The EPA Administrator signed the following proposed rule on July 25, 2002. It is being submitted for publication in the *Federal Register*. While EPA has taken steps to ensure the accuracy of this Internet version of the rule, it is not the official version of the rule for purposes of public comment. Please refer to the official version in a forthcoming *Federal Register* publication and on GPO's Web Site. The rule will likely be published in the *Federal Register* in August 2002 You can access the *Federal Register* at: http://www.access.gpo.gov/su_docs/aces/aces140.html. When using this site, note that "text" files may be incomplete because they don't include graphics. Instead, select "Adobe Portable Document File" (PDF) files.

ENVIRONMENTAL PROTECTION AGENCY
40 CFR Parts 86, 90, 1045, and 1068
[AMS-FRL-xxxx-x]

RIN 2060-AJ90

Control of Emissions from Spark-Ignition Marine Vessels and Highway Motorcycles

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of Proposed Rulemaking.

SUMMARY: In this action, we are proposing evaporative emissions standards for marine vessels that use spark-ignition engines (including sterndrive, inboard, and outboard engines and personal watercraft) and we discuss our plans to propose standards in the future regulating exhaust emissions from spark-ignition marine engines. This action also proposes new emission standards for highway motorcycles, including motorcycles of less than 50 cubic centimeters in displacement. This action is related to our proposal for emission standards for several sources that cause or contribute to air pollution. On October 5, 2001 we published proposed standards for large spark-ignition engines such as those used in forklifts and airport tugs; recreational vehicles using spark-ignition engines such as off-highway motorcycles, all-terrain vehicles, and snowmobiles; and recreational marine diesel engines.

Nationwide, marine evaporative HC emissions contribute to ozone, and motorcycles contribute to ozone, CO, and PM nonattainment. These pollutants cause a range of adverse health effects, especially in terms of respiratory impairment and related illnesses. The proposed standards would help states achieve and maintain air quality standards. In addition, the proposed evaporative emission standards would help reduce acute exposure air toxics and the proposed motorcycle exhaust standards would help reduce exposure to CO, air toxics, and PM for operators and other people close to emission sources. They would also help address other environmental problems, such as visibility impairment in our national parks.

We believe that manufacturers would be able to maintain or even improve the performance of their products in certain respects when producing engines and vessels meeting the proposed standards. In fact, we estimate that the evaporative emission standards would reduce fuel consumption by enough to offset any costs associated with the evaporative emission control technology. Overall, the gasoline fuel savings associated with the anticipated changes in technology resulting from the rule proposed in this notice are estimated to be about 31 million gallons per year once the program is fully phased in (2030). The proposal also has several provisions to address the unique limitations of small-volume manufacturers.

DATES: *Comments*: Send written comments on this proposal by November 8, 2002. See Section VII for more information about written comments.

Hearings: We will hold a public hearing on September 17, 2002 starting at 9:30 am EDT. This hearing will focus on issues related to highway motorcycles. In addition, we will hold a public hearing on September 23, 2002 starting at 9:30 am EDT. This hearing will focus on issues related to marine vessels. If you want to testify at a hearing, notify the contact person listed below at least ten days before the hearing. See Section VII for more information about public hearings.

ADDRESSES: *Comments*: You may send written comments in paper form or by e-mail. We must receive them by November 8, 2002. Send paper copies of written comments (in duplicate if possible) to the contact person listed below. You may also submit comments via e-mail to "MCNPRM@epa.gov." In your correspondence, refer to Docket A-2000-02.

EPA's Air Docket makes materials related to this rulemaking available for review in Public Docket No. A-

2000-01 and A-2000-02 at the following address: U.S. Environmental Protection Agency (EPA), Air Docket (6102), Room M-1500 (on the ground floor in Waterside Mall), 401 M Street, S.W., Washington, D.C. 20460 between 8:00 a.m. to 5:30 p.m., Monday through Friday, except on government holidays. You can reach the Air Docket by telephone at (202) 260-7548, and by facsimile (202) 260-4400. We may charge a reasonable fee for copying docket materials, as provided in 40 CFR part 2.

Hearings: We will hold a public hearing for issues related to highway motorcycles on September 17 at the Ypsilanti Marriott at Eagle Crest, Ypsilanti, Michigan (734-487-2000).
We will host a public hearing for issues related to marine vessels on September 23 at the National Vehicle and Fuel Emission Laboratory, 2000 Traverwood Dr., Ann Arbor, Michigan (734-214-4334). See Section VII, "Public Participation" below for more information on the comment procedure and public hearings.

FOR FURTHER INFORMATION CONTACT: Margaret Borushko, U.S. EPA, National Vehicle and Fuels Emission Laboratory, 2000 Traverwood, Ann Arbor, MI 48105; Telephone (734) 214-4334; FAX: (734) 214-4816; E-mail: borushko.margaret@epa.gov.

SUPPLEMENTARY INFORMATION:

Regulated Entities

This proposed action would affect companies that manufacture or introduce into commerce any of the engines or vehicles that would be subject to the proposed standards. These include: marine vessels with spark-ignition engines and highway motorcycles. This proposed action would also affect companies buying engines for installation in vessels and motorcycles. There are also proposed requirements that apply to those who rebuild any of the affected engines. Regulated categories and entities include:

Category	NAICS Codes[a]	SIC Codes[b]	Examples of Potentially Regulated Entities
Industry		3732	Manufacturers of marine vessels
Industry	811310	7699	Engine repair and maintenance
Industry	336991		Motorcycles and motorcycle parts manufacturers
Industry	421110		Independent Commercial Importers of Vehicles and Parts

[a]North American Industry Classification System (NAICS)
[b]Standard Industrial Classification (SIC) system code.

This list is not intended to be exhaustive, but rather provides a guide regarding entities likely to be regulated by this action. To determine whether particular activities may be regulated by this action, you should carefully examine the proposed regulations. You may direct questions regarding the applicability of this action to the person listed in "FOR FURTHER INFORMATION CONTACT."

Obtaining Electronic Copies of the Regulatory Documents

The preamble, regulatory language, Draft Regulatory Support Document, and other rule documents are also available electronically from the EPA Internet Web site. This service is free of charge, except for any cost incurred for internet connectivity. The electronic version of this proposed rule is made available on the day of publication on the primary web site listed below. The EPA Office of Transportation and Air Quality also publishes official *Federal Register* notices and related documents on the secondary web site listed below.

1. http://www.epa.gov/docs/fedrgstr/EPA-AIR/
(either select desired date or use Search feature)
2. http://www.epa.gov/otaq/
(look in What's New or under the specific rulemaking topic)

Please note that due to differences between the software used to develop the documents and the software into which the document may be downloaded, format changes may occur.

Table of Contents

I. Introduction

A. Overview

Air pollution is a serious threat to the health and well-being of millions of Americans and imposes a large burden on the U.S. economy. Ground-level ozone, carbon monoxide, and particulate matter are linked to potentially serious respiratory health problems, especially respiratory effects and environmental degradation, including visibility impairment in our precious national parks. Over the past quarter century, state and federal representatives have established emission-control programs that significantly reduce emissions from individual sources. Many of these sources now pollute at only a small fraction of their pre-control rates. This proposal is part of a new effort that further addresses these air-pollution concerns by proposing national standards regulating emissions from several types of nonroad engines and vehicles that are currently unregulated by establishing standards for nonroad engines and vehicles, as required by Clean Air Act section 213(a)(3). The first part of this effort was a proposal published on October 5, 2001 which included industrial spark-ignition engines such as those used in forklifts and airport tugs; recreational vehicles such as off-highway motorcycles, all-terrain vehicles, and snowmobiles; and recreational marine diesel engines.[1]

This action, the second part, includes evaporative emission standards for marine vessels with spark-ignition engines and their fuel systems.[2] In addition, we are proposing new emission standards for highway motorcycles. The proposed standards for motorcycles reflect the development of emission-control technology that has occurred since we last set standards for these engines in 1978. Including highway motorcycles in this proposal is also appropriate as we consider new emission standards for the counterpart off-highway motorcycle models.

Nationwide, the sources covered by this proposal are significant contributors to mobile-source air pollution. Marine evaporative emissions currently account for 1.3 percent of mobile-source hydrocarbon (HC) emissions, and highway motorcycles currently account for about 1.1 percent of mobile-source HC emissions, 0.4 percent of mobile-source carbon monoxide (CO) emissions, 0.1 percent of mobile-source oxides of nitrogen (NOx) emissions, and 0.1 percent of mobile-source particulate matter (PM) emissions.[3] The proposed standards would reduce exposure to these emissions and help avoid a range of adverse health effects associated with ambient ozone and PM levels, especially in terms of respiratory impairment and related illnesses. In addition, the proposed standards would help reduce acute exposure air toxics and PM for persons who operate or who work with or are otherwise active in close proximity to these sources. They would also help address other environmental problems associated with these sources, such as visibility impairment in our national parks and other wilderness areas where recreational vehicles and marine vessels are often used.

This proposal follows EPA's Advance Notice of Proposed Rulmaking (ANRPM) published on December 7, 2000 (65 FR 76797). In that Advance Notice, we provided an initial overview of possible regulatory strategies for nonroad vehicles and engines and invited early input to the process of developing standards. We received

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[1] See 66 FR 51098.

[2] Diesel-cycle engines, referred to simply as "diesel engines" in this document, may also be referred to as compression-ignition (or CI) engines. These engines typically operate on diesel fuel, but other fuels may also be used. Otto-cycle engines (referred to here as spark-ignition or SI engines) typically operate on gasoline, liquefied petroleum gas, or natural gas.

[3] While we characterize emissions of hydrocarbons, this can be used as a surrogate for volatile organic compounds (VOC), which is broader group of compounds.

comments on the Advance Notice from a wide variety of stakeholders, including the engine industry, the equipment industry, various governmental bodies, environmental groups, and the general public. These comments are available for public viewing in Docket A-2000-01. The Advance Notice, the related comments, and other new information provide the framework for this proposal.

B. How Is this Document Organized?

This proposal covers both marine vessels and highway motorcycles and many readers may only be interested in one or the other of theses applications. We have attempted to organize the document in a way that allows each reader to focus on the application of particular interest. The Air Quality discussion in Section II is general in nature, however, and applies to the proposal as a whole.

The next three sections contain our proposal for the marine vessels and highway motorcycles that are the subject of this action. Section III presents the proposed evaporative emission program for marine vessels using spark-ignition engines. Section IV discusses our intentions for controlling exhaust emissions from spark-ignition marine engines in the future. Section V contains our proposed highway motorcycle standards.

Section VI summarizes the projected impacts and a discussion of the benefits of this proposal. Finally, Sections VII and VIII contain information about public participation, how we satisfied our administrative requirements, and the statutory provisions and legal authority for this proposal.

The remainder of this Section I summarizes important background information about this proposal, including the engines covered, the proposed standards, and why we are proposing them.

C. What Categories of Vessels and Vehicles are Covered in This Proposal?

1. Which marine vessels are covered in this proposal?

We are proposing evaporative emission requirements for marine vessels that use any kind of spark ignition (SI) engine, including boats using sterndrive, inboard, and outboard engines and personal watercraft. These vessels are currently unregulated for evaporative emissions. Although we are not proposing exhaust emission standards for SI marine, we discuss our intent for a future emission control program.

This proposal covers new vessels that are used in the United States, whether they are made domestically or imported.[4] A more detailed discussion of the meaning of the terms "new," "imported," as well as other terms that help define the scope of application of this proposal, is contained in Section III.B of this preamble.

2. Which highway vehicles are covered in this proposal?

We are proposing standards for new highway motorcycles, including those with engines with displacements of less than 50 cubic centimeters (cc). The federal emission standards for highway motorcycles were established over twenty years ago. Technology has advanced significantly over the last two decades, and many advancements are currently being used on highway motorcycles in California and elsewhere in the world. Despite these advancements, highway motorcycles currently produce more harmful emissions per mile than driving a car, or

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[4] For this proposal, we consider the United States to include the States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, Guam, American Samoa, the U.S. Virgin Islands, and the Trust Territory of the Pacific Islands.

even a large SUV. (This discrepancy will become even larger when the Tier 2 emissions standards for passenger cars and SUVs take effect starting in 2004, when SUVs will have to meet the same set of standards as passenger cars.) Present technology already in use on highway motorcycles can be applied easily and cost-effectively to achieve additional improvements in emissions. California, which has separately regulated motorcycles, recently adopted more advanced emissions standards in several stages. New emission standards and test procedures have also been proposed or finalized internationally. Proposing more stringent standards nationwide will reduce emissions from these engines, which operate predominantly in warmer weather when ozone formation is a greater concern. In addition, we believe it is important to consider the emissions standards for highway motorcycles in the context of setting standards for off-highway motorcycles. Some degree of consistency between the standards for these related products may allow manufacturers to transfer technologies across product lines. (At the same time, we recognize that there are other factors which may argue for treating these categories differently.)

D. What Requirements Are We Proposing?

Clean Air Act section 213 directs EPA to establish standards which achieve the greatest degree of emission reductions from nonroad engines and vehicles achievable through the application of technology that will be available, giving appropriate consideration to cost, noise, energy, and safety factors. Other requirements such as certification procedures, engine and vehicle labeling, and warranty requirements are necessary for implementing the proposed program in an effective way.

For vessels that use spark-ignition marine engines, we are proposing emission standards, beginning in 2008, that would reduce evaporative hydrocarbon emissions by more than 80 percent. To meet these standards, manufacturers would need to design and produce fuel systems that prevent gasoline vapors from escaping. While we are not proposing exhaust emission standards for spark-ignition marine engines at this time, we are participating with California and industry representatives in a technology development program that is evaluating the feasibility of using catalyst controls on these engines. We considered setting emission standards for sterndrive and inboard marine engines in this rulemaking, but have decided not to pursue these standards at this time. We instead intend to propose exhaust emission standards for these engines after the results of this development program are available. We also intend at that time to review, and if appropriate, propose to update emission standards for outboard and personal watercraft engines based on the results of the ongoing catalyst test program.

With respect to highway motorcycles, section 202(a)(3)(E) of the Clean Air Act states, in part: "In any case in which such standards are promulgated for such emissions from motorcycles as a separate class or category, the Administrator, in promulgating such standards, shall consider the need to achieve equivalency of emission reductions between motorcycles and other motor vehicles to the maximum extent practicable." Given that it has been more than twenty years since the first (and only) federal emission regulations for motorcycles were implemented, we believe it is consistent with the Act to set new standards for highway motorcycles. Thus, for highway motorcycles we are proposing to harmonize with the California program, but with some additional flexibilities. This is a two-phase program that would result in reductions of HC+NOx of about 50 percent when fully phased in.

E. Why Is EPA Taking This Action?

There are important public health and welfare reasons supporting the standards proposed in this document. As described in Section II, these sources contribute to air pollution which causes public health and welfare problems. Emissions from these engines contribute to ground level ozone and ambient CO and PM levels. Exposure to ground level ozone, CO, and PM can cause serious respiratory problems. These emissions also contribute to other serious environmental problems, including visibility impairment.

F. Putting This Proposal into Perspective

This proposal should be considered in the broader context of EPA's nonroad and highway vehicle emission-control programs; state-level programs, particularly in California; and international efforts. Each of these are described in more detail below.

1. EPA's emission-control programs

a. EPA's nonroad process

Clean Air Act section 213(a)(1) directs us to study emissions from nonroad engines and vehicles to determine, among other things, whether these emissions "cause, or significantly contribute to, air pollution that may reasonably be anticipated to endanger public health or welfare." Section 213(a)(2) further required us to determine whether emissions of CO, VOC, and NOx from all nonroad engines significantly contribute to ozone or CO emissions in more than one nonattainment area. If we determine that emissions from all nonroad engines were significant contributors, section 213(a)(3) then requires us to establish emission standards for classes or categories of new nonroad engines and vehicles that in our judgment cause or contribute to such pollution. We may also set emission standards under section 213(a)(4) regulating any other emissions from nonroad engines that we find contribute significantly to air pollution.

We completed the Nonroad Engine and Vehicle Emission Study, required by Clean Air Act section 213(a)(1), in November 1991.[5] On June 17, 1994, we made an affirmative determination under section 213(a)(2) that nonroad emissions are significant contributors to ozone or CO in more than one nonattainment area. We also determined that these engines make a significant contribution to PM and smoke emissions that may reasonably be anticipated to endanger public health or welfare. In the same document, we set a first phase of emission standards (now referred to as Tier 1 standards) for land-based nonroad diesel engines rated at or above 37 kW. We recently added a more stringent set of Tier 2 and Tier 3 emission levels for new land-based nonroad diesel engines at or above 37 kW and adopted Tier 1 standards for land-based nonroad diesel engines less than 37 kW. Our other emission-control programs for nonroad engines are listed in Table I.F-1. This proposal takes another step toward the comprehensive nonroad engine emission-control strategy envisioned in the Act by proposing an emission-control program for the remaining unregulated nonroad engines.

[5] This study is available in docket A-92-28.

Table I.F-1
EPA’s Nonroad Emission-Control Programs

Engine Category	Final Rule	Date
Land-based diesel engines 37 kW Tier 1	56 FR 31306	June 17, 1994
Spark-ignition engines 19 kW Phase 1	60 FR 34581	July 3, 1995
Spark-ignition marine	61 FR 52088	October 4, 1996
Locomotives	63 FR 18978	April 16, 1998
Land-based diesel engines Tier 1 and Tier 2 for engines < 37 kW Tier 2 and Tier3 for engines 37 kW	63 FR 56968	October 23, 1998
Commercial marine diesel	64 FR 73300	December 29, 1999
Spark-ignition engines 19 kW (Non-handheld) Phase 2	64 FR 15208	March 30, 1999
Spark-ignition engines 19 kW (Handheld) Phase 2	65 FR 24268	April 25, 2000

b. National standards for marine engines

In the October 1996 final rule for spark-ignition marine engines, we set standards only for outboard and personal watercraft engines. We decided not to finalize emission standards for sterndrive or inboard marine engines at that time. Uncontrolled emission levels from sterndrive and inboard marine engines were already significantly lower than the outboard and personal watercraft engines. We did, however, leave open the possibility of revisiting the need for emission standards for sterndrive and inboard engines in the future.

c. National standards for highway motorcycles

National standards for highway motorcycles were first established in the 1978 model year. Interim standards were effective for the 1978 and 1979 model years, and final standards took effect with the 1980 model year. These standards remain in effect today, unchanged from more than two decades ago. These standards, which have resulted in the phase-out of two-stroke engines for highway motorcycles above 50cc displacement, achieved significant reductions in emissions. The level of technology required to meet these standards is widely considered to be comparable to the pre-catalyst technology in the automobile. However, for the past two decades, other agencies in Europe, Asia, and California have caused motorcycle emission controls to keep some pace with the available technology. It is clear that the impact of the current federal standards on technology was fully realized by the mid-1980's, and that the international and other efforts have been the recent driving factor in technology development for motorcycle emissions control.

