventional pollutants mentioned in Section 202, the act does not specify a level of stringency (e.g., best available control technology) for prospective regulations.

In promulgating its current car and light truck standards, the agency set 11 different emission levels (some of them temporary), allowing the manufacturers to choose any of these "bins," provided that the company achieves a prescribed overall fleet average. Thus, there is precedent for applying varying requirements to different sized vehicles, for phasing in requirements, and for the use of fleet averages as opposed to a single standard applied to all models.

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[19] There is no need to demonstrate that the regulations will eliminate the danger posed by the air pollution in question. In the case of other air pollutants—notably, ozone—progressively more stringent standards for motor vehicle emissions have been promulgated for more than 40 years without the pollutants the regulations addressed being reduced sufficiently for all nonattainment areas to attain the ambient air quality standards.

[20] Criteria pollutants are pollutants that endanger public health or welfare and whose presence in ambient air results from numerous or diverse sources. Sections 108 and 109 of the act give the Administrator the authority to identify such pollutants and set national ambient air quality standards for them. There are six criteria pollutants, all of which were identified in the 1970s.

[21] Ozone is not generally emitted directly by emission sources, but forms in the atmosphere as the result of chemical reactions among precursors in the presence of sunlight. The precursors include the hydrocarbons present in gasoline (currently termed "non-methane organic gases," NMOG, in the regulations), as well as nitrogen oxides and carbon monoxide, which are regulated as criteria pollutants in their own right.

In the GHG standards for motor vehicles proposed in the September 28, 2009 *Federal Register*, EPA has used the concept of a vehicle's "footprint" to set differing standards for different size vehicles. As explained by EPA:

> These standards are based on CO_2 emissions-footprint curves, where each vehicle has a different CO_2 emissions compliance target depending on its footprint value (related to the size of the vehicle). Generally, the larger the vehicle footprint, the higher the corresponding vehicle CO_2 emissions target. As a result, the burden of compliance is distributed across all vehicles and all manufacturers. Manufacturers are not compelled to build light vehicles of any particular size or type, and each manufacturer will have its own standard which reflects the vehicles it chooses it (sic) produce.[22]

Manufacturers will also be allowed to average, bank, and trade emission credits if the standards are promulgated as proposed.

Although flexible in many respects, motor vehicle standards have often been used to force the development of new technology. In adopting technology-forcing regulations, EPA has generally followed the lead of California. Because of its more severe air pollution and its pioneering role in establishing motor vehicle emission control requirements in the 1960s, California is allowed to adopt standards more stringent than federal requirements. The state must apply for a waiver of federal preemption in order to enforce its more stringent standards, which EPA is to grant if the state meets certain criteria, primarily a showing that the standards are needed to meet "compelling and extraordinary conditions."

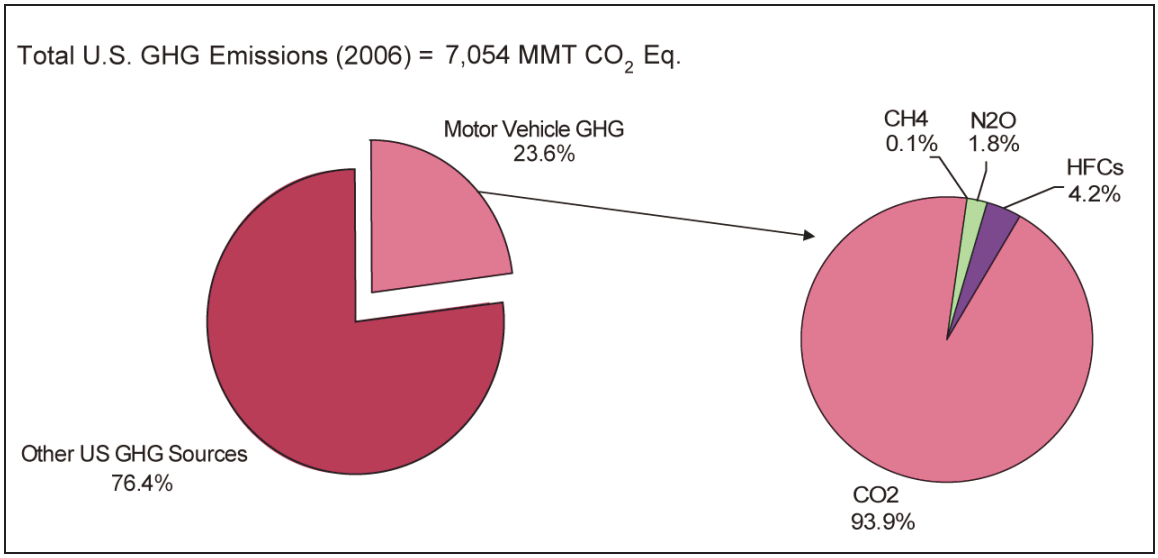
In the 1970s, California and the federal government used technology-forcing regulations to bring about the development and introduction of catalytic converters, reducing emissions from new vehicles as much as 90% in less than a decade. In recent years, California's Zero Emission Vehicle and Low Emission Vehicle (LEV2) requirements, though frequently modified, have stimulated the development of alternative fuel, hybrid, and electric vehicles and led to the development of the National Low Emission Vehicle program and EPA's current Tier 2 emission standards.