2. State initiatives

Under Clean Air Act section 209, California has the authority to regulate emissions from new motor vehicles and new motor vehicle engines. California may also regulate emissions from nonroad engines, with the exception of new engines used in locomotives and new engines used in farm and construction equipment rated under 130 kW.[6] So far, the California Air Resources Board (California ARB) has adopted requirements for four

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[6] The Clean Air Act limits the role states may play in regulating emissions from new motor vehicles and nonroad engines. California is permitted to establish emission standards for new

groups of nonroad engines: (1) diesel- and Otto-cycle small off-road engines rated under 19 kW; (2) new land-based nonroad diesel engines rated over 130 kW; (3) land-based nonroad recreational engines, including all-terrain vehicles, off-highway motorcycles, go-carts, and other similar vehicles; and (4) new nonroad SI engines rated over 19 kW. They have approved a voluntary registration and control program for existing portable equipment.

Other states may adopt emission standards set by California ARB, but are otherwise preempted from setting emission standards for new engines or vehicles. In contrast, there is generally no federal preemption of state initiatives related to the way individuals use individual engines or vehicles.

a. SI Marine engines

California ARB developed exhaust emission standards for SI marine engines through two rulemakings. In 1998, they adopted standards for outboards and personal watercraft that have three stages. Beginning with the 2001 model year, manufacturers must meet the 2006 EPA national averaging standard for engines sold in California. In addition, they require two more phases in 2004 and 2008 which reduce the standards an additional 20 and 60 percent, respectively, beyond the EPA standards.

Last year, California ARB also adopted exhaust emission standards for sterndrive and inboard marine engines. These standards cap HC+NOx emissions at 15 g/kW-hr beginning in 2003. In 2007, 45 percent of each manufacturer's product line must meet 5 g/kW-hr HC+NOx. This production fraction becomes 75 percent in 2008 and 100 percent in 2009. Manufacturers will likely need to use catalytic converters to meet this standard.

As part of the emission-control program for sterndrive and inboard marine engines, California ARB has committed to performing a review of emission-control technology in conjunction with the industry, U.S. Coast Guard, and EPA. They intend to hold a technology review in 2003, and if necessary, hold another technology review in 2005. The technology review will focus on applying catalytic control to marine engines operating in boats on the water. EPA is working with these groups to continue to assess technical concerns related to introducing catalysts on these marine engines.

b. Highway motorcycles

Motorcycle emission standards in California were originally identical to the federal standards. However, California ARB has revised their standards several times to bring them to their current levels. In the 1982 model year the standards were modified to tighten the HC standard from 5.0 g/km to 1.0 or 1.4 g/km, depending upon engine displacement. California adopted an evaporative emission standard of 2.0 g/test for 1983 and later model year motorcycles, and later amended the regulations for 1988 and later model year motorcycles, resulting in standards of 1.0 g/km HC for engines under 700cc and 1.4 g/km HC for 700cc and larger engines.

In 1999 California ARB finalized new standards for Class III highway motorcycles that will take effect in two phases - "Tier 1" standards starting with the 2004 model year, followed by "Tier 2"standards starting with the 2008 model year. The Tier 1 standard is 1.4 g/km HC+NOx, and the Tier 2 standard is 0.8 g/km HC+NOx. The CO standard remains at 12.0 g/km.

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motor vehicles and most nonroad engines; other states may adopt California's programs (sections 209 and 177 of the Act). The Act specifies the power rating minimum in terms of horsepower for farm and construction equipment (175 hp = 130 kW).

3. Actions in other countries

a. European action - Recreational Marine Engines

The European Commission has proposed emission standards for recreational marine engines, including both diesel and gasoline engines. These requirements would apply to all new engines sold in member countries. The numerical emission standards for SD/I marine engines, are shown in Table I.F-2. Table I.F-2 also presents average baseline emissions based on data that we have collected. These data are presented in Chapter 4 of the Draft Regulatory Support Document. We have received comment that we should apply these standards in the U.S., but the proposed European emission standards for SD/I marine engines may not result in a decrease in emissions, and based on emissions information we now have, would in some cases allow an increase in emissions from current designs of engines operated in the U.S.

Table I.F-2
Proposed European Emission Standards
for Four-Stroke Spark-Ignition Marine Engines

Pollutant	Emission Standard (g/kW-hr)	Baseline Emissions (g/kW-hr)
NOx	15.0	9.7
HC	7.2[a]	5.8
CO	154[a]	141

[a] For a 150 kW engine; decreases slightly with increasing engine power rating.

b. Highway motorcycles

Under the auspices of the United Nations/Economic Commission for Europe (UN/ECE) there is an ongoing effort to develop a global harmonized world motorcycle test cycle (WMTC). The objective of this work is to develop a scientifically supported test cycle that accurately represents the in-use driving characteristics of motorcycles. The United States is also a participating member of UN/ECE. This is an ongoing process that EPA is actively participating in, but that will not likely result in an action until sometime in 2003 or 2004. If an international test procedure is agreed upon by the participating nations, we plan to initiate a rulemaking process to propose adopting the global test cycle as part of the U.S. regulations.

The European Union (EU) recently finalized a new phase of motorcycle standards, which will start in 2003, and are considering a second phase to start in 2006. The 2003 European standards are more stringent than the existing federal standards, being somewhat comparable to the California Tier 1 standards taking effect in 2004. The standards being considered for 2006, along with a revised test cycle (as an interim cycle to bridge between the current EU cycle and a possible WMTC cycle in the future) are likely to be proposed soon by the EU. As of April 2002 the 2006 European standards and test cycle are being considered and debated by the European Parliament and the European Commission.

Many other nations, particularly in southeast Asia where low-displacement two-stroke motorcycles are ubiquitous, have established standards that could be considered quite stringent. Taiwan, in particular, is often noted for having some of the most stringent standards in the world, but India, China, Japan, and Thailand, are moving quickly towards controlling what is, in those nations, a significant contributor to air pollution problems.

4. Recently Proposed EPA Standards for Nonroad Engines

This proposal is the second part of an effort to control emissions from nonroad engines that are currently unregulated and for updating Federal emissions standards for highway motorcycles. The first part of this effort was a proposal published on October 5, 2001 for emission control from large spark-ignition engines such as those used in forklifts and airport tugs; recreational vehicles using spark-ignition engines such as off-highway motorcycles, all-terrain vehicles, and snowmobiles; and recreational marine diesel engines. The October 5, 2001 proposal includes general provisions in proposed 40 CFR part 1068 that address the applicability of nonroad engine standards, which could be relevant to commenters.

With regard to Large SI engines, we proposed a two-phase program. The first phase of the standards, to go into effect in 2004, are the same as those recently adopted by the California Air Resources Board. In 2007, we propose to supplement these standards by setting limits that would require optimizing the same technologies but would be based on a transient test cycle. New requirements for evaporative emissions and engine diagnostics would also start in 2007.

For recreational vehicles, we proposed emission standards for snowmobiles separately from off-highway motorcycles and all-terrain vehicles. For snowmobiles, we proposed a first phase of standards for HC and CO emissions based on the use of clean carburetion or 2-stroke electronic fuel injection (EFI) technology, and a second phase of emission standards for snowmobiles that would involve use of direct fuel injection 2-stroke and some 4-stroke technology. For off highway motorcycles and all-terrain vehicles, we proposed standards based mainly on moving these engines from 2-stroke to 4-stroke technology. In addition, we proposed a second phase of standards for all-terrain vehicles that could require some catalyst use.

For marine diesel engines, we proposed to extend our commercial marine diesel engine standards to diesel engines used on recreational vessels. These standards would phase in beginning in 2006.

II. Public Health and Welfare Effects of Emissions from Covered Engines

A. Background

This proposal contains regulatory strategies to control evaporative emissions from marine vessels that use spark ignition engines. Spark-ignition marine vessels include vessels that use sterndrive and inboard engines as well as outboards and personal watercraft. Most of these vessels are recreational, but there are some commercial vessels that use spark-ignition engines as well. The standards we are proposing in this document for marine vessels may require changes to the fuel system or fuel tank. We are also proposing revised standards for highway motorcycles. The current HC and CO emission standards for highway motorcycles were set in 1978 and are based on 1970s technology. The proposed standards are harmonized to California's emission limits, but also include new requirements for under 50 cc motorcycles.

Nationwide, marine vessels and on-highway motorcycles are an important source of mobile-source air pollution (see section II-C). We determined that marine vessels that use spark-ignition engines cause or contribute to ozone and carbon monoxide pollution in more than on nonattainment area in an action dated February 7, 1996 (61 FR 4600). These engines continue to contribute to these problems because they are primarily used in warm weather and therefore their HC, NOx, CO, and PM emissions contribute to ozone formation and ambient PM and CO levels, and because they are primarily used in marinas and commercial ports that are frequently located in nonattainment areas such as Chicago and New York. Evaporative emissions from marine vessels are also significant for similar reasons and because the emissions occur all the time rather than just when the engine is running. Similarly, on-highway motorcycles are typically used in warm, dry weather when their HC and NOx emissions are most likely to form ozone, thus adding to ground-level ozone levels and contributing to ozone nonattainment.

We expect that implementation of the proposed standards would result in about a 50 percent reduction in HC emissions and NOx emissions from highway motorcycles in 2020. We expect that the proposed standards would result in about a 56 percent reduction in evaporative HC emissions from marine vessels using spark-ignition engines in 2020 (see Section VI below for more details). These emission reductions would reduce ambient concentrations of ozone, and fine particles, which is a health concern and contributes to visibility impairment. The standards would also reduce personal exposure for people who operate or who work with or are otherwise in close proximity to these engines and vehicles. As summarized below and described more fully in the Draft Regulatory Support Document for this proposal, many types of hydrocarbons are air toxics. By reducing these emissions, the proposed standards would provide assistance to states facing ozone air quality problems, which can cause a range of adverse health effects, especially in terms of respiratory impairment and related illnesses. States are required to develop plans to address visibility impairment in national parks, and the reductions proposed in this rule would assist states in those efforts.

B. What Are the Public Health and Welfare Effects Associated With Emissions From Nonroad Engines and Motorcycles Subject to the Proposed Standards?

Marine vessels that use spark-ignition engines and highway motorcycles generate emissions that contribute to ozone formation and ambient levels of PM, and air toxics. This section summarizes the general health effects of these pollutants. National inventory estimates are set out in Section II.C, and estimates of the expected impact of the proposed control programs are described in Section VI. Interested readers are encouraged to refer to the Draft Regulatory Support Document for this proposal for more in-depth discussions.

1. Health and welfare effects associated with ground level ozone and its precursors

Volatile organic compounds (VOC) and NOx are precursors in the photochemical reaction which forms tropospheric ozone. Ground-level ozone, the main ingredient in smog, is formed by complex chemical reactions of

VOCs and NOx in the presence of heat and sunlight. Hydrocarbons (HC) are a large subset of VOC, and to reduce mobile-source VOC levels we set maximum emissions limits for hydrocarbon and particulate matter emissions.

A large body of evidence shows that ozone can cause harmful respiratory effects including chest pain, coughing, and shortness of breath, which affect people with compromised respiratory systems most severely. When inhaled, ozone can cause acute respiratory problems; aggravate asthma; cause significant temporary decreases in lung function of 15 to over 20 percent in some healthy adults; cause inflammation of lung tissue; produce changes in lung tissue and structure; may increase hospital admissions and emergency room visits; and impair the body's immune system defenses, making people more susceptible to respiratory illnesses. Children and outdoor workers are likely to be exposed to elevated ambient levels of ozone during exercise and, therefore, are at a greater risk of experiencing adverse health effects. Beyond its human health effects, ozone has been shown to injure plants, which has the effect of reducing crop yields and reducing productivity in forest ecosystems.

There is strong and convincing evidence that exposure to ozone is associated with exacerbation of asthma-related symptoms. Increases in ozone concentrations in the air have been associated with increases in hospitalization for respiratory causes for individuals with asthma, worsening of symptoms, decrements in lung function, and increased medication use, and chronic exposure may cause permanent lung damage. The risk of suffering these effects is particularly high for children and for people with compromised respiratory systems.

Ground level ozone today remains a pervasive pollution problem in the United States. In 1999, 90.8 million people (1990 census) lived in 31 areas designated nonattainment under the 1-hour ozone NAAQS.[7] This sharp decline from the 101 nonattainment areas originally identified under the Clean Air Act Amendments of 1990 demonstrates the effectiveness of the last decade's worth of emission-control programs. However, elevated ozone concentrations remain a serious public health concern throughout the nation.

Over the last decade, declines in ozone levels were found mostly in urban areas, where emissions are heavily influenced by controls on mobile sources and their fuels. Twenty-three metropolitan areas have realized a decline in ozone levels since 1989, but at the same time ozone levels in 11 metropolitan areas with 7 million people have increased.[8] Regionally, California and the Northeast have recorded significant reductions in peak ozone levels, while four other regions (the Mid-Atlantic, the Southeast, the Central and Pacific Northwest) have seen ozone levels increase.

The highest ambient concentrations are currently found in suburban areas, consistent with downwind transport of emissions from urban centers. Concentrations in rural areas have risen to the levels previously found only in cities. Particularly relevant to this proposal, ozone levels at 17 of our National Parks have increased, and in 1998, ozone levels in two parks, Shenandoah National Park and the Great Smoky Mountains National Park, were

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[7] National Air Quality and Emissions Trends Report, 1999, EPA, 2001, at Table A-19. This document is available at http://www.epa.gov/oar/aqtrnd99/. The data from the Trends report are the most recent EPA air quality data that have been quality assured. A copy of this table can also be found in Docket No. A-2000-01, Document No. II-A-64.

[8] National Air Quality and Emissions Trends Report, 1998, March, 2000, at 28. This document is available at http://www.epa.gov/oar/aqtrnd98/. The data from the Trends report are the most recent EPA air quality data that have been quality assured. A copy of this table can also be found in Docket No. A-2000-01, Document No. II-A-63.

30 to 40 percent higher than the ozone NAAQS over part of the last decade.[9]

To estimate future ozone levels, we refer to the modeling performed in conjunction with the final rule for our most recent heavy-duty highway engine and fuel standards.[10] We performed ozone air quality modeling for the entire Eastern U.S. covering metropolitan areas from Texas to the Northeast.[11] This ozone air quality model was based upon the same modeling system as was used in the Tier 2 air quality analysis, with the addition of updated inventory estimates for 2007 and 2030. The results of this modeling were examined for those 37 areas in the East for which EPA's modeling predicted exceedances in 2007, 2020, and/or 2030 and the current 1-hour design values are above the standard or within 10 percent of the standard. This photochemical ozone modeling for 2020 predicts exceedances of the 1-hour ozone standard in 32 areas with a total of 89 million people (1999 census) after accounting for light- and heavy-duty on-highway control programs.[12] We expect the NOx and HC control strategies contained in this proposal for marine vessels that use spark-ignition engines and highway motorcycles will further assist state efforts already underway to attain and maintain the 1-hour ozone standard.

In addition to the health effects described above, there exists a large body of scientific literature that shows that harmful effects can occur from sustained levels of ozone exposure much lower than 0.125 ppm.[13] Studies of prolonged exposures, those lasting about 7 hours, show health effects from prolonged and repeated exposures at moderate levels of exertion to ozone concentrations as low as 0.08 ppm. The health effects at these levels of

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[9] National Air Quality and Emissions Trends Report, 1998, March, 2000, at 32. This document is available at http://www.epa.gov/oar/aqtrnd98/. The data from the Trends report are the most recent EPA air quality data that have been quality assured. A copy of this table can also be found in Docket No. A-2000-01, Document No. II-A-63.

[10] Additional information about this modeling can be found in our Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, document EPA420-R-00-026, December 2000. This document is available at http://www.epa.gov/otaq/diesel.htm#documents and in Docket No. 1-2000-01, Document No. II-A-13.

[11] We also performed ozone air quality modeling for the western United States but, as described further in the air quality technical support document, model predictions were well below corresponding ambient concentrations for out heavy-duty engine standards and fuel sulfur control rulemaking. Because of poor model performance for this region of the country, the results of the Western ozone modeling were not relied on for that rule.

[12] Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, US EPA, EPA420-R-00-026, December 2000, at II-14, Table II.A-2. Docket No. A-2000-01, Document Number II-A-13. This document is also available at http://www.epa.gov/otaq/diesel.htm#documents.

[13] Additional information about these studies can be found in Chapter 2 of "Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements," December 2000, EPA420-R-00-026. Docket No. A-2000-01, Document Number II-A-13. This document is also available at http://www.epa.gov/otaq/diesel.htm#documents.

exposure include transient pulmonary function responses, transient respiratory symptoms, effects on exercise performance, increased airway responsiveness, increased susceptibility to respiratory infection, increased hospital and emergency room visits, and transient pulmonary respiratory inflammation.

Prolonged and repeated ozone concentrations at these levels are common in areas throughout the country, and are found both in areas that are exceeding, and areas that are not exceeding, the 1-hour ozone standard. Areas with these high concentrations are more widespread than those in nonattainment for that 1-hour ozone standard. Monitoring data indicates that 334 counties in 33 states exceeded these levels in 1997-99.[14] The Agency's most recent photochemical ozone modeling forecast that 111 million people are predicted to live in areas that are at risk of exceeding these moderate ozone levels for prolonged periods of time in 2020 after accounting for expected inventory reductions due to controls on light- and heavy-duty on-highway vehicles.[15]

2. Health and welfare effects associated with particulate matter

Highway motorcycles contribute to ambient particulate matter through direct emissions of particulate matter in the exhaust. Both marine vessels and highway motorcycles contribute to indirect formation of PM through their emissions of organic carbon, especially HC. Organic carbon accounts for between 27 and 36 percent of fine particle mass depending on the area of the country.

Particulate matter represents a broad class of chemically and physically diverse substances. It can be principally characterized as discrete particles that exist in the condensed (liquid or solid) phase spanning several orders of magnitude in size. All particles equal to and less than 10 microns are called PM_{10}. Fine particles can be generally defined as those particles with an aerodynamic diameter of 2.5 microns or less (also known as $PM_{2.5}$), and coarse fraction particles are those particles with an aerodynamic diameter greater than 2.5 microns, but equal to or less than a nominal 10 microns.

Particulate matter, like ozone, has been linked to a range of serious respiratory health problems. Scientific studies suggest a likely causal role of ambient particulate matter (which is attributable to several of sources including mobile sources) in contributing to a series of health effects. The key health effects categories associated with ambient particulate matter include premature mortality, aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days), aggravated asthma, acute respiratory symptoms, including aggravated coughing and difficult or painful breathing, chronic bronchitis, and decreased lung function that can be experienced as shortness of breath. Observable human noncancer health effects associated with exposure to diesel PM include some of the same health effects reported for ambient PM such as respiratory symptoms (cough, labored breathing, chest tightness, wheezing), and chronic respiratory disease (cough, phlegm, chronic bronchitis and suggestive evidence for decreases in pulmonary function). Symptoms of immunological effects such as wheezing and increased allergenicity are also seen. Epidemiology studies have found an association between exposure to fine particles and such health effects as premature mortality or hospital admissions for cardiopulmonary disease.