Emissions of GHGs from new motor vehicles are the subject of already promulgated California standards, for which the state requested that EPA issue a waiver of federal preemption in December 2005. These California standards will require gradual reductions of GHG emissions from new passenger vehicles until they are about 30% below the emissions of the 2002 fleet in 2016. Compliance will be determined by fleet averages, rather than by the emissions of individual vehicles, and the regulations provide additional flexibility, including averaging of emissions over a five-year period, banking, and trading of credits within and among manufacturers. (For a discussion of the California standards, see CRS Report RL34099, *California's Waiver Request Under the Clean Air Act to Control Greenhouse Gases From Motor Vehicles*.) The California program, for which EPA granted a waiver June 30, 2009, has served as a model for how EPA could regulate motor vehicle GHGs under the Clean Air Act.

[22] The regulations are at 74 *Federal Register* 49454, September 28, 2009. For a further description, including emission targets for specific types of vehicle and specifics regarding the averaging, banking , and trading of emission credits, see "EPA and NHTSA Propose Historic National Program to Reduce Greenhouse Gases and Improve Fuel Economy for Cars and Trucks," Fact Sheet, at http://www.epa.gov/otaq/climate/regulations/420f09047.htm#2.

Promulgation of an endangerment finding would trigger the development of regulations for emissions of four greenhouse gases emitted by motor vehicles (CO_2, methane, nitrous oxide, and hydrofluorocarbons).[23] According to EPA, emissions of the four gases from motor vehicles (passenger cars, light duty trucks, other trucks and buses, and motorcycles) accounted for 23.6% of the total inventory of U.S GHG emissions in 2006. Most of the emissions are in the form of CO_2 (see **Figure 1**), which is the product of combusting any fuel containing carbon. Hydrofluorocarbons (HFCs), the chemicals used as coolants in auto air conditioning systems, are the second most important motor vehicle GHG; but, as the figure shows, they are a distant second.

Figure 1. Motor Vehicle Greenhouse Gas Emissions



Source: U.S. EPA, March 6 Draft Deliberative Presentation

Notes: Motor vehicles = passenger cars, light duty trucks, other trucks, buses, and motorcycles, including releases of HFCs from motor vehicle air conditioning. CH4=methane; N2O=nitrous oxide; HFCs=hydrofluorocarbons.

Assuming that EPA sets standards for emissions of motor vehicle GHGs, the agency can either regulate the GHGs as a basket, or regulate them individually. The agency has proposed a combination of the two approaches, with hard caps on emissions of methane and nitrous oxide, but averaging, banking, and trading of credits allowed for CO_2 and HFCs. The endangerment finding proposal stated that the Administrator believes she can regulate emissions of the GHGs either individually or as a group: "If the Administrator defines the air pollutant as the group of greenhouse gases, she believes she would have the discretion to set standards that either control the emissions of the group as a whole, and/or standards that control emissions of individual

[23] Two other commonly mentioned greenhouse gases, sulfur hexafluoride (SF_6) and perfluorocarbons, are not emitted by motor vehicles.

greenhouse gases, as constituents of the class."[24] This determination, like other elements of the proposal, was subject to public comment.

As shown in **Table 2**, cars and light trucks (pickups, minivans, SUVs, etc.) account for three-quarters of motor vehicle GHG emissions, with medium- and heavy-duty trucks accounting for most of the rest. The regulations proposed on September 28 apply only to cars and light trucks, not to medium- and heavy-duty trucks.