PM also causes adverse impacts to the environment. Fine PM is the major cause of reduced visibility in

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[14] A copy of this data can be found in Air Docket A-2000-01, Document No. II-A-80.

[15] Memorandum to Docket A-99-06 from Eric Ginsburg, EPA, "Summary of Model-Adjusted Ambient Concentrations for Certain Levels of Ground-Level Ozone over Prolonged Periods," November 22, 2000, at Table C, Control Scenario 2020 Populations in Eastern Metropolitan Counties with Predicted Daily 8-Hour Ozone greater than or equal to 0.080 ppm. Docket A-2000-01, Document Number II-B-13.

parts of the United States, including many of our national parks. Other environmental impacts occur when particles deposit onto soils, plants, water or materials. For example, particles containing nitrogen and sulphur that deposit on to land or water bodies may change the nutrient balance and acidity of those environments. Finally, PM causes soiling and erosion damage to materials, including culturally important objects such as carved monuments and statues. It promotes and accelerates the corrosion of metals, degrades paints, and deteriorates building materials such as concrete and limestone.

The NAAQS for PM_{10} were established in 1987. The most recent PM_{10} monitoring data indicate that 14 designated PM_{10} nonattainment areas with a projected population of 23 million violated the PM_{10} NAAQS in the period 1997-99. In addition, there are 25 unclassifiable areas that have recently recorded ambient concentrations of PM_{10} above the PM_{10} NAAQS.[16]

Current 1999 $PM_{2.5}$ monitored values, which cover about a third of the nation's counties, indicate that at least 40 million people live in areas where long-term ambient fine particulate matter levels are at or above 16 g/m^3 (37 percent of the population in the areas with monitors).[17] According to our national modeled predictions, there were a total of 76 million people (1996 population) living in areas with modeled annual average $PM_{2.5}$ concentrations at or above 16 g/m^3 (29 percent of the population).[18] This 16 g/m^3 threshold is the low end of the range of long term average $PM_{2.5}$ concentrations in cities where statistically significant associations were found with serious health effects, including premature mortality.[19]

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[16] EPA adopted a policy in 1996 that allows areas with PM_{10} exceedances that are attributable to natural events to retain their designation as unclassifiable if the State is taking all reasonable measures to safeguard public health regardless of the sources of PM_{10} emissions.

[17] Memorandum to Docket A-99-06 from Eric O. Ginsburg, Senior Program Advisor, "Summary of 1999 Ambient Concentrations of Fine Particulate Matter," November 15, 2000. Air Docket A-2000-01, Document No. II-B-12. For information regarding estimates for future $PM_{2.5}$ levels, *see* information about the Regulatory Model System for Aerosols and Deposition (REMSAD) and our modeling protocols, which can be found in the Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Controls Requirements, document EPA 420-R-00-026, December 2000. Docket No. A-2000-01, Document No. A-II-13. This document is also available at http://www.epa.gov/otaq/diesel.htm#documents. Also *see* Technical Memorandum, EPA Air Docket A-99-06, Eric O. Ginsburg, Senior Program Advisor, Emissions Monitoring and Analysis Division, OAQPS, Summary of Absolute Modeled and Model-Adjusted Estimates of Fine Particulate Matter for Selected Years, December 6, 2000, Table P-2. Docket Number 2000-01, Document Number II-B-14.

[18] Memorandum to Docket A-99-06 from Eric O. Ginsburg, Senior Program Advisor, "Summary of Absolute Modeled and Model-Adjusted Estimates of Fine Particulate Matter for Selected Years," December 6, 2000. Air Docket A-2000-01, Document No. II-B-14.

[19] EPA (1996) Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information OAQPS Staff Paper. EPA-452/R-96-013. Docket Number A-99-06, Documents Nos. II-A-18, 19, 20, and 23. The particulate matter air quality criteria documents are also available at http://www.epa.gov/ncea/partmatt.htm. .

We expect the PM reductions that result from control strategies contained in this proposal will further assist state efforts already underway to attain and maintain the PM NAAQS.

3. Health effects associated with air toxics

In addition to the human health and welfare impacts described above, emissions from the engines covered by this proposal also contain several Mobile Source Air Toxics, including benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein.[20] The health effects of these air toxics are described in more detail in Chapter 1 of the Draft Regulatory Support Document for this rule. Additional information can also be found in the Technical Support Document for our final Mobile Source Air Toxics rule.[21] The hydrocarbon controls contained in this proposal are expected to reduce exposure to air toxics and therefore may help reduce the impact of these engines on cancer and noncancer health effects.

C. What Is the Inventory Contribution of These Sources?

The spark-ignition marine vessels and highway motorcycles that would be subject to the proposed standards contribute to the national inventories of pollutants that are associated with the health and public welfare effects described in Section II.B. To estimate nonroad engine and vehicle emission contributions, we used the latest version of our NONROAD emissions model. This model computes nationwide, state, and county emission levels for a wide variety of nonroad engines, and uses information on emission rates, operating data, and population to determine annual emission levels of various pollutants. Emission estimates for highway motorcycles were developed using information on the certification levels of current motorcycles and updated information on motorcycle use provided by the motorcycle industry. A more detailed description of the modeling and our estimation methodology can be found in the Chapter 6 of the Draft Regulatory Support Document.

Baseline emission inventory estimates for the year 2000 for the marine vessels and highway motorcycles covered by this proposal are summarized in Table II.C-1. This table shows the relative contributions of the different mobile-source categories to the overall national mobile-source inventory. Of the total emissions from mobile sources, evaporative emissions from spark-ignition marine vessels contribute about 1.3 percent of HC. Highway motorcycles contribute about 1.1 percent, 0.1 percent, 0.4 percent, and 0.1 percent of HC, NOx, CO, and PM emissions, respectively, in the year 2000.

Our draft emission projections for 2020 for the spark-ignition marine vessels and highway motorcycles that would be subject to the proposed standards show that emissions from these categories are expected to increase over time if left uncontrolled. The projections for 2020 are summarized in Table II.C-2 and indicate that the evaporative emissions from marine vessel are expected to contribute 1.8 percent of mobile source HC, and motorcycles are expected to contribute 2.3 percent, 0.2 percent, 0.6 percent, and 0.1 percent of mobile source HC, NOx, CO, and PM emissions in the year 2020. Population growth and the effects of other regulatory control programs are factored into these projections.

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[20] EPA recently finalized a list of 21 Mobile Source Air Toxics, including VOCs, metals, and diesel particulate matter and diesel exhaust organic gases (collectively DPM+DEOG). 66 FR 17230, March 29, 2001

[21] See our Mobile Source Air Toxics final rulemaking, 66 FR 17230, March 29, 2001, and the Technical Support Document for that rulemaking. Docket No. A-2000-01, Documents Nos. II-A-42 and II-A-30.

Table II.C-1
Modeled Annual Emission Levels for
Mobile-Source Categories in 2000 (thousand short tons)

Category	NOx		HC		CO		PM	
	tons	percent of mobile source	tons	percent of mobile source	tons	percent of mobile source	tons	percent of mobile source
Highway Motorcycles	**8**	**0.1%**	**84**	**1.1%**	**331**	**0.4%**	**0.4**	**0.1%**
Marine SI Evaporative	**0**	**0.0%**	**108**	**1.3%**	**0**	**0.0%**	**0**	**0.0%**
Marine SI Exhaust	32	0.2%	708	9.6%	2,144	2.8%	38	5.4%
Nonroad Industrial SI > 19 kW	306	2.3%	247	3.2%	2,294	3.0%	1.6	0.2%
Recreational SI	13	0.1%	737	9.6%	2,572	3.3%	5.7	0.8%
Recreation Marine CI	24	0.2%	1	0.0%	4	0.0%	1	0.1%
Nonroad SI < 19 kW	106	0.8%	1,460	19.1%	18,359	23.6%	50	7.2%
Nonroad CI	2,625	19.5%	316	4.1%	1,217	1.6%	253	36.2%
Commercial Marine CI	977	7.3%	30	0.4%	129	0.2%	41	5.9%
Locomotive	1,192	8.9%	47	0.6%	119	0.2%	30	4.3%
Total Nonroad	5,275	39%	3,646	48%	26,838	35%	420	60%
Total Highway	7,981	59%	3,811	50%	49,813	64%	240	34%
Aircraft	178	1%	183	2%	1,017	1%	39	6%
Total Mobile Sources	13,434	100%	7,640	100%	77,668	100%	699	100%
Total Man-Made Sources	24,538	--	18,586	--	99,747	--	3,095	--
Mobile Source percent of Total Man-Made Sources	55%	--	41%	--	78%	--	23%	

Table II.C-2
Modeled Annual Emission Levels for
Mobile-Source Categories in 2020 (thousand short tons)

Category	NOx		HC		CO		PM	
	tons	percent of mobile source	tons	percent of mobile source	tons	percent of mobile source	tons	percent of mobile source
Highway Motorcycles	**14**	**0.2%**	**142**	**2.3%**	**572**	**0.6%**	**0.8**	**0.1%**
Marine SI Evaporative	**0**	**0.0%**	**114**	**1.8%**	**0**	**0.0%**	**0**	**0.0%**
Marine SI Exhaust	58	0.9%	284	4.6%	1,985	2.2%	28	4.4%
Nonroad Industrial SI > 19 kW	486	7.8%	348	5.6%	2,991	3.3%	2.4	0.4%
Recreational SI	27	0.4%	1,706	27.7%	5,407	3.3%	7.5	1.2%
Recreation Marine CI	39	0.6%	1	0.0%	6	0.0%	1.5	0.2%
Nonroad SI < 19 kW	106	1.7%	986	16.0%	27,352	30.5%	77	12.2%
Nonroad CI	1,791	28.8%	142	2.3%	1,462	1.6%	261	41.3%
Commercial Marine CI	819	13.2%	35	0.6%	160	0.2%	46	7.3%
Locomotive	611	9.8%	35	0.6%	119	0.1%	21	3.3%
Total Nonroad	3,937	63%	3,651	59%	39,482	44%	444	70%
Total Highway	2,050	33%	2,276	37%	48,906	54%	145	23%
Aircraft	232	4%	238	4%	1,387	2%	43	7%
Total Mobile Sources	6,219	100%	6,165	100%	89,775	100%	632	100%
Total Man-Made Sources	16,195	--	16,234	--	113,443	--	3,016	--
Mobile Source percent of Total Man-Made Sources	38%	--	38%	--	79%	--	21%	

III. Evaporative Emission Control from Boats

A. Overview

Evaporative emissions refer to hydrocarbons released into the atmosphere when gasoline, or other volatile fuels, evaporate from a fuel system. These emissions come from four primary mechanisms: hot soak, diurnal heating, vapor displacement during refueling, and permeation from tanks and hoses. Hot soak emissions occur when fuel evaporates from hot engine surfaces such as parts of the carburetor as a result of engine operation. These are minimal on fuel-injected engines. Control of hot soak emissions involves the engine manufacturer rather than the tank manufacturer.

Currently, most fuel tanks in boats are vented to atmosphere through vent hoses. Diurnal emissions, which represent about 20 percent of the evaporative emissions from boats, occur as the fuel in the tank and fuel lines heats up due to increases in ambient temperature. As the fuel heats, it forms hydrocarbon vapor which is vented to the atmosphere. Refueling emissions are vapors that are displaced from the fuel tank to the atmosphere when fuel is dispensed into the tank and only represent a small portion of the total evaporative emissions. Permeation refers to when fuel penetrates the material used in the fuel system and is most common through plastic fuel tanks and rubber hoses. This permeation makes up the majority of the evaporative emissions from fuel tanks and hoses. Table III.A-1 presents our national estimates of the evaporative hydrocarbon emissions from boats using spark-ignition engines for 2000.

Table III.A-1: Estimated Evaporative Emissions from Tanks/Hoses in 2000

Evaporative Emission Component	HC [tons]
Diurnal breathing losses	22,700
Permeation through the fuel tank	26,600
Permeation through hoses	43,200
Refueling vapor displacement	6,700
Hot Soak	260
Total evaporative emissions	100,000

This section describes the new provisions proposed for 40 CFR part 1045, which would apply only to boat manufacturers and fuel system component manufacturers. This section also discusses proposed test equipment and procedures (for anyone who tests fuel tanks and hoses to show they meet emission standards) and proposed general compliance provisions (for boat manufacturers, fuel system component manufacturers, operators, repairers, and others).

We are proposing performance standards intended to reduce permeation and diurnal evaporative emissions from boats using spark-ignition engines. The proposed standards, which would apply to new boats starting in 2008, are nominally based on manufacturers reducing these sources of evaporative emissions by about 80 percent overall. Because of the many small businesses that manufacture boats and fuel tanks, we are proposing a flexible compliance program that is intended to help minimize the burden of meeting the proposed requirements.

Based on a database maintained by the U.S. Coast Guard, we estimate that there are nearly 1,700 boat builders producing boats that use engines for propulsion. At least 1,200 of these boat builders install gasoline-fueled engines and would therefore be subject to the evaporative emission-control program discussed below. Our understanding is that more than 90 percent of the boat builders identified so far would be considered small businesses as defined by the Small Business Administration for SIC code 3732. Some of these boat builders construct their own fuel tanks either out of aluminum or fiberglass reinforced plastic. However, the majority of fuel tanks used by boat builders are purchased from fuel tank manufacturers.

We have determined that fuel tank manufacturers sell approximately 550,000 fuel tanks per year for gasoline storage on boats. The market is divided into manufacturers that produce plastic tanks and manufacturers that produce aluminum tanks. We have identified nine companies that make plastic marine fuel tanks with total sales of approximately 440,000 units per year. Of these plastic tanks, about 20 percent are portable while the rest are installed. We have determined that there are at least five companies that make aluminum marine fuel tanks with total sales of approximately 110,000 units per year. All but one of the fuel tank manufacturers that we have identified are small businesses as defined by the Small Business Administration for SIC Code 3713.

Our understanding is that there are four primary manufacturers of marine hose used in fuel supply lines and venting. At least two of these four manufacturers produce hoses for other transportation sources as well and already supply low permeation hoses that would meet our proposed standards. Only one U.S. manufacturer of fill neck hose has been identified. The rest is shipped from overseas.

B. Boats/Fuel Systems Covered By This Proposal

Generally speaking, this proposed rule would cover the fuel systems of all new marine vessels with spark-ignition (SI) engines. We include boats and fuel systems that are used in the United States, whether they are made domestically or imported.

In the ANPRM, we discussed exhaust and evaporative emissions from boats using only sterndrive or inboard engines. As discussed later in Section IV, we are not proposing exhaust emission standards for these engines at this time. We are, however, proposing to expand the scope of the evaporative emission standards discussed in the ANPRM, because we see no significant technological differences between fuel tanks and hoses used for sterndrive or inboard engines and those used for other SI marine engines. In fact, fuel tank and hose manufacturers often sell their products without knowing what type of marine engine will be used with it.

1. Why does this apply only to marine vessels using spark-ignition engines?

Spark-ignition marine engines generally use gasoline fuel while compression-ignition marine engines generally use diesel fuel. We are proposing evaporative emission standards only for boats using spark-ignition engines because diesel fuel has low volatility and, therefore, does not evaporate readily. In fact, the evaporative emissions from boats using diesel fuel are already significantly lower than standards we are proposing for boats using spark-ignition marine engines.

2. Would the proposed standards apply to all vessels using SI engines or only to new vessels?

The scope of this proposal is broadly set by Clean Air Act section 213(a)(3), which instructs us to set emission standards for *new* nonroad engines and *new* nonroad vehicles. Generally speaking, the proposed rule is intended to cover all new vessels. Once the emission standards apply to these vessels, individuals or companies must get a certificate of conformity from us before selling them in the United States. This includes importation and any other means of introducing engines and vehicles into commerce. The certificate of conformity (and corresponding label) provide assurance that manufacturers have met their obligation to make engines that meet emission standards over the useful life we specify in the regulations.

3. How do I know if my vessel is new?

We are proposing to define "new" consistent with previous rules. Under the proposed definition, a vessel is considered new until its title has been transferred to the ultimate purchaser or the vessel has been placed into service. Imported vessels would also be considered to be new.

4. When would imported vessels need to meet the proposed emission standards?

The proposed emissions standards would apply to all new vessels in the United States. According to Clean Air Act section 216, "new" includes vessels that are imported by any person, whether freshly manufactured or used. All vessels imported for introduction into commerce would need an EPA-issued certificate of conformity to clear customs, with limited exemptions (as described below).

Any marine vessel built after these emission standards take effect and subsequently imported into the U.S. would be a new vessel for the purpose of the regulations proposed in this document. This means it would need to comply with the applicable emission standards. For example, a marine vessel manufactured in a foreign country in 2004, then imported into the United States in 2008, would be considered "new." This provision is important to prevent manufacturers from avoiding emission standards by building vessels abroad, transferring their title, and then importing them as used vessels.

5. Would the proposed standards apply to exported vessels?

Vessels intended for export would generally not be subject to the requirements of the proposed emission-control program. However, vessels that are exported and subsequently re-imported into the United States would be need to be certified.

6. Are there any new vessels that would not be covered?

We are proposing to extend our basic nonroad exemptions to the engines and vehicles covered by this proposal. These include the testing exemption, the manufacturer-owned exemption, the display exemption, and the national security exemption. These exemptions are described in more detail under Section III.E.3. In addition, the Clean Air Act does not consider vessels used solely for competition to be nonroad vehicles, so they are exempt from meeting the proposed emission standards.

C. Proposed Evaporative Emission Requirements

Our general goal in designing the proposed standards is to develop a program that will achieve significant emission reductions. The standards are designed to "achieve the greatest degree of emission reduction achievable through the application of technology the Administrator determines will be available for the engines or vehicles to which such standards apply, giving appropriate consideration to the cost of applying such technology within the period of time available to manufacturers and to noise, energy, and safety factors associated with the application of such technology." Section 213(a)(3) of the Clean Air Act also instructs us to first consider standards equivalent in stringency to standards for comparable motor vehicles or engines (if any) regulated under section 202, taking into consideration technological feasibility, costs, and other factors.

1. What are the proposed evaporative emission standards?

We are proposing to require reductions in diurnal emissions, fuel tank permeation, and fuel system hose permeation from new vessels beginning in 2008. The proposed standards are presented in Table III.C-1 and represent more than a 25 percent reduction in diurnal emissions and a 95 percent reduction in permeation from both plastic fuel tanks and from hoses. Section III.F.1 presents the test procedures associated with these proposed standards. Test temperatures are presented in Table III.C-1 because they represent an important parameter in defining the emission levels. The proposed fuel tank venting and permeation standards are based on the total capacity of the fuel tank as described below. The proposed hose permeation standards are based on the inside surface area of the hose. We are not proposing standards for hot soak and refueling emissions, as described above, at this time.