Although they would affect a large group of emission sources that account for a significant percentage of total U.S. GHG emissions, the effectiveness of motor vehicle emission standards in reducing total GHG emissions is limited in that both California's and the proposed EPA standards would apply only to new motor vehicles. The auto and light truck fleet turns over slowly: the median survival rate for 1990 cars, for example, was 16.9 years, and that for light trucks was 15.5 years.[25] Given this durability, the impact of GHG standards on the total emissions of the motor vehicle fleet will take a long time to be felt. If historic experience is any guide, reductions in GHG emissions per new vehicle, unless they are very aggressive, may be largely offset by growth in vehicle miles traveled.

Table 2. Motor Vehicle GHG Emissions, 2007, by Source Category

(million metric tonnes, CO_2-e)

Category	Total GHG Emissions	% of Motor Vehicle Total
Passenger Cars	664.5	40.3%
Light Duty Trucks	561.6	34.0%
Medium- and Heavy-Duty Trucks	410.4	24.9%
Buses	12.4	0.8%
Motorcycles	2.0	0.1%
Total	1650.9	

Source: U.S. EPA, *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2007*, Table 2-15.

Ships

Three of the 10 petitions to EPA asking the agency to control greenhouse gas emissions concern ocean-going ships (also referred to as marine engines and vessels) and (in two of the petitions) their fuel. Although there is a wide range of estimates, the International Maritime Organization's consensus is that international shipping emitted 843 million metric tonnes of carbon dioxide, 2.7% of global CO_2 emissions in 2007. Including domestic shipping and fishing vessels larger than 100 gross tonnes, the amount would increase to 1.019 billion tonnes, 3.3% of global

[24] Environmental Protection Agency, "Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act," 74 *Federal Register* 18905, April 24, 2009.

[25] Oak Ridge National Laboratory, for the U.S. Department of Energy, *Transportation Energy Data Book: Edition 27*, 2008, Tables 3.10 and 3.11.

emissions.[26] At these levels, only five countries (the United States, China, Russia, India, and Japan) account for a higher percentage of the world total of CO_2 emissions.[27]

In addition to the CO_2 emissions, the low quality bunker fuel that ships use and the absence of pollution controls result in significant emissions of black carbon and nitrogen oxides, which also contribute to climate change. Refrigerants used on ships (hydrofluorcarbons and perfluorocarbons—HFCs and PFCs) are also potent greenhouse gases when released to the atmosphere. Thus, the total impact of ships on climate may be somewhat greater than 3%.

The authority to control pollution from ships is found in Section 213(a)(4) of the Clean Air Act, which provides general authority to the Administrator to promulgate standards for emissions other than carbon monoxide, oxides of nitrogen, and volatile organic compounds from "nonroad engines and vehicles."[28] Fuels are regulated separately under Section 211 of the act.

The language of Section 213 is similar to that for new motor vehicles in Section 202. If the Administrator determines that emissions of GHGs from ships "significantly contribute"[29] to air pollution which may reasonably be anticipated to endanger public health or welfare, she may promulgate such regulations as she deems "appropriate." Except for the specific conventional pollutants mentioned in Section 213(a)(2), there is no level of stringency (such as best available control technology) specified for prospective regulations. The Administrator may establish classes or categories of ships for the purposes of regulation. There is no deadline for the promulgation of standards, and in setting them, the Administrator may take into account costs, noise, safety, and energy factors associated with the application of technology.

A wide variety of measures might be undertaken to reduce emissions from shipping, from simple operational measures, such as reducing speed[30] or using cleaner fuels, to various hull and propeller design features that would increase fuel economy. Reducing speed can save substantial amounts of fuel. A.P. Moller-Maersk, which operates the world's largest fleet of containerships, reported that it reduced fuel consumption by its ships 8% in 2008, despite an increase in business activity. According to the company, "Reducing speed 5-10% does increase the number of days at sea, but reduces both fuel consumption and CO_2 emission by more than 15%." The petitions also mention improved fleet deployment planning, use of shore-side power while in port, heat recovery systems, the use of sails as supplemental propulsion sources, and NOx controls, such as selective catalytic reduction (SCR) or exhaust gas recirculation, as potential emission control measures.

A complicating factor in the regulation of emissions from ocean-going vessels would be that, for the most part, their GHG emissions occur in international waters, and the sources (the ships) are not registered in the United States: according to California's petition, 95% of the fleet calling on

[26] International Maritime Organization, *Updated Study on Greenhouse Gas Emissions from Ships*, Executive Summary of Phase 1 Report, 1st September 2008, p. 5 at egserver.unfccc.int/seors/attachment/file_storage/6ep77qqvcujba7k.doc. Both estimates exclude emissions from naval vessels.

[27] Oceana, *Shipping Impacts on Climate: A Source with Solutions*, p. 2, at http://www.oceana.org/fileadmin/oceana/uploads/Climate_Change/Oceana_Shipping_Report.pdf.

[28] CO, NOx, and VOCs are regulated under Section 213(a)(3), which requires the imposition of best available control technology, and set a deadline for such regulation.

[29] Section 213 uses the words "significantly contribute," whereas Section 202 says "cause, or contribute to."

[30] See *Preparing for the Future*, The A.P. Moller – Maersk Group's Health, Safety, Security and Environment Report 2008, pp. 28-30, at http://media.maersk.com/da/PressReleases/2009/Documents/Maersk%20HSSE%202008_Final.pdf.

U.S. ports is foreign-flagged. The petitioners assert that these factors are not a bar to EPA regulation, however, citing as precedent a Supreme Court case that held that the Americans with Disabilities Act could be applied to foreign-flagged cruise ships so long as the ADA-required accommodations did not interfere with the ships' internal affairs or require major, permanent modifications to the ships.[31] In addition, according to the California petition, the United States can and does enforce pollution standards on ships in its territorial waters, "as can be seen by the fact that the National Park Service has imposed air pollutant emissions controls on cruise ships, including foreign-flagged cruise ships (the vast majority of such ships are foreign-flagged), that sail off the coast from Glacier Bay National Park, in Alaska."[32]

EPA did not address these assertions in the ANPR, but it might be that a distinction needs to be made between operational factors (speed, fuel type, etc.), that are easily amenable to control, and permanent modifications of the vessel. In its petition, California cites the Clean Air Act's historic role in forcing the development of new, cleaner technology, but the Supreme Court opinions in *Spector v. Norwegian Cruiseline* and other cases might seem to impose some limits on the degree to which the act's authority can be used with respect to foreign-flagged vessels.[33]

In addition to petitioning for regulation of emissions from ships, the petitions from California and from Oceana et al. stated that EPA should regulate the composition of marine shipping vessel fuel to control global-climate-change-related emissions, or should require use of marine diesel fuel oil instead of bunker fuel. The purpose would be to limit the sulfur content of marine fuels and reduce NOx emissions. We discuss EPA's authority to regulate fuels in a separate section below, but note here that EPA, the State of California, and the International Maritime Organization are all moving forward with regulations to limit the sulfur content of bunker fuel for the purpose of reducing conventional pollutants. California's low sulfur fuel requirements went into effect July 1, 2009. In addition, on March 27, 2009, EPA proposed that the entire U.S. coastline except portions of Alaska be designated by the IMO as an Emission Control Area, subject to lower sulfur limits in bunker fuel.

Sulfur emissions form fine particles of sulfate in the atmosphere, with significant impacts on public health and welfare. (For a further discussion of these impacts, see CRS Report RL34548, *Air Pollution and Greenhouse Gas Emissions from Ships*.) Although harmful as a conventional pollutant, sulfur emissions are thought by most experts to be beneficial or at least neutral in the climate context. Sulfates have a cooling effect on the atmosphere, since the particles tend to reflect solar radiation back into space rather than absorbing it. On the other hand, removing sulfur might be necessary to prevent the fouling of pollution control equipment that reduces other pollutants that do lead to warming.

[31] Spector v. Norwegian Cruiseline, 545 U.S. 119 (2005).

[32] People of the State of California Acting by and Through Attorney General Edmund G. Brown, Jr., "Petition for Rule Making Seeking the Regulation of Greenhouse Gas Emissions from Ocean-Going Vessels," October 3, 2007, p. 13. The cited regulations are at 36 CFR 13.65(b)(4). The *Federal Register* citation is 61 *Federal Register* 27008, 27011 (May 30, 1996).

[33] In addition to these considerations, U.S. international treaty obligations, specifically international trade agreements, may be implicated. These issues are beyond the scope of this report.

Other Nonroad Engines

Section 213 can also be used to regulate other nonroad vehicles and engines. A similar endangerment finding would first be required, following which the Administrator may promulgate such regulations as she deems appropriate to control emissions from the classes or categories of nonroad engines that she determines "significantly contribute to" the air pollution that endangers public health or welfare. The Administrator is to take into account costs, noise, safety, and energy factors in setting standards. There is no deadline for setting standards.