Table III.C-1: Proposed Evaporative Standards

Evaporative Emission Component	Proposed Emission Standard	Test Temperature
Diurnal Venting	1.1 g/gallon/day	22.2-35.6 C (72-96 F)
Fuel Tank Permeation	0.08 g/gallon/day	40 C (104 F)
Hose Permeation	5 g/m^2/day (15 g/m^2/day with 15% methanol blend)	23 C (73 F)

The proposed emission standards are based on our evaluation of several fuel system technologies (described in Section III.H) which vary in cost and in efficiency. The proposed implementation date gives manufacturers about five years to comply after we expect to issue final standards . As discussed in more detail in Section III.H.1, this would help minimize costs by allowing fuel tank manufacturers time to implement controls in their tanks as designs normally turnover as opposed to forcing turnover premature to normal business practice. There are a multiplicity of tank sizes and shapes produced every year and the cost and efficiency of the available emission-control technologies will vary with these different configurations. In determining the proposed standards, we considered costs and focused on straightforward approaches that could potentially be used by all businesses. As discussed in Section H.3, we believe that the approaches in this proposal would comply with U.S. Coast Guard safety requirements for fuel systems. Given all this, in the 2008 time frame, we believe an average reduction of at least 80 percent in total evaporative emissions from new boats can be achieved, considering the availability and cost of technology, lead time, noise, energy and safety. We request comment on the proposed standards and implementation dates, on the units used for the fuel tank permeation standards (i.e. g/gallon/day versus g/m^2/day), and on the certification provisions discussed below. We are also interested in comments regarding the cost of implementing the proposed standards. Commenters are encouraged to provide specific data when possible.

2. Will averaging, banking and trading be allowed across a manufacturer's product line?

An emission-credit program is an important factor we take into consideration in setting emission standards that are appropriate under Clean Air Act section 213. An emission-credit program can reduce the cost and improve the technological feasibility of achieving standards, helping to ensure the attainment of the standards earlier than would otherwise be possible. Manufacturers gain flexibility in product planning and the opportunity for a more cost-effective introduction of product lines meeting a new standard. Emission-credit programs also create an incentive for the early introduction of new technology, which would allow certain vessels to be used to evaluate new technology. This can provide valuable information to manufacturers on the technology before they apply it throughout their product line. This early introduction of lower-emitting technology improves the feasibility of achieving the standards and can provide valuable information for use in other regulatory programs that may benefit from similar technologies.

Emission-credit programs may involve averaging, banking, and trading (ABT). Averaging allows a manufacturer to certify one or more products at an emission level less stringent than the applicable emission standard, as long as the increased emissions are offset by products certified to a level more stringent than the applicable standard. The over-complying products generate credits that can be used by the under-complying products. Compliance is determined on a total mass emissions basis to account for differences in production volume and tank sizes among emission families. The average of all emissions for a particular manufacturer's production must be at or below that level of the applicable emission standard. Early banking allows a manufacturer to certify early and generate credits for modifying their fuel system to the 2008 compliance strategy. In 2008 and later, the banking program would allow a manufacturer to generate credits and retain them for future use. Trading involves the sale of banked credits from one company to another.

We believe there is a variety of technology options that could be used to meet the proposed standards for diurnal emissions. By using different combinations of these technologies, manufacturers will be able to produce products that achieve a range of emission reductions. However, certain technologies may be more appropriate for different applications. In some cases, manufacturers may need flexibility in applying the emission-control technology to their products. For this reason, we are proposing that the 1.1 g/gallon/day diurnal emission standard be based a corporate average of a manufacturer's total production. To meet this average level, manufacturers would be able to divide their fuel tanks into different emission families and certify each of their emission families to a different Family Emissions Level (FEL). The FELs would then be weighted by sales volume and fuel tank capacity to determine the average level across a manufacturer's total production. An additional benefit of a corporate average approach is that it provides an incentive for developing new technology that can be used to achieve even larger emission reductions.

Participation in the ABT program would be voluntary. Any manufacturer could choose to certify each of its evaporative emission control families at levels which would meet the 1.1 g/gallon/day proposed standard and would then comply with the average by default. Some manufacturers may choose this approach as the could see it as less complicated to implement.

The following is an example of how the proposed averaging program for diurnal emissions could give a boat manufacturer flexibility in its production. Suppose a boat builder was selling 10 boats, three with 100-gallon fuel tanks and seven with 50-gallon fuel tanks. In this case, the boat builder constructs its own fuel tanks believes that an open-vent configuration without any emission control is necessary for the vessel application using the 100 gallon tanks. However, the manufacturer is able to use closed-vent fuel tanks with a 2.0 psi pressure relief valve in the smaller fuel tanks. Using the design certification levels described in Section III..F.3, the 100 gallon fuel tanks would have an FEL of 1.5 g/gallon/day and the 50 gallon fuel tanks would have an FEL of 0.7 g/gallon/day. The manufacturer would generate debits for the three boats with 100 gallon fuel tanks using the following equation:

Debits = (1.5 g/gallon - 1.1 g/gallon) × 3 tanks × 100 gallon/tank = 120 g

The manufacturer would need to use credits to cover these debits. The boats certified using a closed vent with a 2.0 psi pressure relief valve in this example would generate the following credits:

Credits = (1.1 g/gallon - 0.7 g/gallon) × 7 tanks × 50 gallon/tank = 140 g

Because the credits are larger than the debits in this example, the boat builder would meet the proposed corporate average standard by certifying these ten boats.

We also propose to allow manufacturers to bank and trade emission credits. We are proposing that emission credits generated under this program have no expiration, with no discounting applied. The credits would belong to the entity that certifies the fuel tank. In the above example, the manufacturer would have 20 grams of credits (140 g - 120 g = 20 g) that itcould bank, either for trading or for later model year averaging.

Beginning in 2004, we propose to allow early banking for diurnal evaporative emissions. Under this program, manufacturers generate early credits in 2004 through 2007 for adding new evaporative emission control technology which would reduce diurnal emissions. These credits could be banked and then used in 2008 and later.

As a precaution against creating an opportunity for windfall credits to be generated from fuel systems already below the average baseline level we would only allow credits to be generated below the proposed standard.

The following is an example of how early emission credits could be generated. In this example, a boat builder sells 20 boats in the 2004 to 2007 time period, each with a 50 gallon fuel tank. If this boat builder decided to sell one boat per year with a sealed tank and a 1.5 psi pressure relief valve (0.9 g/gallon/test), the boat builder would be able to generate emission credits using the following equation:

Credits = (1.1 g/gallon - 0.9 g/gallon/test) × 4 tanks × 50 gallon/tank = 40 g

Over this time period, the boat builder would not generate any emission debits. Therefore, the boat builder would have 40 grams of credits that it could use in 2008 and later. We request comment on the proposed ABT program for diurnal emissions.

We are supportive of the concept of ABT in general. An ABT program can reduce cost and improve technological feasibility, and provide manufacturers with additional product planning flexibility. This allows EPA to consider emissions standards with the most appropriate level of stringency and lead time, as well as providing an incentive for the early introduction of new technology. However, while we are open to the idea of including the program in the rule, we are not at this time proposing to allow ABT for meeting the proposed fuel tank and hose permeation standards. In preliminary discussions, manufacturers indicated a desire to meet requirements directly rather than using an ABT concept. From EPA's perspective including an ABT program in the rule creates a long-term administrative burden that is not worth taking on if the industry does not intend to take advantage of the flexibility. While we believe that all fuel tanks and fuel hoses can meet the proposed permeation standards using straight forward technology as discussed in Section III.H, industry may find value in an early banking program, especially for fuel tanks. Under this concept, industry could certify some tanks early in exchange for time to delay some tanks. This could potentially be done on a one-on-one basis, or perhaps on a volumetric exchange basis. In addition, we do not preclude the value of an averaging and trading program as a compliance flexibility to meet the proposed permeation standards which represent a 95 percent reduction in permeation. We request comment on whether we should adopt an ABT program for hose and fuel tank permeation emissions.

3. Would these standards apply to portable fuel tanks as well?

For personal watercraft and most boats using SD/I or large outboard engines, the fuel tanks are permanently mounted in the vessel. However, small boats using outboard engines may have portable fuel tanks that can be removed from the boat and stored elsewhere. Because these fuel tanks are not sold as part of a boat, we would not require boat builders that use only portable fuel tanks to certify to the proposed evaporative emission standards described above for fuel tanks. The fuel tank manufacturer would have to certify to the fuel tank diurnal and permeation standards. For this purpose, we would consider a portable fuel tank to be one that is not permanently mounted on the boat, has a handle, and has no more than 12 gallons of fuel capacity.

Portable fuel tanks generally have a quick-connect that is used to detach the fuel line between the engine and tank. Once the fuel line is detached, this quick-connect will close. In addition, these tanks generally have a valve that either closes automatically when the tank is disconnected from the engine or a valve that can be closed by the user which will prevent vapors from escaping from the tank when it is stored.

We propose to allow design-based certification of portable fuel tanks to the diurnal emission standard based on the criteria that they seal automatically when the tank is disconnected from the engine and that they meet the proposed fuel tank permeation standard. We believe that the diurnal emissions from a typical portable fuel tank would be well below the proposed standard provided that it is sealed when not in use. Because the emission control depends on user practices, (such as disconnecting the tank after use) we propose not allowing any credits to be generated for diurnal emissions. We request comment on allowing design-based certification of portable fuel tanks that have valves that must be closed by the user.

4. Is EPA proposing voluntary "Blue Sky" emissions standards?

Several state and environmental groups and manufacturers of emissions controls have supported our efforts to develop incentive programs to encourage the use of emission control technologies that go beyond federal emission standards. In the final rule for land-based nonroad diesel engines, we included a program of voluntary standards for low-emitting engines, referring to these as "Blue Sky Series" engines (63 FR 56967, October 23, 1998). Since then, we have included similar programs in several of our other nonroad rules. The general purposes of such programs are to provide incentives to manufacturers to produce clean products as well as create market choices and opportunities for environmental information for consumers regarding such products. The voluntary aspects of these programs, which in part provides an incentive for manufacturers willing to certify their products to more stringent standards than necessary, is an important part of the overall application of "Blue Sky Series" programs.

We are proposing a voluntary Blue Sky Series standard for diurnal emissions from marine fuel tanks. Under this proposal we are targeting close to a 95 percent reduction in diurnal evaporative emissions beyond the proposed mandatory diurnal emission standards as a qualifying level for Blue Sky fuel tanks. The proposed Blue Sky standard is 0.1 g/gallon/day, which, as discussed in Section III.F.3, could be met through the use of technologies such as a low permeation bladder fuel tank.

Creating a voluntary standard for low diurnal emissions will be an important step in advancing emission control technology. While these are voluntary standards, they become binding on tanks produced under that certificate once a manufacturer chooses to participate. EPA certification will therefore provide protection against false claims of environmentally beneficial products. A manufacturer choosing to certify a fuel tank under this approach must comply with all the proposed certification requirements including useful life, warranty, and other general compliance provisions. This program would become effective when we finalize this rule.

For the program to be most effective, however, incentives should also be in place to motivate the production and sale of lower emitting fuel tanks. We solicit ideas that could encourage the creation and use of these incentive programs by users and state and local governments. We believe it is important that such incentive programs lead to a net benefit to the environment; therefore, we are proposing that fuel tanks with the Blue Sky designation not generate extra ABT credits for demonstrating compliance with this proposed standard. We also request comment on additional measures we could take to encourage development and introduction of low emission control technology. Finally, we request comment on the Blue Sky approach in general as it would apply to marine fuel tanks.

5. What is consumer-choice labeling?

California ARB has recently proposed consumer/environmental label requirements for outboard and personal watercraft engines. Under this approach, manufacturers would label their engines or vehicles based on their certified emission level. California has proposed three different labels to differentiate varying degrees of emission control one for meeting the EPA 2006 standard, one for being 20 percent lower, and one for being 65 percent below. More detail on this concept is provided in the docket.[22]

We are considering a similar approach to labeling the vessels subject to this proposal. This would apply

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[22] "Public Hearing to Consider Amendments to the Spark-Ignition Marine Engine Regulations," Mail Out #MSC 99-15, June 22, 1999 (Docket A-2000-01, Document II-A-27).

especially to consumer products. Consumer-choice labeling would give people the opportunity to consider varying emission levels as a factor in choosing specific models. This may also give the manufacturer an incentive to produce more of their cleaner models. A difficulty in designing a labeling program is in creating a scheme that communicates information clearly and simply to consumers. Also, some are concerned that other organizations could use the labeling provisions to mandate certain levels of emission control, rather than relying on consumer choice as a market-based incentive. We request comment on this approach for marine vessels.

D. Demonstrating Compliance

1. How would I certify my products?

We are proposing to apply our emission standards to vessels, but allow certification of fuel tanks and hoses separately. For both cases, we are proposing a certification process similar to our existing program for other mobile sources. In the existing program, manufacturers test representative prototype designs and submit the emission data along with other information to EPA in an application for a Certificate of Conformity. As discussed in Section III.F.3, we are proposing to allow manufacturers to certify based on either design (for which there is data) or emissions testing. If we approve the application, then the manufacturer's Certificate of Conformity allows the manufacturer to produce and sell the vessels or fuel systems described in the application in the U.S.

We are proposing that manufacturers certify their vessels, fuel tanks, or hoses by grouping them into emission families. Under this approach, vessels, fuel tanks, or hoses systems expected to have similar emission characteristics would be classified in the same emission family. The emission family definition is fundamental to the certification process and to a large degree determines the amount of testing required for certification. To address a manufacturer's unique product mix, we may approve using broader or narrower emission families.

Once an emission family is certified, we would require every vessel, fuel tank, or hose a manufacturer produces from the emission family to have a label with basic identifying information. The proposed regulation text details the proposed requirements for design and content of the labels. We request comment on this approach.

2. Who will be responsible for certifying the vessel or fuel system?

Every boat powered by a spark-ignition marine engine and every portable fuel tank would have to be covered by an emissions certificate (or separate certificates for fuel tanks and hoses). The proposed regulations require that compliance to the emission standards must be demonstrated before the sale of the boat (or tank, in the case of portable fuel tanks). However, to allow additional flexibility in complying with standards, we propose to allow tank and hose manufacturers to certify their product lines separately. Therefore, if a boat builder were to use certified fuel tanks and hoses, the boat builder could rely on the tank and hose manufacturers' certificates. The boat builder would only need to state that they are using components that, combined, will meet the proposed standard and properly install the fuel system. We request comment on this approach.

3. How long would my vessel or fuel system have to comply?

Manufacturers would be required to build vessels that meet the emission standards over each vessel's useful life. The useful life we adopt by regulation is intended to reflect the period during which vessels are designed to properly function without being remanufactured. We propose a regulatory useful life of ten years for marine evaporative emission control. This is consistent with the regulatory useful life for outboard marine engines. We use the same useful life based on the belief that engines and boats are intended to have the same design life. We request comment on the proposed useful life requirement.

4. What warranty requirements apply to certified vessels and fuel systems?

Consistent with our current emission-control programs, we are proposing that manufacturers provide a design and defect warranty covering emission-related components. For marine vessels, we propose that the fuel systems be warranted for five years for the emission related components. The proposed regulations would require that the warranty period must be longer than this minimum period we specify if the manufacturer offers a longer warranty for the fuel system or any of its components; this includes extended warranties on the fuel system or any of its components that are available for an extra price. See the proposed regulation language for a description of which components are emission-related. We request comment on whether the warranty provisions should apply only to the certificate holder or to all manufacturers of the fuel system components used by the certificate holder.

If an operator makes a valid warranty claim for an emission-related component during the warranty period, the manufacturer is generally obligated to replace the component at no charge to the operator. The manufacturer may deny warranty claims if the operator failed to do prescribed maintenance that contributed to the warranty claim.

We are also proposing a defect reporting requirement that applies separate from the emission-related warranty (see Section III.E.6). In general, defect reporting applies when a manufacturer discovers a pattern of component failures, whether that information comes from warranty claims, voluntary investigation of product quality, or other sources. We request comment on the proposed warranty and defect reporting requirements.

E. General Compliance Provisions

This section describes a wide range of compliance provisions that would apply to marine vessels (or fuel tanks or hoses as appropriate) and are the same as those recently proposed for the nonroad engines September 2001 (see 66 FR 51098). Several of these provisions apply not only to manufacturers, but also to operators, and others.

The following discussion of the general compliance provisions reflects the organization of the proposed regulatory text. For ease of reference, the subpart designations are provided. We request comment on all these provisions.

1. Miscellaneous Provisions (Part 1068, subpart A)

This proposed regulation contains some general provisions, including general applicability and the definitions that apply to 40 CFR part 1068. Other provisions concern good engineering judgment, how we would handle confidential information; how the EPA Administrator delegates decision-making authority; and when we may inspect a manufacturer's facilities, vessels, or records.

The process of testing for evaporative emissions (or certifying based on design) and preparing an application for certification requires the manufacturer to make a variety of judgments. Section 1068.5 of the proposed regulations describes the methodology we propose to use to evaluate concerns related to manufacturers' use of good engineering judgment in cases where the manufacturer has such discretion. If we find a problem in these areas, we would take into account the degree to which any error in judgment was deliberate or in bad faith. This subpart is consistent with provisions in the final rule for light-duty highway vehicles and commercial marine diesel engines.

2. Prohibited Acts and Related Requirements (Part 1068, subpart B)

The proposed provisions in this subpart lay out a set of prohibitions for manufacturers and operators to ensure that vessels comply with the emission standards. These provisions are summarized below, but readers are encouraged to review the proposed regulatory text. These provisions are intended to help ensure that each new vessel or portable tank sold or otherwise entered into commerce in the United States is certified to the relevant standards.

a. General prohibitions (§1068.100)

This proposed regulation contains several prohibitions consistent with the Clean Air Act. Under this proposal, no one may sell a vessel or portable fuel tank in the United States without a valid certificate of conformity issued by EPA, deny us access to relevant records, or keep us from entering a facility to test or inspect vessels or fuel system components. In addition, no one may remove or disable a device or design element that may affect an vessel's emission levels, or manufacture any device that will make emission controls ineffective, which we would consider tampering. We have generally applied the existing policies developed for tampering with highway engines and vehicles to nonroad engines.[23] Other proposed prohibitions reinforce manufacturers' obligations to meet various certification requirements. We would also prohibit selling parts that prevent emission-control systems from working properly. Finally, for vessels that are excluded for certain applications (i.e. solely for competition), we would generally prohibit using these vessels in other applications.

These proposed prohibitions are the same as those that apply to other applications we have regulated in previous rules. Each prohibited act has a corresponding maximum penalty as specified in Clean Air Act section 205. As provided for in the Federal Civil Penalties Inflation Adjustment Act of 1990, Pub. L. 10-410, these maximum penalties are in 1970 dollars and should be periodically adjusted by regulation to account for inflation. The current penalty amount for each violation is $27,500.[24]

b. In-service systems (§1068.110)

The proposed regulations would prevent manufacturers from requiring owners to use any certain brand of aftermarket parts and give the manufacturer responsibility for servicing related to emissions warranty, leaving the responsibility for all other maintenance with the owner. This proposed regulation would also reserve our right to do testing (or require testing) to investigate potential defeat devices, as authorized by the Act.