The nonroad sector is a broad category that includes construction equipment, farm equipment, forklifts, outdoor power equipment, lawn and garden equipment, and recreational vehicles.[34] This group accounted for 199.7 million metric tons of CO_2 emissions in 2007, according to the two petitions requesting regulation (see **Table 3**), 3.3% of total U.S. emissions of CO_2 in that year. According to the ICTA petition, GHG emissions from the nonroad sector increased 49% between 1990 and 2005, a higher rate of emissions increase over the same period than for on-road vehicles (32%), aircraft (3%), boats and ships (36%), and rail (32%).[35]

Table 3. Nonroad Sector CO_2 Emissions, 2007, by Source Category

(million metric tonnes)

Category	CO_2 Emissions	% of Nonroad Total
Construction and Mining Equipment	63.9	32.0%
Agricultural Equipment	39.6	19.8%
Industrial Equipment	27.8	13.9%
Lawn and Garden Equipment	23.8	11.9%
Commercial Equipment	16.4	8.2%
Pleasure Craft	15.8	7.9%
Recreational Equipment	9.4	4.7%
Logging Equipment	1.9	1.0%
Airport Equipment	1.0	0.5%
Railroad Equipment	0.2	0.1%
Total	199.7	

Source: ICTA et al., *Petition for Rulemaking Seeking the Regulation of Greenhouse Gas Emissions from Nonroad Vehicles and Engines*. According to the petition, the emissions data were compiled by the Western Environmental Law Center using EPA's nonroad emissions model.

Given their smaller impact on overall emission levels, EPA has been slower to regulate conventional (criteria) pollutants from nonroad engines than from motor vehicles. Many of these

[34] Locomotives are also considered nonroad engines, but the authority to regulate them (in Section 213(a)(5)) is separate from that applicable to the rest of the category, and does not appear to give the Administrator the authority to set GHG standards. Thus, they were not included in either of the two petitions EPA received requesting regulation of nonroad GHG emissions.

[35] International Center for Technology Assessment, et al., "Petition for Rulemaking Seeking the Regulation of Greenhouse Gas Emissions from Nonroad Vehicles and Engines," January 29, 2008, p. 5.

engines had few emission control requirements for as many as 25 years after the regulation of automobiles. In the last decade, however, often following the lead of California, EPA has promulgated standards for many nonroad categories. Some of these standards, particularly for diesel-powered equipment and for lawn and garden equipment have been technology-forcing. Others, such as for snowmobiles, have been less so.

In general, given the wide variety of engine types and sizes and the configurations of the equipment itself, the agency has based its standards on a review of individual subcategories and the technologies available to reduce emissions from specific types of machinery or equipment, rather than applying one across the board standard. Presumably, any GHG standards for this sector would take the same approach.

Aircraft

EPA has also received petitions to regulate GHG emissions from aircraft and aircraft engines. In the United States, aircraft of all kinds are estimated to emit between 2.4% and 3.4% of the nation's total greenhouse gas emissions.[36] When other factors are considered, the impact of U.S. aviation on climate change is perhaps twice that size. These factors include the contribution of aircraft emissions to ozone formation, the water vapor and soot that aircraft emit, and the high altitude location of the bulk of aircraft emissions. (For additional information on aircraft GHG emissions, see CRS Report R40090, *Aviation and Climate Change*.)

As noted in **Table 1**, two December 2007 petitions requested that EPA address aircraft GHG emissions. Specifically, the petitions asked that EPA make a finding that aircraft GHG emissions endanger public health or welfare, and that the agency adopt regulations that allow a range of compliance approaches: these might include emission limits, operational practices, fees, a cap-and-trade system, minimizing engine idling time, employing single engine taxiing, or use of ground-side electricity measures to replace the use of fuel-burning auxiliary power units at airport gates.[37]

EPA has authority to regulate emissions from aircraft under Section 231 of the Clean Air Act. The language is similar to that for other mobile sources. It requires the Administrator to issue standards for the emission of any air pollutant from any class or classes of aircraft engines which, in her judgment, causes or contributes to air pollution which may reasonably be anticipated to endanger public health or welfare. The regulations are to take effect "after such period as the Administrator finds necessary ... to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance.... "

Unlike ships, aircraft operating in the United States are generally registered here: EPA has cited data that foreign carriers accounted for only 3% of major carrier operations in the United States in 1999.[38] Thus, whether GHG regulations could be applied to foreign flag carriers might seem to

[36] The lower percentage includes CO_2 emissions from consumption of fuel by military aircraft, general aviation, and domestic operation of commercial aircraft. The higher estimate includes CO_2 emissions from international air travel originating in the United States, as well.

[37] For a brief discussion of the petitions, see 73 *Federal Register* 44460, July 30, 2008. Some of these measures, such as minimizing engine idling time, employing single engine taxiing, and use of ground-side electricity measures to replace the use of fuel-burning auxiliary power units, are already widely used by the airlines as fuel-saving measures.

[38] U.S. EPA, Office of Air and Radiation, *Emission Standards and Test Procedures for Aircraft and Aircraft Engines, Summary and Analysis of Comments*, November 2005, p. 10, at http://www.epa.gov/oms/regs/nonroad/aviation/ (continued...)

pose less of an issue, at least in terms of whether any potential regulations would address the bulk of the sector's U.S. emissions. On the other hand, international air travel is extremely competitive, and issues of whether regulations can be imposed on foreign carriers have already been raised in the context of the European Union's adoption of cap-and-trade requirements for international aviation. U.S. airlines generally maintain that the imposition of requirements on foreign-flag airlines (i.e., themselves, in the European Union) violates international trade agreements. Their preference is that any controls be negotiated through the International Civil Aviation Organization (ICAO) and be applied equally to all carriers.

It is also worth noting that, compared to other mobile sources, EPA's Clean Air Act authority vis-à-vis aircraft and aircraft engines contains two principal differences. The first is that the Administrator must consult with the Administrator of the Federal Aviation Administration and the Secretary of Transportation in developing emission standards, and is not allowed to change the standards if doing so would significantly increase noise and adversely affect safety. The second, and perhaps more significant difference, is that EPA has rarely regulated emissions from aircraft without first negotiating international agreements through ICAO. ICAO's regulation of conventional pollutants from aircraft, unlike EPA's regulation of the same pollutants from motor vehicles, has consistently avoided forcing technology. The most recent standards for nitrogen oxides, for example, essentially ratified what the principal aircraft manufacturers had already achieved.[39]

Fuels

Fuel regulation, whether of bunker fuel, gasoline, or any other type of fuel, is authorized under Section 211 of the Clean Air Act. Section 211 gives the Administrator authority to control or prohibit the manufacture and sale of any fuel or fuel additive if she concludes that its emission products may endanger public health or welfare, or if they will impair to a significant degree the performance of emission control devices. As with the regulation of engines and vehicles, the Administrator is given substantial leeway in the design and implementation of fuel regulations and there is no deadline for their promulgation even after an endangerment finding is made.

GHG emissions from fuels have already been targeted for regulation by the State of California.[40] On March 5, 2009, the California Air Resources Board (CARB) proposed the California Low Carbon Fuel Standard, the goal of which is to reduce GHG emissions from transportation fuels per unit of energy 10% by 2020.[41] The regulations would address emissions from the production, transportation, and consumption of gasoline, diesel fuel, and their alternatives, including biofuels. The regulations envision compliance both through the use of lower carbon fuels and through the development of more efficient, advanced-technology vehicles, such as plug-in hybrids, electric vehicles, and hydrogen fuel cells. A public comment period on the proposed standards began with their release on March 5. CARB hopes to finalize the regulations by 2010.

(...continued)

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[39] "EPA Proposal to Bring Certain Aircraft Up to International Engine Standard," *Daily Environment Report*, September 30, 2003.

[40] For more information, see CRS Report R40078, *A Low Carbon Fuel Standard: State and Federal Legislation and Regulations*.

[41] The proposed regulation and supporting information can be found on CARB's website at http://www.arb.ca.gov/regact/2009/lcfs09/lcfsisor1.pdf.

As has been the case with motor vehicles, California has often led the way in the development of cleaner conventional fuels through technology-forcing regulation, with U.S. EPA later adopting similar standards. Thus, many view the Low Carbon Fuel Standard as the prototype of another possible use of existing Clean Air Act authority to regulate greenhouse gas emissions nationally. On July 29, 2009, the Institute for Policy Integrity at NYU Law School petitioned EPA to establish a cap-and-trade system to limit greenhouse gas emissions from fuels used in motor vehicles, nonroad vehicles, and aircraft.