3. Exemptions (Part 1068, subpart C)

We are proposing to include several exemptions for certain specific situations. Most of these are consistent with previous rules. We highlight the new or different proposed provisions in the following paragraphs. In general, exempted vessels would need to comply with the requirements only in the sections related to the exemption. Note that additional restrictions could apply to importing exempted vessels (see Section III.E.4). Also, we are also proposing that we may require manufacturers (or importers) to add a permanent label describing that the vessel or fuel system component is exempt from emission standards for a specific purpose. In addition to helping us enforce emission standards, this would help ensure that imported vessels clear U.S. Customs without difficulty.

a. Testing

Anyone would be allowed to request an exemption for vessels or fuel system components used only for research or other investigative purposes.

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[23] "Interim Tampering Enforcement Policy," EPA memorandum from Norman D. Shulter, Office of General Counsel, June 25, 1974 (Docket A-2000 01; document II-B20).

[24] EPA acted to adjust the maximum penalty amount in 1996 (61 FR 69364, December 31, 1996). See also 40 CFR part 19.

b. Manufacturer-owned vessels and fuel systems

Vessels and fuel system components that are used by manufacturers for development or marketing purposes could be exempted from regulation if they are maintained in the manufacturers' possession and are not used for any revenue-generating service. They would no longer be exempt if they were later offered for sale.

c. Display vessels or fuel systems

Boat builders and fuel system component manufacturers would get an exemption if the vessels or fuel systems are for display only. They would no longer be exempt if they were later offered for sale.

d. National security

Manufacturers could receive an exemption for vessels or portable fuel tanks they can show are needed by an agency of the federal government responsible for national defense. For cases where the vessels will not be used on combat applications, the manufacturer would have to request the exemption with the endorsement of the procuring government agency.

e. Exported vessels

Vessels and portable fuel tanks that will be exported to countries that don't have the same emission standards as those that apply in the United States would be exempted without need for a request. This exemption would not be available if the destination country has the same emission standards as those in the United States.

f. Competition vessels

New vessels that are used solely for competition are excluded from regulations applicable to nonroad equipment. For purposes of our certification requirements, a manufacturer would receive an exemption if it can show that it produces the vessel specifically for use solely in competition. In addition, vessels that have been modified for use in competition would be exempt from the prohibition against tampering described above (without need for request). The literal meaning of the term "used solely for competition" would apply for these modifications. We would therefore not allow the vessel to be used for anything other than competition once it has been modified. This also applies to someone who would later buy the vessel, so we would require the person modifying the vessel to remove or deface the original label and inform a subsequent buyer in writing of the conditions of the exemption. The exemption would no longer apply.

4. Imports (Part 1068, subpart D)

In general, the same certification requirements would apply to vessels whether they are produced in the U.S. or are imported. This proposed regulation also includes some additional provisions that would apply if someone wants to import an exempted or excluded vessel. For example, the importer would need written approval from us to import any exempted vessel; this is true even if an exemption for the same reason doesn't require approval for vessels produced in the U.S.

All the proposed exemptions described above for new vessels would also apply to importation, though some of these apply only on a temporary basis. If we approve a temporary exemption, it would be available only for a defined period and could require the importer to post bond while the vessel is in the U.S. There are several additional proposed exemptions that would apply only to imported vessels.

- Identical configuration: This would be a permanent exemption to allow individuals to import vessels that were designed and produced to meet applicable emission standards. These vessels may not have the emission label only because they were not intended for sale in the United States.

- Repairs or alterations: This would be a temporary exemption to allow companies to repair or modify vessels.
- Diplomatic or military: This would be a temporary exemption to allow diplomatic or military personnel to use uncertified vessels during their term of service in the U.S.

We request comment on all the proposed exemptions for domestically produced and imported vessels.

5. Selective Enforcement Audit (Part 1068, subpart E)

Clean Air Act section 206(b) gives us the authority and discretion in any program with vehicle or engine emission standards to do selective enforcement auditing of production vessels and fuel systems. The proposed regulation text describes the audit procedures in greater detail. We intend generally to rely on inspecting manufacturers' designs to ensure they comply with emission standards. However, we would reserve our right to do selective enforcement auditing if we have reason to question the emission testing conducted or data reported by the manufacturer.

6. Defect Reporting and Recall (Part 1068, subpart F)

We are proposing provisions for defect reporting. Specifically, we are proposing that manufacturers tell us when they learn of a defect occurring 25 times or more for emission families with annual sales up to 10,000 units. This threshold of defects would increase proportionately for larger families. While these thresholds would depend on sales, counting defects would not be limited to a single emission family. For example, if a manufacturer learns that operators reported 25 cases of problems with a limiting orifice from three different low-volume models spread over five years, that would trigger the need to file a defect report. This information could come from warranty claims, customer complaints, product performance surveys, or anywhere else. The proposed regulation language in §1068.501 also provides information on the thresholds for triggering a further investigation for where a defect report is more likely to be necessary. We request comment on the proposed defect reporting provisions.

Under Clean Air Act section 207, if we determine that a substantial number of vessels, fuel tanks, or hoses within an emission family, although properly used and maintained, do not conform to the appropriate emission standards, the manufacturer will be required to remedy the problem and conduct a recall of the noncomplying emission family. However, we also recognize the practical difficulty in implementing an effective recall program for marine vessels. It would likely be difficult to properly identify all the affected owners. The response rate for affected owners or operators to an emission-related recall notice is also a critical issue to consider. We recognize that in some cases, recalling noncomplying marine vessels may not achieve sufficient environmental protection, so our intent is to generally allow manufacturers to nominate alternative remedial measures to address most potential noncompliance situations. We expect that successful implementation of appropriate alternative remediation would obviate the need for us to make findings of substantial nonconformity under section 207 of the Act. We would consider alternatives nominated by a manufacturer based on the following criteria; the alternatives should

(1) represent a new initiative that the manufacturer was not otherwise planning to perform at that time, with a clear connection to the emission problem demonstrated by the emission family in question;
(2) cost more than foregone compliance costs and consider the time value of the foregone compliance costs and the foregone environmental benefit of the emission family;
(3) offset at least 100 percent of the emission exceedance relative to that required to meet emission standards; and
(4) be possible to implement effectively and expeditiously and to complete in a reasonable time.

These criteria would guide us in evaluating projects to determine whether their nature and burden is appropriate to remedy the environmental impact of the nonconformity. However, in no way would the consideration of such a provision diminish our statutory authority to direct a recall if that is deemed the best course of action. We request comment on this approach to addressing the Clean Air Act provisions related to recall. In addition, we request comment on the proposed requirement to keep recall-related records until three years after a manufacturer completes all responsibilities under a recall order.

7. Public Hearings (Part 1068, subpart G)

According to this regulation, manufacturers would have the opportunity to challenge our decision to suspend, revoke, or void an emission family's certificate. This also applies to our decision to reject the manufacturer's use of good engineering judgment (see §1068.5). Part 1068, subpart G describes the proposed procedures for a public hearing to resolve such a dispute.

F. Proposed Testing Requirements

In order to obtain a certificate allowing sale of products meeting EPA emission standards, manufacturers generally must show compliance with such standards through emission testing. 40 CFR part 86 details specifications for test equipment and procedures that apply to highway vehicle evaporative emission testing. We propose to base the SI marine evaporative emission test procedures on this part. However, we propose to modify this test procedure somewhat to more accurately reflect the anticipated technology for meeting the evaporative emission standards proposed in this rule. We are also proposing design-based certification as an alternative to performing specific testing.

1. What are the proposed test procedures for measuring diurnal emissions?

We propose that the evaporative emission test will be representative of ambient temperatures ranging from 22° C to 36° C (72° F to 96 F). Emissions would be measured in a Sealed Housing for Evaporative Determination (SHED) over a 72-hour period. The fuel tank would be set up in the SHED and sealed except for the vent(s). The fuel tank would be set up in the SHED wiht all hoses, seals, and other components attached. The fuel tank would be filled completely and drained to 40-percent capacity with 9 RVP test fuel and soaked with an open vent until the fuel reached 22 C.[25] Immediately after the fuel reaches this temperature, the SHED would be purged, and the diurnal temperature cycling would begin. The temperature cycle is actually three repeats of a 24-hour diurnal trace and is described in Chapter 4 of the Draft Regulatory Support Document. During the test a minimum of 5 mph wind speed would me simulated using a fan. The final g/gallon/day result is based on the highest mass emission rate from these three 24-hour cycles, divided by the fuel tank capacity. Fuel tank capacity refers the maximum amount of fuel in the tank under in-use conditions.

These proposed test procedures are designed to simulate near worst case conditions for a typical boat. We believe that typical in-use fuel tanks will rarely be exposed to a temperature cycle larger than 24°F in a single day. However, in special applications where the fuel tank is exposed to direct sunlight, the tank temperature can change much more than 24°F over the course of a single day. Therefore, we are proposing that special test procedures that simulate the radiant effect of sunlight be used to test fuel tanks that will be exposed to direct sunlight. We would not require this for exposed fuel tanks that are shielded from the sun.

This diurnal cycle is consistent with the test requirements in 40 CFR part 86 for highway vehicles.

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[25] Reid Vapor Pressure (psi). This is a measure of the volatility of the fuel. 9 RVP represents a typical summertime fuel in northern states.

However, the test procedure for highway vehicles includes engine operation and hot soaks.[26] One purpose of the engine operation is to purge the charcoal canister that collects evaporative emissions in highway applications. However, we are excluding engine operation from the evaporative test procedures for boats using SI marine engines because we do not anticipate the use of charcoal canisters in these applications. Another purpose of running the engine and the purpose of the hot soaks is to measure evaporative emissions due to the heating of the engine and exhaust system. However, this would significantly increase the difficulty of the SHED testing due to the large size of most boats. Because most boats are operated only 50 hours per year, these running loss and hot soak emissions are considerably smaller than diurnal and permeation emissions. In addition, most of the emission-control strategies that could be used to meet the proposed standards would also reduce running loss and hot soak emissions. We request comment on the proposed test procedures for determining evaporative emissions from boats using SI marine engines.

2. What are the proposed test procedures for measuring permeation emissions?

a. fuel tanks

We propose that tank permeation be based on a test procedure consistent with the Coast Guard requirements in 33 CFR 183.620. Specifically, the rate of permeation from the tank will be measured at 40 C using the same test fuel as for the diurnal testing. We request comment on using 40 C as the test temperature or if 23 C should be used to be consistent with the hose testing. Our understanding is that 40 C represents higher temperatures that may be seen in an engine compartment during operation while 23 C represents typical ambient conditions. If a lower test temperature were used, the standards would need to be adjusted appropriately. Based on data presented in Chapter 4 of the draft RSD, the standards would have to be reduced on the order of 50 percent for every 10 C reduction in test temperature. We also request comment on using ASTM Fuel "C" and a 15% methanol blend to be consistent with the hose permeation test procedures or on using 10% ethanol consistent with on-highway evaporative emission testing. The tank would have to be filled and soaked for a minimum of 60 days to ensure that permeation emissions are accurately reflected in the test procedure. The tank would be sealed during testing, and care would have to be made that the environment in which the tank was tested was continuously purged of vapor to prevent the saturation of vapor with hydrocarbons around the outside of the tank. Permeation would be measured through weight loss in the tank or using equivalent procedures.

We also request comment on whether we should require specific durability test procedures for fuel tanks. Such durability tests could include pressure vacuum cycle testing, slosh testing, and temperature cycling. Information on these tests is included in the docket.[27]

b. hoses

We propose to use the current practices for measuring permeation from marine hoses that are specified in SAE J 1527. Under this procedure, the hose is tested at 23 C with both ASTM Fuel "C" (50% toluene, 50% isooctane) and with a blend on fuel "C" with 15% methanol. SAE J 1527 sets permeation limits for hose of 100 g/m^2/day for fuel C and 300 g/m^2/day for the 15% methanol blend. Consistent with this relationship, we propose to

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[26] Hot soak emissions are those caused by residual heat in the engine and exhaust system immediately after the engine is shut down. Running loss emissions are those caused by engine and exhaust heat while the engine is operating.

[27] Draft SAE Information Report J1769, "Test Protocol for Evaluation of Long Term Permeation Barrier Durability on Non-Metallic Fuel Tanks," (Docket A-2000-01, document IV-A-24).

allow the permeation rate to be three times higher than the proposed standard for fuel C when the hose is tested on the 15% methanol blend. Because permeation rates double, roughly, with every 10 C increase in temperature, the test procedure has a large effect on emissions measured for a given hose material. In addition, the temperature effects may be greater for some materials than for others. For low permeation non-metal fuel lines used in automotive applications, the current practices are specified in SAE J 2260 and SAE J 1737. Under these test procedures, the hose permeation is measured at 60 C with an 85%-15% blend of fuel "C" and methanol. We request comment on using the higher test temperature in the automotive test procedure. We also request comment on requiring testing using a 10% ethanol blend consistent with on-highway evaporative emission testing.

3. Could I certify based on engineering design rather than through testing?

We recognize that performing SHED testing could be cost-prohibitive for many fuel tank manufacturers or boat builders. In addition, many of the technologies that can be used to reduce evaporative emissions are straightforward design strategies. For these reasons, we propose that manufacturers have the option of certifying to the diurnal evaporative emission requirements based on fuel system designs, as described in the proposed regulations. Test data would be required to certify fuel tanks and hoses to the proposed permeation standards. However, we would allow carryover of test data from year to year for a given emission control design. We believe the cost of testing tanks and hose designs for permeation would be considerably lower than running variable temperature diurnal testing. In addition, the data could be carried over from year to year, and there is a good possibility that the broad emission family concepts under consideration could lead to minimum testing. For instance, a hose manufacturer could test its hose design once, and all the boat builders who use this hose could incorporate this data in their certification applications.

We are proposing design based certification to the tank permeation standard for one case. We would consider an aluminum fuel tank to meet the design criteria for a low permeation fuel tank. However, we would not consider this design to be any more effective than a low permeation fuel tank for the purposes of any sort of credit program. Although aluminum is impermeable, seals and gaskets used on the fuel tank may not be. The design criteria for the seals and gaskets would be that either they would not have a total exposed surface area exceeding 1000 mm^2, or the seals and gaskets would have to be made of a material with a permeation rate of 10 g/m^2/day or less at 23 C.

The rest of this section discusses designs that we propose to be acceptable for design-based certification to the proposed diurnal emission standard. The emission data we used to develop these proposed design options are presented in Chapter 4 of the Draft Regulatory Support Document. Additional testing may help us more precisely set the appropriate emission levels associated with each design. Manufacturers wanting to use designs other than those we discuss here would have to perform the above test procedures for their design. However, once a new design is proven, we could add this new design to the list of designs for this certification flexibility and assign it to the appropriate averaging bin. For example, if several manufacturers were to pool their resources to test a diurnal emission control strategy and submit this data to EPA, we would consider this particular strategy and emission level as a new design level for design based certification. We request comment on the concept of design-based certification and on the technologies and associated emission levels discussed below. Section III.H.3 presents a more detailed description of what each of these technologies are and how they can be used to reduce evaporative emissions.

We have identified several technologies for reducing diurnal emissions from marine fuel tanks. The design levels proposed below represent our understanding of the effectiveness of various emission control technologies over the proposed test procedure. Table III.F.1 summarizes design-based emission levels associated with several emission control strategies. These control strategies are discussed in more detail after the table. Manufacturers would be required to submit information demonstrating that the components they use would be durable over the useful life of the vessel. For tanks that allow pressure build-up, a low-pressure vacuum-relief valve would also be necessary for the engine to be able to draw fuel during operation. Also, in the cases where anti-siphon valves are used with these designs, the anti-siphon system would have to be designed such that fuel could not spill out through this valve when the system is under pressure.

Table III.F-1: Emission Levels for Design Based Certification to the Proposed Diurnal Emission Standard

Emission Level [g/gallon/day]	Technology
1.5	baseline (open vent with a normal length vent hose)
1.3	near zero pressure limited flow orifice and insulation (R-value 15), or closed vent, 0.5 psi relief valve
1.1*	closed vent, 1.0 psi relief valve
0.9	closed vent, 1.5 psi relief valve
0.7	closed vent, 2.0 psi relief valve
0.5	closed vent, 0.5 psi relief valve with a volume compensating air bag
0.1	bladder fuel tank

* proposed average standard for diurnal emissions.

<u>1.5 g/gal/test</u>: Typical fuel tanks used in boats currently have an open vent to the atmosphere through a vent hose. This vent is intended to prevent pressure from building up in the fuel tank. This uncontrolled fuel tank configuration would be considered to be at this level based on the data presented in Chapter 4 of the Draft RSD.

<u>1.3 g/gal/test</u>: The design criteria for this level would be a fuel tank with a near zero pressure limited flow orifice and insulation. The limited flow orifice would be defined as having a maximum cross-sectional area defined by the following equation: Area [mm^2] = 0.04 × fuel tank capacity [gallons]. For example, a 20 gallon tank would need an orifice with no more than a 1 mm diameter. This size orifice is sufficient to limit diffusion of hydrocarbons without causing significant pressure to build in the fuel tank. The design criteria for the insulation would be to use insulation having at least an R-value of 15 (see section III.H.3.b).

<u>1.3 g/gal/test</u>: An alternative design criterion for this level would be a sealed fuel tank with a pressure-relief valve that would open at a pressure of 0.5 psi.

<u>1.1 g/gal/test</u>: The design criterion for this level would be a sealed fuel tank with a pressure-relief valve that would open at a pressure of 1.0 psi.

<u>0.9 g/gal/test</u>: The design criterion for this level would be a sealed fuel tank with a pressure-relief valve that would open at a pressure of 1.5 psi.

<u>0.7 g/gal/test</u>: The design criterion for this level would be a sealed fuel tank with a pressure-relief valve that would open at a pressure of 2.0 psi.

<u>0.5 g/gal/test</u>: The design criterion for this level would be a volume-compensating air bag used in conjunction with a 0.5 psi pressure-relief valve if the bag is designed to fill 25 percent of the fuel tank capacity

when inflated. This bag would have no leaks to the fuel tank and would be constructed out of a non permeable material.

0.1 g/gal/test: The design criterion for this level would be to use a bladder tank. The bladder would have to be sealed and built of low permeable material. This bladder would collapse as fuel was drawn out of it and expand when refueled thereby eliminating the vapor space needed for diurnal vapor generation.

G. Special Compliance Provisions

The scope of this proposal includes many boat and fuel tank manufacturers that have not been subject to our regulations or certification process. Many of these manufacturers are small businesses for which a typical regulatory program may be burdensome. This section describes the proposed special compliance provisions designed to address this concern. As described in Section VIII.B, the report of the Small Business Advocacy Review Panel addresses the concerns of small manufacturers of gasoline fuel tanks for marine applications and small boat builders that use these tanks.

To identify representatives of small businesses for this process, we used the definitions provided by the Small Business Administration for fuel tank manufacturers and boat builders (less than 500 employees). Twelve small businesses agreed to serve as small-entity representatives. These companies represented a cross-section of both gasoline and diesel engine marinizers, as well as boat builders.

In this industry sector, we believe some of the burden reduction approaches presented in the Panel Report should be applied to all businesses. All of the marine fuel tank manufacturers except for one qualify as small businesses. We believe the purpose of these options is to reduce the potential burden on companies for which fixed costs cannot be distributed over a large product line. For this reason, we often times also consider the production volume when making decisions regarding flexibilities. The one fuel tank manufacturer not qualifying as a small business still has low production volumes of marine fuel tanks, thus we believe some flexibilities should be made available to this manufacturer as well.

Three of the five burden reduction approaches discussed in the Panel Report are design-based certification, allowance to use emission credits with design-based certification, and a five-year lead time with early banking. As discussed above, we are proposing these approaches for all manufacturers certifying marine fuel tanks to the proposed evaporative emission standards. This section discusses the other two approaches in the Panel Report and how we propose to apply them to the marine industry.

1. Broadly defined product certification families

To certify to the evaporative emission standards, we propose that manufacturers would have to classify their vessels, fuel tanks, or hoses in emission families based on having similar emission characteristics. We would expect to differentiate families by fuel type, diurnal control technology, and the tank and hose material/treatment. The manufacturer would then certify each of these evaporative emission families. The purpose of emission families has traditionally been to reduce testing burden by allowing a family to be certified based on the test results from its highest-emitting member.

For highway evaporative emission requirements, each manufacturer divides its products into several evaporative emission families based on characteristics of the fuel system. These characteristics include: fuel type, charcoal canister type and capabilities, seals, valves, hoses, and tank material. The manufacturer then has to certify each of these evaporative emission families. Unlike highway vehicles, evaporative emission controls for marine vessels are not likely to rely on charcoal canisters as a control technology. Furthermore, most or all SI marine engines will use gasoline and most manufacturers do not make both plastic and aluminum fuel tanks. Most manufacturers will therefore have very few emission families and it will be unlikely that emission families could be much broader than discussed here. In addition, broadening emission families may not reduce compliance burden, considering the proposed design-based certification approach. However, we request comment on whether there are reasonable ways to broaden these engine families, and whether or not small businesses would benefit from any such broadened definitions.

2. Hardship provisions for small businesses producing marine fuel tanks

There are two types of hardship provisions. The first type of hardship program would allow small businesses to petition EPA for additional lead time (e.g., up to 3 years) to comply with the standards. A small manufacturer would have to make the case that it has taken all possible business, technical, and economic steps to comply but the burden of compliance costs would have a significant impact on the company's solvency. A manufacturer would be required to provide a compliance plan detailing when and how it would achieve compliance with the standards. Hardship relief could include requirements for interim emission reductions and/or purchase and use of emission credits. The length of the hardship relief decided during review of the hardship application would be up to one year, with the potential to extend the relief as needed. The second hardship program would allow companies to apply for hardship relief if circumstances outside their control cause the failure to comply (i.e., supply contract broken by parts supplier) and if the failure to sell the subject vessels would have a major impact on the company's solvency. See the proposed regulatory text in 40 CFR 1068.240 and 1068.241 for additional details.

H. Technological Feasibility

We believe there are several strategies that manufacturers can use to meet our proposed evaporative emission standards. We have collected and will continue to collect emission test data on a wide range of evaporative emission control technology. The design-based certification levels discussed above are based on this test data and we may amend the list of approved designs and emission levels as more data become available.

1. Implementation schedule

There are several strategies available to reduce evaporative emissions (diurnal and permeation) from marine fuel tanks. Some of these may require changes to the tank design, structure, and material that would cause a change in the molds used to make the plastic tanks. These molds need to be replaced periodically as part of normal manufacturing practices. Small manufacturers using rotational molding to produce plastic fuel tanks have commented that the molds covering the majority of their production line have about a five-year life before replacement. However, for the low-production fuel tanks, they may use their molds for 10 to 15 years. They have stated that their costs would be greatly reduced if they could turn over fuel tank molds in a manner more consistent with their current business practice, rather than doing so solely in response to an evaporative control requirement.

We recognize that tank manufacturers and boat builders will need time to choose and implement the evaporative emission control strategies that work best for them. We believe the implementation date of 2008, coupled with the option for early banking, provides sufficient lead time beyond the anticipated publication of the final rule. This five-year lead time is consistent with the general turnover schedule of most molds used in plastic fuel tank production. We request comment whether there are small entities whose product line is dominated by tanks for which the molds are turned over at a slower rate.

Surface treatments to reduce tank permeation are widely used today in other container applications and the technology and production facilities needed to conduct this process exist. While there is definitely value in an organized approach to compliance on the part of the manufacturers, the lead time requirement is largely driven by modifications needed to comply with the diurnal requirements. EPA requests comment on the feasibility of implementing the tank permeation requirement in 2006 or 2007.

Low permeation marine hose is used today on some vessels that is close to meeting the proposed standards. In addition, the development time for new hose designs is on the order of 1-2 years. Therefore, we request comment on whether an earlier implementation date for the proposed permeation standards for marine hoses would be appropriate. We are proposing an implementation date for hose permeation standards of 2008, consistent with the fuel tank standards, because hose fitting modifications may be required which could affect tank design. Manufacturers have commented that low permeation hoses require special connection fittings with better tolerances than seen on many fittings today. Automotive fuel lines also already exist that meet the proposed permeation standards. However, manufacturers have raised concerns with the cost of applying these less flexible fuel lines in marine applications. In any case, using these automotive fuel lines would probably also require fitting changes. EPA requests comment on the feasibility of implementing the hose permeation requirement in 2006 or 2007.

2. Standard levels

We tested several diurnal emission-control strategies using the procedures discussed in VI.D.1. Based on this testing we believe there are several emission-control technologies that could be used to significantly reduce diurnal emissions. Also, we have identified several strategies for reducing permeation emissions from fuel tanks and hoses. We recognize that some of these technologies may be more desirable than others for some manufacturers, and we recognize that different strategies for equal emission reductions may be better for different applications. Specific examples of technology that could be used to meet the proposed standards would be fuel tank with a 1 psi valve in the vent, a fluorinated plastic fuel tank, and hose constructed with a thermoplastic barrier. We present several other technological approaches below.

3. Technological approaches

We believe several emission-control technologies can be used to reduce evaporative emissions from marine fuel tanks. In addition, there are a few technologies that are used in other applications that may not be as effective here. The advantages and disadvantages of various emission-control strategies are discussed below. Chapter 4 of the Draft Regulatory Support Document presents more detail on these technologies and Chapter 5 provides information on the estimated costs.

a. closed fuel vent with pressure relief

Evaporative emissions are formed when the fuel heats up, evaporates, and passes through the vent into the atmosphere. By closing that vent, evaporative emissions are prevented from escaping. However, as vapor is generated, pressure builds up in fuel tank. Once the fuel cools back down, the pressure subsides.

The U.S Coast Guard safety regulations (33 CFR part 183) require that fuel tanks be able to withstand pressure up to 3 psi and must be able to pass a pressure-impulse test which cycles the tank from 0 to 3 psi 25,000 times. The Coast Guard also requires that these fuel tanks be vented such that the pressure in the tank in-use never exceeds 80 percent of the pressure that the tank is designed to withstand without leaking. The American Boat and Yacht Council makes the additional recommendation that the vent line should have a minimum inner diameter of 7/16 inch (H-24.13). However, these recommended practices also note that "there may be EPA or state regulations that limit the discharge of hydrocarbon emissions into the atmosphere from gasoline fuel systems. The latest version of these regulations should be consulted."

To prevent pressure from building too high, we first considered a 2 psi pressure-relief valve. This is a typical automotive rating and is within the Coast Guard requirements. With this valve, vapors would be retained in the tank until 2 psi of pressure is built up in the tank due to heating of the fuel. Once the tank pressure reached 2 psi, just enough of the vapor would be vented to the atmosphere to maintain 2 psi of pressure. As the fuel cooled, the pressure would decrease. We estimate that this would achieve about a 55-percent reduction in evaporative emissions over the proposed test procedure. A 1 psi valve would achieve a reduction of about half of this over the proposed test procedure. However, in use, this reduction could be much greater because the test procedure is designed to represent a hotter than average day. On a more mild day there could be less pressure buildup in the tank and the valve may not even need to open. As discussed in Chapter 4 of the draft RSD, we tested fuel tanks for diurnal emissions with pressure relief valves ranging from 0.4 to 2.2 psi. With the use of a sealed system, a low-pressure vacuum-relief valve would also be necessary so air could be drawn into the tank to replace fuel drawn from the tank when the engine is running.

Manufacturers of plastic fuel tanks have expressed concern that their tanks are not designed to operate under pressure. For instance, although they will not leak at 3 psi, rotationally molded fuel tanks with large flat surfaces could begin deforming at pressures as low as 0.5 psi. At higher pressures, the deformation would be greater. This deformation would affect how the tank is mounted in the boat. Also, fuel tank manufacturers commented that some of the fittings or valves used today may not work properly under even 2 psi of pressure. Finally, they commented that backup pressure-relief valves would be necessary for safety.

We believe that, with enough lead time, fuel tank manufacturers will be able to redesign their fuel tanks to be more resistant to deformation under pressure. By reducing the size of flat areas on the tank through adding contours to the tank, or by increasing the thickness of the tank walls, the fuel tanks can be designed to resist deformation under pressure. Portable plastic fuel tanks are generally sealed without any pressure relief and are designed to withstand any pressure that may occur under these conditions. We also believe that if certain fittings and valves cannot withstand pressure today, they can be designed to do so. In addition, we are proposing a standard which can be met with a 1 psi valve which we believe would require significantly less modification to current tanks than designing for 3 psi of pressure. In developing this level we considered first 2.0 psi valves which is consistent with on-highway fuel tanks and is below the Coast Guard tank pressure requirement. However, we proposed a standard based on a 1.0 psi pressure relief valve to give manufacturers some margin to minimize fuel tank deflection under pressure. Although we do not consider this to be a feasibility issue, we recognize that if the tank were to deflect too much in-use that either the fuel tank compartment would have to be enlarged to accommodate this expansion or a smaller fuel tank would need to be used. We request comment on this issue.

Below, we discuss strategies that could be used in conjunction with a sealed system to minimize the build-up of pressure in the fuel tank. Such technologies are insulation, volume-compensating air bags, and bladder fuel tanks. With the use of these technologies, the same emission reductions could be achieved with a pressure-relief valve set to allow lower vent pressures. Finally the structure of the proposed standards gives manufacturers the flexibility to meet the emission limits without building up pressure in the fuel tank.

b. limited flow orifice

An alternative to using a pressure-relief valve to hold vapors in the fuel tank would be to use a limited-flow orifice. This would essentially be a plug in the vent line with a pin hole in it that would be small enough to limit vapor flow out of the fuel tank. However, the orifice size may be so small that there would be a risk of fouling. In addition, an orifice designed for a maximum of 2 psi under worst-case conditions may not be very effective at lower temperatures. We tested a 17-gallon tank with a 75-micron diameter limited-flow orifice over the proposed diurnal test procedure and saw close to a 25 percent reduction in diurnal emissions. The peak pressure in this test was 1.6 psi.

c. insulated fuel tank

Another option we evaluated was insulating either the fuel tank or the compartment around the fuel tank. Rather than capturing the vapors in the fuel tank, we minimize the fuel heating, which therefore minimizes the vapor generation. This could be used in conjunction with a limited-flow orifice to reduce the loss of vapor through the vent line due to diffusion. Our test data suggest that a 50-percent reduction in emissions over the proposed test procedure can be achieved using insulation with an R-value of 15.[28] However, it should be noted that today's fuel tanks, when installed in boats, have some amount of "inherent insulation." This is especially true for boats that remain in the water. This inherent insulation is considered in our baseline emission factors. Additional control could be achieved with the use of a pressure-relief valve coupled with an insulated tank. Note that an insulated tank could maintain the same emission control while using a pressure-relief valve that allowed lower peak pressures, compared with a tank that was not insulated.

The method of insulation would have to be consistent with U.S. Coast Guard fuel system requirements. These requirements regulate the resistance to fuels, oils and other chemicals, water adsorption, compressive strength, and density of foam used to encase fuel tanks. In addition, the Coast Guard requirements protect against corrosion of metal fuel tanks due to foam pulling away from the fuel tank causing water to be trapped or from improper drainage. There are several methods that could be used to insulate the fuel tank while maintaining safe practices. These methods include an insulation barrier within the walls of the fuel tank, insulating the compartment that the tank is in rather than the tank itself, and foaming the tank in place by filling the entire compartment the tank is in. The Coast Guard requirements and potential insulation strategies are discussed further in Chapter 3 of the Draft Regulatory Support Document.

d. volume-compensating air bag

Another concept for minimizing pressure in a sealed fuel tank is through the use of a volume-compensating air bag. The purpose of the bag is to fill up the vapor space in the fuel tank above the fuel. By minimizing the vapor space, the equilibrium concentration of fuel vapors occupies a smaller volume, resulting in a smaller mass of vapors. As the equilibrium vapor concentration increases with increasing temperature, the vapor space expands, which forces air out of the bag through the vent to atmosphere. Because the bag volume decreases to compensate for the expanding vapor space, total pressure inside the fuel tank stays very close to atmospheric pressure.[29] Once the fuel tank cools as ambient temperature goes down, the resulting vacuum in the fuel tank will make the bag expand again by drawing air from the surrounding ambient. Our test results showed that pressure could be kept below 0.8 psi using a bag with a capacity equal to 25 percent of the fuel tank capacity. Therefore, the use of a volume-compensating air bag could allow a manufacturer to reduce the pressure limit on its relief valve.

We are still investigating materials that would be the most appropriate for the construction of these bags. The bags would have to hold up in a fuel tank for several years and resist permeation, while at the same time being light and flexible. One such material we are considering is fluorosilicon fiber. Also, the bag would have to be positioned to avoid interfering with other fuel system components such as the fuel pick-up or catching on any sharp edges in the fuel tank. We estimate that this would be more expensive than using a pressure relief valve with some reinforcement of the fuel tank for pressure; however, it is also more effective at emission control and would minimize pressure in the fuel tank.

e. bladder fuel tank

Probably the most effective technology for reducing diurnal emissions from marine fuel tanks is through the use of a collapsible fuel bladder. In this concept, a low permeation bladder is installed in the fuel tank to hold the fuel. As fuel is drawn from the bladder, the vacuum created collapses the bladder. Therefore, there is no vapor

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[28] R-value measures resistance to heat flow and is defined in 16 CFR 460.5.

[29] The Ideal Gas Law states that pressure and volume are inversely related. By increasing the volume of the vapor space, the pressure can be held constant.

space and no pressure build up from fuel heating. Because the bladder is sealed, there would be no vapors vented to atmosphere. This option could also significantly reduce emissions during refueling that would normally result from dispensed fuel displacing vapor in the fuel tank. We have received comments that this would be cost-prohibitive because it could increase costs from 30 to 100 percent depending on tank size. However, bladder fuel tanks have positive safety implications as well and are already sold by at least one manufacturer to meet market demand in niche applications.

f. *charcoal canister*

The primary evaporative emission-control device used in automotive applications is a charcoal canister. With this technology, vapor generated in the tank is vented through a charcoal canister. The activated charcoal collects and stores the hydrocarbons. Once the engine is running, purge air is drawn through the canister and the hydrocarbons are burned in the engine. These charcoal canisters generally are about a liter in size and have the capacity to store three days of vapor over the test procedure conditions. This technology does not appear to be attractive for marine fuel tanks because boats may sit for weeks at a time without the engine running. Once the canister is saturated, it provides no emission control.

g. *floating fuel and vapor separator*

Another concept used in some stationary engine applications is a floating fuel and vapor separator. Generally small, impermeable plastic balls are floated in the fuel tank. The purpose of these balls is to provide a barrier between the surface of the fuel and the vapor space. However, this strategy does not appear to be effective for marine fuel tanks. Because of the motion of the boat, the fuel sloshes and the barrier would be continuously broken. Even small movements in the fuel could cause the balls to rotate and transfer fuel to the vapor space. In addition, the unique geometry of many fuel tanks could cause the balls to collect in one area of the tank.

h. *low permeability fuel tanks*

We estimate that more than a quarter of the evaporative emissions from boats with plastic fuel tanks come from permeation through the walls of the fuel tanks. In highway applications, non-permeable plastic fuel tanks are produced by blow molding a layer of ethylene vinyl alcohol or nylon between two layers of polyethylene. However, blow molding has high fixed costs and therefore requires high production volumes to be cost effective. For this reason, this manufacturing technique is generally only used for portable fuel tanks which are generally produced in higher volumes. For these tanks, however, multi-layer fuel tank construction may be an inexpensive and effective approach to controlling permeation emissions

Manufacturers of rotationally molded plastic fuel tanks generally have low production volumes and have commented that they could not produce their tanks with competitive pricing in any other way. Currently, they use cross-link polyethylene which is a low density material that has relatively high rate of permeation. One material that could be used as a low permeation alternative in the rotational molding process is nylon. The use of nylon in the construction of these fuel tanks would reduce permeation by more than 95 percent when compared to cross-link polyethylene such as is used today.

Another type of barrier technology for fuel tanks would be to treat the surfaces of a plastic fuel tanks with fluorine. The fluorination process causes a chemical reaction where exposed hydrogen atoms are replaced by larger fluorine atoms which a barrier on surface of the fuel tank. In this process, fuel tanks are be stacked in a steel container. The container is then be voided of air and flooded with fluorine gas. By pulling a vacuum in the container, the fluorine gas is forced into every crevice in the fuel tanks. As a result of this process, both the inside and outside surfaces of the fuel tank would be treated. As an alternative, for tanks that are blow molded, the inside surface of the fuel tank can be exposed to fluorine during the blow molding process. A similar barrier strategy is called sulfonation where sulfur trioxide is used to create the barrier by reacting with the exposed polyethylene to form sufonic acid groups on the surface. Either of these processes can be used to reduce gasoline permeation by more than 95 percent. Achieving reductions at this level repeatedly would require tanks with consistent material quality, amount, and composition including pigments and any additive packages. This would enable process and efficiency optimization and consistency in the effectiveness of surface treatment processes.

Over the first month or so of use, polyethylene fuel tanks can expand by as much as three percent due to saturation of the plastic with fuel. Manufacturers have raised the concern that this hydrocarbon expansion could affect the effectiveness of surface treatments like fluorination or sulfonation. We believe that this will not have a significant effect on the effectiveness of these surface treatments. The California Air Resources Board has performed extensive permeation testing on portable fuel containers with and without these surface treatments. Prior to the permeation testing, the tanks were prepared by first performing a durability procedure where the fuel container is cycled a minimum of 1000 times between 5 psi and -1 psi. In addition, the fuel containers are soaked with fuel for a minimum of four weeks prior to testing. Their test data, presented in Chapter 4 of the draft RSD, show that fluorination and sulfonation are still effective after this durability testing.