Regulation of fuels would be a way for CARB or EPA to obtain reductions from existing vehicles and engines. As noted earlier, the slow turnover of the vehicle fleet means that emission reductions from new vehicles would only gradually affect emission levels from the fleet as a whole. By requiring low carbon fuels, CARB and EPA could obtain GHG reductions from the entire fleet more quickly.

On the other hand, measuring the carbon content of fuels is more complicated than it may seem, particularly if one considers the life-cycle emissions, including indirect impacts of production. EPA is embroiled in a controversy over this issue already,[42] as it attempts to develop a methodology for measuring greenhouse gas emissions from biofuels, as required by the Energy Independence and Security Act of 2007 (P.L. 110-140).[43] For regulations implementing this provision, EPA is still developing a methodology to measure the GHG effects of indirect land-use changes, such as the switching of land from forest to cropland.

Summary of Mobile Source and Fuel GHG Emissions

Table 4 summarizes EPA's existing authorities over mobile source GHG emissions and the emissions of each of the sectors discussed in this report. Given the Supreme Court's remand in *Massachusetts v. EPA*, the agency is focusing its efforts on motor vehicles (passenger cars and light trucks), which, as Table 4 shows, account for the majority of mobile source GHG emissions. Nevertheless, assuming the agency does issue an endangerment finding for motor vehicles, it would appear that they could move forward to control GHG emissions from most of the other categories of mobile sources and/or their fuels by issuing similar endangerment findings.

Regulation of GHGs from mobile sources might also lead the agency to establish controls for stationary sources, such as electric power plants.[44] That option, which would use authorities in different sections of the Clean Air Act than Title II, is addressed in CRS Report R40585, *Climate Change: Potential Regulation of Stationary Greenhouse Gas Sources Under the Clean Air Act*, by

[42] For information, see CRS Report R40460, *Calculation of Lifecycle Greenhouse Gas Emissions for the Renewable Fuel Standard*.

[43] Section 202 of the act mandates the use of "advanced biofuels"—fuels produced from non-corn feedstocks and with 50% lower lifecycle greenhouse gas emissions than petroleum fuel—starting in 2009. Of the 36 billion gallons of renewable fuel required in 2022, at least 21 billion gallons must be advanced biofuel.

[44] In its ANPR, in July 2008, the agency stated: "As part of EPA's efforts to respond to the Supreme Court's decision, the Agency conducted a thorough review of the CAA to identify and assess any other CAA provisions that might authorize regulation of GHG emission sources. That review made clear that a decision to control any source of GHG emissions could or would impact other CAA programs with potentially far-reaching implications for many industrial sectors. In particular, EPA recognized that regulation of GHG emissions from motor vehicles under section 202(a)(1) or from other sources of GHG emissions under many other provisions of the Act would subject major stationary sources to preconstruction permitting under the CAA." 73 *Federal Register* 44399, July 30, 2008.

Larry Parker and James E. McCarthy. Electric power plants accounted for 33.6% of U.S. GHG emissions in 2007.

Table 4. Categories of Sources Whose GHG Emissions Could Be Regulated Under Title II of the Clean Air Act

(assuming an endangerment finding for the category)

Category	CAA Authority (Section #)	Estimated 2007 GHG Emissions (million tonnes CO_2-e)	% of Total U.S. GHG Emissions
Passenger Cars	202	664.5	9.3%
Light Duty Trucks	202	561.6	7.9%
Medium- and Heavy-Duty Trucks	202	410.4	5.8%
Aircraft (domestic operation)	231	189.4	2.7%
Construction and Mining Equipment	213	63.9	0.9%
Agricultural Equipment	213	39.7	0.6%
Ships and Other Boats[a]	213	33.7	0.5%
Industrial Equipment	213	27.8	0.4%
Lawn and Garden Equipment	213	23.8	0.3%
Commercial Equipment	213	16.4	0.2%
Pleasure Craft	213	15.8	0.2%
Buses	202	12.4	0.2%
Recreational Equipment	213	9.4	0.1%
Motorcycles	202	2.0	<0.1%
Logging Equipment	213	1.9	<0.1%
Airport Equipment	213	1.0	<0.1%
Railroad Equipment	213	0.2	<0.1%
Total[b]		2073.9	29.1%

Source: U.S. EPA and ICTA

a. Does not include international bunker fuel.

b. Emission reductions from these categories might also be addressed through regulation of the carbon content of their fuels.

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