The U.S. Coast Guard has raised the issue that any process applied to marine fuel tanks to reduce permeation would also need to pass Coast Guard flame resistance requirements. We are not aware of any reason that a fluorination or sulfonation surface treatment would affect the flame resistance of a marine fuel tank. Since this issue was raised, we contracted to have a fluorinated fuel tank tested. This tank passed the U.S. Coast Guard flame resistance test.

Also, about a third of marine fuel tanks used today are made of aluminum. Hydrocarbons do not permeate through aluminum.

We request comment on the low-permeable materials and strategies discussed above, and other options that are available, for use in marine fuel tanks and on their cost and effectiveness.

i. low permeability hoses

We also estimate that permeation through fuel and vapor hoses make up more 40 percent of the evaporative emissions from boats. This fraction is higher for boats using aluminum fuel tanks, because they are inherently low in tank permeation emissions. By replacing rubber hoses with low permeability hoses, evaporative emissions through the fuel supply and vent hoses can be reduced by more than 95 percent.

Marine fuel hoses are designated as either Type A or B and either Class 1 or 2.[30] Type A hose passes the U.S. Coast Guard fire test while Type B represents hose that has not passed this test. Class 1 hose is intended for fuel feed lines where the hose is normally in contact with fuel and has a permeation limit of 100 g/m^2/day at 23 C. Class 2 hose is intended for vent lines and fuel fill necks where fuel is not continuously in contact with the hose and has a permeation limit of 300 g/m^2/day at 23 C. In general practice, most boat builders use Class 1 hose for vent lines as well as fuel lines to prevent having to carry two hose types. However, most fuel fill necks, which have a much larger diameter and are constructed differently, are Class 2 hose. Marine hose with permeation rates of less than one tenth of the Class 1 permeation limit is also used by some boat builders today for fuel and vent lines. Given sufficient lead time, we believe that hose manufacturers can modify their designs to use thicker barriers or lower permeating materials to further reduce the permeation rates from this hose.

[30] Society of Automotive Engineers Surface Vehicle Standard, "Marine Fuel Hoses," SAE J 1527 (Docket A-2000-01; document IV-A-19).

Low permeability fuel supply and vent hoses produced today are generally constructed in one of two ways: either with a low permeability layer or by using a low permeability rubber blend. One hose design, already used in some marine applications, uses a thermoplastic layer between two rubber layers to control permeation. This thermoplastic barrier may either be nylon or ethyl vinyl acetate. In automotive applications, other barrier materials are used such as fluoroelastomers and fluoroplastics such as Teflon®. An added benefit of low permeability lines is that some fluoropolymers can be made to conduct electricity and therefore can prevent the buildup of static charges. Currently, fuel fill necks used in marine applications generally are not made with barrier layers and permeate more than fuel supply lines. However, hoses are produced for chemical applications by the same companies, using the same process, that include barrier layers. This same production methodology could be used for marine fuel hoses. Also, EPA also expects low permeability fill neck hoses to be used in automotive applications in the 2004 as a result of the Tier 2 motor vehicle evaporative emission standards.

An alternative approach to reducing the permeability of marine hoses would be fluorination. This process would be performed in a manner similar to discussed above for fuel tanks.

Fuel lines used to meet the proposed standards would also have to meet Coast Guard specifications in 33 CFR 183 which include a flame resistance test. Although the automotive standard, SAE J 2260, does not specifically include a flame resistance test like that included in the Coast Guard specifications, manufacturers generally design (and test) their hoses to be flame resistant.

4. Summary

EPA believes that the proposed standards for evaporative emissions from boats using spark-ignition marine engines reasonably reflect what manufacturers can achieve through the application of available technology. Marine fuel tank manufacturers and boat builders will need to use the five years of lead time to select, design, and produce evaporative emission-control strategies that will work best for their product line. We expect that meeting these requirements will pose a challenge, but one that is feasible taking into consideration the availability and cost of technology, lead time, noise, energy, and safety. The role of these factors is presented in detail in Chapters 3 and 4 of the draft RSD.

We believe there are several options that can be used to reduce diurnal emissions from marine fuel tanks. This, coupled with the proposed emission-credit program for diurnal emissions, gives manufacturers flexibility in how they choose to comply with the proposed standards. We believe the most likely approach meeting the proposed emission diurnal standard will be for manufacturers to use a closed vent with a 1 psi pressure relief valve. Although we evaluated several technologies that have the potential to achieve larger emission reductions, we believe that more stringent standards are not appropriate at this time. This industry is primarily made up of small manufacturers and would likely need more time to develop technology options for further emission control. In addition, there are a wide range of fuel tank designs and applications in the recreational marine market, and the technologies discussed above may not be appropriate for all applications. Given these issues, and U.S. Coast Guard requirements, we believe that the flexibility given in the proposed diurnal requirements is appropriate.

The proposed permeation standards are based on the effective application of low permeable materials or surface treatments. This is essentially a step change in technology; therefore, we believe that even if we were to propose a less stringent permeation standard, these technology options would likely still be used. In addition, this technology is relatively inexpensive and can achieve meaningful emission reductions. The proposed standards are expected to achieve a 95 percent reduction in permeation emissions from marine fuel tanks and hoses. We believe that more stringent standards could result in significantly more expensive materials without large additional emission reduction. We request comment on our proposed permeation emission standards.

IV. Sterndrive and Inboard Marine Engines

This section describes our current thinking regarding exhaust emissions from sterndrive and inboard marine engines (SD/I). We are not proposing SD/I exhaust emission standards at this time. We are investigating whether the application of catalysts on marine engines could be a cost-effective way to control emissions. We believe, that setting catalyst-forcing standards now would be premature, given the open issues related to catalyst use in the marine environment. However, we are continuing our efforts to develop and demonstrate catalytic control on SD/I marine engines in the laboratory and in-use, and will place new information in the docket when it is available. In fact, we intend to follow with another rulemaking in the future that will address exhaust emissions from SD/I engines once we have collected more information. We intend to include outboards and personal watercraft in this rulemaking as well.

There are three primary approaches that we believe could be used to reduce exhaust emissions from sterndrive and inboard marine engines. The first is through lower emission calibration of the engine, especially through the use of electronic fuel injection. This could be implemented quickly, but would only result in small emission reductions. The second approach would be through the use of exhaust gas recirculation (EGR) which could be used to get a 40 to 50-percent reduction in NOx. Although this would be feasible, it would not be nearly as effective at controlling emissions as the third approach of using catalytic control. We believe catalytic control could be used to achieve much larger emission reductions than either of the first two approaches; therefore, we intend to implement catalyst-based standards as soon as we believe it is feasible. We believe we can implement these stringent standards sooner if we do not set an interim standard based on EGR. Manufacturers have raised concerns that if they were to focus on designing for an EGR-based standard, it would divert resources needed for catalyst development.

We are in the process of resolving technical issues with the use of catalysts in a marine environment. Ongoing testing has shown promising results; we believe that, in the near future, continued efforts will resolve the remaining issues raised by the marine industry and by Coast Guard. One issue is that operation in the marine environment could result in unique durability problems for catalysts. Another issue to be addressed in developing this technology is ensuring that salt water does not reach the catalyst so that salt does not accumulate on the catalyst and reduce its efficiency. A third issue is addressing any potential safety concerns.

As discussed in Section I.F, California ARB has recently put into place HC+NOx exhaust emission standards for SD/I marine engines. These standards include a cap on baseline emission levels in 2003 followed by catalyst-forcing standards (5 g/kW-hr HC+NOx) phased in from 2007 through 2009. These standards are contingent on technology reviews in 2003 and 2005. ARB and industry have agreed on a catalyst development program for marine engines over the next several years. We will participate in and monitor catalyst development efforts for marine engines over the next few years.

Since the ANPRM, we have collected laboratory emission data on a SD/I marine engine through a joint effort with ARB, engine marinizers, and Southwest Research Institute.[31] We collected baseline emission data as well as emission data from closed-loop control, exhaust gas recirculation, and several catalyst concepts. This work included catalyst packaging strategies designed to prevent water reversion to the catalyst. With the combination of closed-loop electronic control and EGR, we saw a reduction of 22 percent HC+NOx and 39 percent CO from baseline. A catalyst was placed in a stock riser extension which resulted in a 74-percent reduction in HC+NOx and 46-percent reduction in CO from baseline. Other catalyst configurations were also tested with varying emissions

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[31] Carroll, J., White, J., "Marine Gasoline Engine Testing," Prepared by Southwest Research Institute for the Environmental Protection Agency and the California Air Resources Board, EPA Contract 68-C-98-169, WA 2-11, September 2001 (Docket A-2000-01; document IV-A-91).

reductions depending on their design.

In the testing discussed above, the 74 percent reduction in HC+NOx was achieved using a two catalysts with a combined volume of less than 1.5 liters on a SD/I engine with a 7.4 liter total engine displacement. SD/I marine engines sold today generally range from 3.0 to 8.1 liters of total cylinder displacement. A smaller engine would need less catalyst volume for the same emissions reduction. Further information on the emission reductions associated with SD/I emission control strategies and associated costs will be included in future rulemaking documents.

As discussed above, we are working with the marine industry, ARB, and Coast Guard on technology assessment of catalytic converters on sterndrive and inboard marine engines. However, we do not believe this technology has been sufficiently demonstrated for us to set national standards based on implementation of catalyst technology at this time. We will also need to consider other factors such as cost and energy impacts in determining appropriate levels of standards.

As we work towards low emission marine engines through catalyst technology for SD/I we also intend to investigate this technology for use on outboards and personal watercraft (OB/PWC). We believe many of the same issues with applying catalysts to SD/I marine engines also apply to OB/PWC marine engines. In addition, the annual emissions contribution of OB/PWC marine is several times larger than the contribution from SD/I marine engines so there is the potential for significant additional reductions from OB/PWC. Therefore, we intend to look into the feasibility and cost effectiveness of applying catalytic control to outboards and personal watercraft as well.

Manufacturers have argued that the development effort required for EGR may detract resources from catalyst development. We are sensitive to this issue and are not proposing EGR-based standards at this time as it could ultimately slow industry's ability to meet catalyst-based standards. Clearly, the greatest potential for emission reductions is through the use of catalysts and we wish to implement standards as soon as feasible. However, if it were to become apparent that catalysts would not be feasible for SI marine engines in the time frame of the California ARB technology reviews, we would contemplate proposal of a standard based on EGR. EGR has been used in automotive applications for decades and we believe there are no significant technical hurdles for applying this inexpensive technology to marine engines. Although current marine engines do not generally have a port for exhaust gas recirculation, the electronic fuel injection systems are capable of controlling an EGR valve and control feedback loop. Given enough lead time, we believe manufacturers could apply this technology effectively on SI marine engines.

We request comment on the feasibility of applying electronic fuel injection, exhaust gas recirculation, catalysts, or other technology that could be used to reduce emissions from SI marine engines. We also request comment on the costs and corresponding potential emission reductions from using these technologies, as well as any potential effects on engine performance, safety, and durability.

V. Highway Motorcycles

We are proposing revised exhaust emission standards for highway motorcycles. This section includes background material, a description of the proposed standards and other important provisions, and a discussion of the technological feasibility of the proposed standards.

A. Overview

In general, we are proposing to harmonize the federal exhaust emission standards for all classes of motorcycles with those of the California program, but on a delayed schedule relative to implementation in California. For Class I and Class II motorcycles, this would mean meeting exhaust emission standards that apply today in California. For Class III motorcycles, this would mean meeting the two tiers of exhaust emission standards that California ARB has put in place for future model years. The existing federal CO standard of 12.0 g/km would remain unchanged. The process by which manufacturers certify their motorcycles, the test procedures, the driving cycle, and other elements of the federal program would also remain unchanged. We are also proposing standards for the currently unregulated category of motorcycles with engines of less than 50cc displacement.

1. What are highway motorcycles and who makes them?

Motorcycles come in a variety of two- and three-wheeled configurations and styles. For the most part, however, they are two-wheeled, self-powered vehicles. EPA regulations currently define a motorcycle as "any motor vehicle with a headlight, taillight, and stoplight and having: two wheels, or three wheels and a curb mass less than or equal to 793 kilograms (1749 pounds)" (See 40 CFR 86.402-98). Both EPA and California regulations sub-divide highway motorcycles into classes based on engine displacement. Table V.A-1 below shows how these classes are defined.

Table V.A-1
Motorcycle Classes

Motorcycle Class	Engine Displacement (cubic centimeters)
Class I	50* - 169
Class II	170 - 279
Class III	280 and greater

* This proposal would extend Class I to include <50cc.

It is important to note that this definition excludes off-highway motorcycles from the regulatory definition of motorcycle. This is because the term "motor vehicle," as used in the Act, applies only to vehicles "designed for transporting persons or property on a street or highway" (CAA section 216). In addition, EPA has promulgated regulations, in 40 CFR 85.1703, that elaborate on the Act's definition of motor vehicles and set forth three criteria, which, if any one is met, would cause a vehicle not to be considered a motor vehicle under the regulations, and therefore not subject to requirements applicable to motor vehicles. These criteria are:

(1) The vehicle cannot exceed a maximum speed of 25 miles per hour over a level paved surface; or

(2) The vehicle lacks features customarily associated with safe and practical street or highway use, including such things as a reverse gear (except motorcycles), a differential, or safety features required by state and/or federal law; or

(3) The vehicle exhibits features which render its use on a street or highway unsafe, impractical,

or highly unlikely, including tracked road contact means, an inordinate size, or features ordinarily associated with military combat or tactical vehicles such as armor and/or weaponry.

Thus, vehicles not meeting the criteria noted above are not covered by the proposed emission standard for motorcycles, because they fail to meet the definition of motor vehicle in the Clean Air Act and in 40 CFR 85.1703. Vehicles that are not considered to be a motor vehicle under these statutory and regulatory provisions are generally considered under the Clean Air Act to be nonroad vehicles. In an earlier proposal, we discussed proposed emission standards for nonroad recreational vehicles, a category which includes off-highway motorcycles (66 FR 51098, October 5, 2001). Also falling into the nonroad definition category are the mopeds and scooters that do not meet the definition of "motor vehicle," i.e., the smaller cousins of the mopeds and scooters that are currently considered highway motorcycles and certified as Class I motorcycles. In other words, if a moped or scooter or similar "motorbike" cannot exceed 25 miles per hour, it is not considered a motor vehicle, but it is instead categorized as a nonroad recreational vehicle and would be subject to the emission standards recently proposed for off-highway motorcycles.

Furthermore, vehicles that otherwise meet the motorcycle definition (i.e., are highway motorcycles as opposed to off-highway motorcycles) but have engine displacements less than 50 cubic centimeters (cc) (generally, youth motorcycles, most mopeds, and some motor scooters) are currently not required to meet EPA standards. Also currently excluded are motorcycles which, "with an 80 kg (176 lb) driver, ... cannot: (1) Start from a dead stop using only the engine; or (2) Exceed a maximum speed of 40 km/h (25 mph) on level paved surfaces" (e.g., some mopeds). Most scooters and mopeds have very small engine displacements and are typically used as short-distance commuting vehicles. Motorcycles with larger engine displacement are more typically used for recreation (racing or touring) and may travel long distances.

The currently regulated highway category includes motorcycles termed "dual-use" or "dual-sport," meaning that their designs incorporate features that enable them to be competent for both street and nonroad use. Dual-sport motorcycles generally can be described as street-legal dirt bikes, since they often bear a closer resemblance in terms of design features and engines to true off-highway motorcycles than to highway cruisers, touring, or sport bikes. These dual-sport motorcycles tend to fall in Class I or Class II.

The larger displacement Class III motorcycles are by far the most common motorcycles in the current U.S. market. Of the 175 engine 2002 families certified as of January 2002 by manufacturers for sale in the U.S., 151 fall in the Class III category, representing more than 93 percent of projected sales. Most of these are quite far from the bottom limit of Class III motorcycles (280cc); more than three-quarters of projected 2002 highway motorcycle sales are above 700cc, with engine displacements exceeding 1000cc for the most powerful "superbikes," large cruisers, and touring bikes. The average displacement of all certified engine families is about 980cc, and the average displacement of certified Class III engine families is above 1100cc. The sales-weighted average displacement of 2002 highway motorcycles is about 1100cc. Class I and Class II motorcycles, which together make up less than seven percent of projected 2002 sales and only 24 out of 175 certified 2002 engine families, consist mostly of dual-sport bikes, scooters, and entry-level sportbikes and cruisers.

According to the Motorcycle Industry Council, in 1998 there were about 5.4 million highway motorcycles in use in the United States (565,000 of these were dual-sport). Total sales in 1999 of highway motorcycles was estimated to be about 387,000, or about 69 percent of motorcycle sales. About 15,000 of these were dual-sport motorcycles.[32] Recent figures for the 2000 calendar year show that retail sales approached 438,000 highway

[32] "2000 Motorcycle Statistical Annual", Motorcycle Industry Council (Docket A-2000-01; document II-D-192).

motorcycles, about 19,000 of which were dual-sport bikes.[33]

Six companies account for about 95 percent of all motorcycles sold (Honda, Harley Davidson, Yamaha, Kawasaki, Suzuki, and BMW). All of these companies except Harley-Davidson and BMW also manufacture off-highway motorcycles and ATVs for the U.S. market. Harley-Davidson is the only company of these six that is manufacturing highway motorcycles in the U.S. for the domestic market. Dozens of other companies make up the remaining five percent. Many of these are small U.S. companies manufacturing anywhere from a few dozen to a few thousand motorcycles, although importers and U.S. affiliates of larger international companies also contribute to the remaining five percent. See the draft Regulatory Support Document for more information regarding the makeup of the industry.

As of the 2002 model year, all highway motorcycles with engines greater than 50cc displacement are powered by four-stroke engines. (Prior to the 2002 model year, Kawasaki was certifying a 100cc two-stroke dual-sport motorcycle to the federal emission standards.) In the scooter and moped segment with engines under 50cc displacement, two-stroke engines have traditionally outnumbered four-strokes, although that appears to be changing. In particular, Honda is now marketing a 2002 49cc four-stroke scooter. Of the several dozen manufacturers in the under 50cc market, about a third are offering four-stroke engines. Therefore, as of the 2002 model year, it appears that about one third of the sales of scooters and mopeds under 50cc are powered by four-stroke engines.

2. What is the history of emission regulations for highway motorcycles?

Emissions from highway motorcycles have been regulated for more than 20 years. While the federal requirements have remained unchanged since the initial standards were adopted more than 20 years ago, regulations in California, Europe, and many nations around the world have been periodically updated to reflect the availability of technology and the need for additional emission reductions.

a. EPA regulations

In 1977 EPA issued a Final Rule (42 FR 1126, Jan. 5, 1977), which established interim exhaust emission standards effective for the 1978 and 1979 model years and ultimate standards effective starting with the 1980 model year. The interim standards ranged from 5.0 to 14.0 g/km HC depending on engine displacement, while the CO standard of 17.0 g/km applied to all motorcycles. The standards and requirements effective for 1980 and later model year motorcycles, which do not include NOx emission standards, remain in effect today. While the final standards did not differ based on engine displacement, the useful life over which these standards must be met ranged from 12,000 km (7,456 miles) for Class I motorcycles to 30,000 km (18,641 miles) for Class III motorcycles. Crankcase emissions from motorcycles have also been prohibited since 1980. There are no current federal standards for evaporative emissions from motorcycles. The current federal standards are shown in Table V.A-2.

[33] DealerNews, volume 37, no. 2, February 2001 (Docket A-2000-01; document II-D-190).

Table V.A-2
Current Federal Exhaust Emission Standards for Motorcycles

Engine Size	HC (g/km)	CO (g/km)
All	5.0	12.0

b. California ARB regulations

Motorcycle exhaust emission standards in California were originally identical to the federal standards that applied to 1978 through 1981 model year motorcycles. The definitions of motorcycle classes used by California ARB continue to be identical to the federal definitions. However, California ARB has revised its standards several times in bringing them to their current levels (see Table V.A-3). In the 1982 model year the standards were modified to tighten the HC standard from 5.0 g/km to 1.0 or 1.4 g/km, depending on engine displacement. California adopted an evaporative emission standard of 2.0 g/test for all three motorcycle classes for 1983 and later model year motorcycles. California later amended the regulations for 1988 and later model year motorcycles to further lower emissions and to make the compliance program more flexible for manufacturers. The 1988 and later standards could be met on a corporate-average basis, and the Class III bikes were split into two separate categories: 280 cc to 699 cc and 700 cc and greater. These are the standards that apply in California now. Like the federal standards, there are currently no limits on NOx emissions for highway motorcycles in California. Under the corporate-average scheme, no individual engine family is allowed to exceed a cap of 2.5 g/km HC. Like the federal program, California also prohibits crankcase emissions.

Table V.A-3
Current California Highway
Motorcycle Exhaust Emission Standards

Engine Size (cc)	HC (g/km)	CO (g/km)
50 - 279	1.0	12.0
280 - 699	1.0	12.0
700 and above	1.4	12.0

In November 1999, California ARB adopted new exhaust emission standards for Class III motorcycles that would take effect in two phases Tier 1 standards starting with the 2004 model year, followed by Tier 2 standards starting with the 2008 model year (see Table V.A-4). Existing California standards for Class I and Class II motorcycles, which have been in place since 1982, remain unchanged, as does their evaporative emissions standard. As with the current standards in California, manufacturers will be able to meet the requirements on a corporate-average basis. Perhaps most significantly, California ARB's Tier 1 and Tier 2 standards control NOx emissions for the first time by establishing a combined HC+NOx standard. California ARB made no changes to the CO emission standard, which remains at 12.0 g/km, equivalent to the existing federal standard. In addition, California ARB is providing an incentive program to encourage the introduction of Tier 2 motorcycles before the 2008 model year. This incentive program allows the accumulation of emission credits that manufacturers can use to meet the 2008 standards. Like the federal program, these standards will also apply to dual-sport motorcycles.

Table V.A-4
Tier 1 and Tier 2 California Class III
Highway Motorcycle Exhaust Emission Standards

Model Year	Engine Displacement	HC + NOx (g/km)	CO (g/km)
2004 through 2007 (Tier 1)	280 cc and greater	1.4	12.0
2008 and subsequent (Tier 2)	280 cc and greater	0.8	12.0

California ARB also adopted a new definition of small-volume manufacturer that will take effect with the 2008 model year. Currently and through the 2003 model year, all manufacturers must meet the standards, regardless of production volume. Small-volume manufacturers, defined in California ARB's recent action as a manufacturer with California sales of combined Class I, Class II, and Class III motorcycles not greater than 300 units annually, do not have to meet the new standards until the 2008 model year, at which point the Tier 1 standard applies. California ARB intends to evaluate whether the Tier 2 standard should be applied to small-volume manufacturers in the future.[34]

c. International regulations

The European Commission (EC) recently finalized a new phase of motorcycle standards, which will start in 2003, and the EC intends a second phase to start in 2006. Whereas the current European standards make a distinction between two-stroke and four-stroke engines, the proposed standards would apply to all motorcycles regardless of engine type. The 2003 standards would require emissions to be below the values shown in Table V.A-5, as measured over the European ECE-40 test cycle.[35] The standards considered for 2006 are still in a draft form and have not yet been officially proposed, but the expectation is that they will be considerably more stringent. In addition to taking another step in reducing motorcycle emissions, the 2006 standards may incorporate an improved motorcycle test cycle, as noted below. The standards in the following table apply to motorcycles of less than 50cc (e.g., scooters and mopeds) only if the motorcycle can exceed 45 kilometers per hour (28 miles per hour). Starting in 2002 motorcycles of less than 50cc that cannot exceed 45 kilometers per hour (28 miles per hour) are subject to a new HC+NOx standard of 1.2 grams per kilometer and a CO standard of 1.0 gram per kilometer.

[34] California ARB, October 23, 1998 "Proposed Amendments to the California On-Road Motorcycle Regulation" Staff Report: Initial Statement of Reasons (Docket A-2000-01; document II-D-12).

[35] The ECE-40 cycle is used by several countries around the world for motorcycle emission testing. It has its origins in passenger car driving, being derived from the European ECE-15 passenger car cycle. The speed-time trace is simply a combination of straight lines, resulting in a "modal" cycle, rather than the transient nature of the U.S. Federal Test Procedure (FTP).

Table V.A-5
European Commission 2003
Motorcycle Exhaust Emission Standards

HC (g/km)	CO (g/km)	NOx (g/km)
1.2	5.5	0.3

Many other nations around the world, particularly in South Asia where two-stroke mostly small displacement motorcycles can be a majority of the vehicle population, have also recently improved their emission standards or are headed that way in the next several years. For example, Taiwan has adopted an HC+NOx standard of 1.0 gram per kilometer for all two-strokes starting in 2003 (as tested on the European ECE-40 test cycle). (Four-stroke motorcycle engines will have to meet at standard of 2.0 grams per kilometer.) India has proposed a standard for all motorcycles of 1.3 grams per kilometer HC+NOx in 2003 and 1.0 grams per kilometer HC+NOx in 2005 (as tested on the Indian Drive Cycle, or IDC).[36] China has adopted the European standards described above, implementing them in 2004, a year later than Europe.

d. *Test cycle*

In the ANPRM we requested comment on the adequacy of the current test cycle (the Federal Test Procedure, or FTP) for representing the highway motorcycle operation. We suggested that the existing US06 test cycle (more aggressive accelerations and higher speeds than the FTP) or another more representative test cycle might be appropriate for highway motorcycles. In addition, we noted the effort underway under the auspices of the United Nations/Economic Commission for Europe (UN/ECE) to develop a global harmonized world motorcycle test cycle (WMTC), and requested comment on adopting such a test cycle. The objective of the WMTC project is to develop a scientifically supported test cycle that accurately represents the in-use driving characteristics of highway motorcycles. The advantages of such a test cycle are numerous. First, the industry could have a single test cycle to meet emission standards in many countries (the process recognizes that nations will have differing emission standards due the varying air-pollution concerns). Second, the test cycle could potentially be better than the existing FTP in that it intends to better represent how a wide range of riders drive their motorcycles.

Similar comments were submitted on this issue by the Motorcycle Industry Council (MIC) and by Harley-Davidson Motor Company. In general MIC and Harley-Davidson stated that while pursuing a global emissions test procedure for motorcycles makes good business sense, the timing of the ongoing international process is not consistent with the current EPA rulemaking to establish new motorcycle standards.

At this time we are not proposing any modifications to the highway motorcycle test cycle. We continue to be involved in the WMTC process and are hopeful that a test cycle meeting the stated objectives can be agreed on by the international participants. Although a draft test cycle has been developed, several issues remain unresolved and it will likely be a couple of years before a new cycle can be issued as a global technical regulation under the process established by a 1998 international agreement. Under that process, if a test cycle is brought to a vote and the United States votes in the affirmative, we will then be committed to initiating a rulemaking that may lead to a proposal to adopt the new test cycle. We request comment on the best way to transition to a new global test cycle in the future, should that time come. Among the many options we could consider are: an immediate transition; a phasing in of the new cycle and a phasing out of the FTP; or a phasing in of the new cycle while maintaining the FTP as an option for a specified number of years.

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[36] The IDC, although not a transient cycle like the FTP, appears to be the only cycle currently in use that is based on actual measurements of motorcycles in use.

e. Consumer modifications

Many motorcycle owners personalize their motorcycles in a variety of ways. This is one of the aspects of motorcycle ownership that is appealing to a large number of motorcycle owners, and they take their freedom to customize their bikes very seriously. However, there are some forms of customization that are not legal under the provisions of Clean Air Act section 203(a), which states that it is illegal:

> "for any person to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title ... after such sale and delivery to the ultimate purchaser..."

In other words, under current law, owners of motor vehicles[37] cannot legally make modifications that cause the emissions to exceed the applicable emissions standards, and they cannot remove or disable emission-control devices installed by the manufacturer.[38]

We use the term "tampering" to refer specifically to actions that are illegal under Clean Air Act section 203; the term, and the prohibition, do not apply generally to the wide range of actions that a motorcycle enthusiast can take to personalize his or her motorcycle, but only to actions that remove or disable emission control devices or cause the emissions to exceed the standards. We know, from anecdotal reports and from some data collected from in-use motorcycles, that a portion of the motorcycle riding population has removed, replaced, or modified the original equipment on their motorcycles. This customization can include changes that can be detrimental (or, in some cases, possibly beneficial) to the motorcycle's emission levels. The ANPRM sought comments and data that could better help us understand the nature of the issue, such that our proposal could be made with the best understanding possible of current consumer practices. We did not intend to suggest that we would be revising the existing tampering restrictions to prohibit many of the things that motorcycle owners are now doing legally.

The proposed emissions standards, if adopted by EPA, would not change this "tampering" prohibition, which has been in place for more than 20 years. Owners would still be free generally to customize their motorcycles in any way, as long as they do not disable emission controls or cause the motorcycle to exceed the emission standards. They would also be free, as they are now, to perform routine maintenance on their motorcycles to restore or maintain the motorcycle engine and related components in their original condition and configuration.

This proposal would increase the number of motorcycle models employing emission reduction technologies such as sequential fuel injection, pulse air injection, and catalytic converters. We request comment on the impact, if any, that these technologies could have on the difficulty and/or cost of routine maintenance or other legal modifications performed by or for the consumer. As discussed below and in the draft RSD, we do not anticipate detrimental impacts to the performance ch aracteristics of motorcycles that will meet the proposed emission standards. We request comment and supporting data on potential performance impacts (positive and negative) of these technologies.

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[37] A motorcycle is a "motor vehicle" as defined under section 216 of the Clean Air Act, which states that "[t]he term 'motor vehicle' means any self-propelled vehicle designed for transporting persons or property on a street or highway."

[38] See Mobile Source Enforcement Memorandum No. 1A, Interim Tampering Enforcement Policy, Office of Enforcement and General Council, June 25, 1974 (Docket A-2000-01; document IV-A-27). (http://www.epa.gov/oeca/ore/aed/comp/hcomp.html)

B. Motorcycles Covered by This Proposal

Highway, or "street-legal," motorcycles are covered by the proposal described in this section. EPA regulations currently define a "motorcycle" as "any motor vehicle with a headlight, taillight, and stoplight and having: two wheels, or three wheels and a curb mass less than or equal to 793 kilograms (1749 pounds)." (See 40 CFR 86.402-98). This definition would continue to apply; therefore, the term "motorcycle" would continue to refer only to highway motorcycles. In addition, these "motorcycles" that are currently subject to emissions standards would be subject to the proposed standards. However, we are also proposing to modify the regulations to include some motorcycles that are currently excluded from the emission regulations, as described below.

EPA regulations currently exclude motorcycles (i.e., motor vehicles that meet the definition of "motorcycle" stated above) from the emission standards requirements based on several criteria laid out in 40 CFR 86.401-97. First, motorcycles are excluded if they have an engine displacement of less than 50cc. Second, a motorcycle is excluded if, with an 80 kg (176 lb) driver, it cannot start from a dead stop using only the engine or exceed 40 kph (25 mph) on a level paved surface. These provisions have the effect of excluding many mopeds, youth motorcycles, and some scooters from having to comply with any emission standards requirements. As discussed above, motorcycle-like vehicles that cannot exceed 25 miles per hour are not considered motor vehicles, and thus would be regulated under the nonroad recreational vehicle standards proposed earlier this year (66 FR 51098, October 5, 2001).

Highway motorcycles with engine displacements less than 50cc are generally most mopeds, as well as some motor scooters ("scooters," or sometimes, "motorbikes"). Many of these vehicles are powered by 49cc two-stroke engines, although four-stroke engines are becoming more popular. Honda, for example, will no longer be marketing any two-stroke street-use motorcycles as of the 2003 model year; everything, including their 49cc scooter, will be powered by a four-stroke engine. We are proposing to revise two aspects of the regulations such that we would require most of these currently excluded vehicles to meet emission standards in the future. First, the general exclusion for motorcycles under 50cc would be changed such that no motorcycles would be excluded from the emission standards on the basis of engine displacement alone. Second, the definition of Class I motorcycles would be revised to accommodate motorcycles under 50cc (i.e., a Class I motorcycle would be defined as a motorcycle with an engine displacement of less than 170cc). The standards that would apply to these vehicles are described in the following section. It is important to note that the motorcycle-like vehicles under 50cc that cannot be defined as a motor vehicle (e.g., one that can't exceed 25 mph), continue to be excluded from these standards; they would, however, be covered by the recently proposed standards for nonroad recreational vehicles (66 FR 51098, October 5, 2001). We request comment on our proposed regulation of this previously unregulated category of motorcycle.

The cost per ton of controlling emissions from motorcycles with less than 50cc displacement engines is higher than for the proposed standards for larger motorcycles. However, the scooters and mopeds are very likely to be operated exclusively within populated urban areas. Scooters and mopeds, by virtue of their limited speeds, are not appropriate for use on highways; these small two-wheelers are often purchased for limited commuting within large urban areas or college campuses. Thus, it is likely that the air quality benefits of controlling emissions from these engines would be greater than indicated by the cost per ton comparison alone. We request comments on the merits of applying standards to these vehicles.

Parties have raised concerns regarding the potential for losses in environmental benefits from the highway use of off-highway motorcycles. Because the standards are different today (off-highway motorcycles do not currently have emissions standards) and would be somewhat different under our proposed standards, emissions reductions potentially could be lost if consumers purchased off-highway motorcycles for highway use on a widespread basis. State requirements vary considerably and in some states it may be difficult to meet requirements by modifying an off-highway motorcycle, while in others it may require only a few minor modifications. We request comment on current practices and the potential for this to occur in the future. We also request comment on steps we could reasonably take to address air pollution concerns associated with highway use of off-highway motorcycles.

C . Proposed Standards

1. What are the proposed standards and compliance dates?

In general, we are proposing to harmonize the federal exhaust emission standards for all classes of motorcycles with those of the California program, but on a delayed schedule relative to implementation in California. (The exception would be motorcycles with engines of less than 50cc displacement, which are not currently regulated by California, for which we are also proposing standards.) For Class I and Class II motorcycles as currently defined, this would mean meeting exhaust emission standards that apply now in California (and have applied since 1982). For Class III motorcycles, this would mean meeting the two tiers of exhaust emission standards that California ARB has put in place for future model years. The existing federal CO standard of 12.0 g/km would remain unchanged. The process by which manufacturers certify their motorcycles, the test procedures, the driving cycle, and other elements of the federal program would remain unchanged.

In the development of this proposal following the publication of the ANPRM we considered several regulatory alternatives. These included: no revision to the standards, harmonization with one of the "tiers" of California standards (current, 2004 Tier-1, 2008 Tier-2), more stringent standards than those in place in California, or possibly different implementation timing. We also considered various alternatives designed to reduce the burden on small manufacturers (these are presented in section VII.B on the Regulatory Flexibility Act).

After considering comments on the ANPRM, we believe that the standards should be revised. The existing federal standards were established more than twenty years ago, and it is clear that emission control technology has advanced a great deal in that time. California has continued to revise their standards to maintain some contact with current technology, and manufacturers have generally (but not uniformly) responded by producing motorcycles for sale nationwide that meet the more stringent California standards. Thus, in large part the existing federal standards has been superseded because of the preponderance of manufacturers that have responded in this way. Those arguing against new emission standards often cite the fact that motorcycles are typically far cleaner than the existing federal standards require. Although we agree, we see this fact as a reason for improving emission standards and as evidence that the current federal standards are out of touch with the reality of today's technology.

We believe it is most appropriate at this time to propose harmonizing with the California exhaust emission standards, as opposed to other options discussed in the ANPRM. For example, the dissimilarities between on- and off-highway motorcycles do not encourage a one-size-fits-all approach for all motorcycles (this opinion is supported by a significant number of those who commented on the ANPRM). Off-highway motorcycles are powered predominantly by two-stroke engines, whereas highway motorcycles are all powered by four-stroke engines as of the 2002 model year. On- and off-highway motorcycle engines also lie at vastly different ends of the size spectrum. The average highway motorcycle sold today has a displacement of nearly 1000cc, whereas almost 90 percent of off-highway motorcycle engines have an engine displacement of less than 350cc. In addition, on- and off-highway motorcycles are used in very different ways; finding a set of standards and a test procedure that adequately represents the typical range of operation for both types would therefore be extremely challenging. On-highway motorcycle manufacturers have commented that, to the extent the standards are revised, harmonization with California, rather than a distinctly different set of standards, is preferable because it eliminates the possibility of needing two distinct product lines for California and Federal regulations.[39]

Delaying implementation of the California standards on a nationwide basis by two years would provide an opportunity for manufacturers to gain some experience with the technology needed to meet the new standards. Two years provides time for technology optimization and cost reduction. Providing a longer delay could potentially provide the option of a further decrease in the level of the emission standards, given that the technological feasibility of the California standards has been adequately demonstrated (at least one manufacturer is already selling a motorcycle meeting the 2008 California standards). However, this would be a tradeoff against a more timely introduction of the new standards.

We also evaluated whether the federal motorcycle program should incorporate averaging provisions, as the California program does. Given the desire of most manufacturers to manufacture a motorcycle for nationwide sale, such a program without averaging would not be desirable because it would not provide the flexibility needed to meet the California and federal requirements together and could have at least potentially led to a somewhat less stringent Federal standard. Therefore, we are proposing to provide an averaging program comparable to California's.

EPA uses the term "useful life" to describe the period (usually years and/or miles) over which the manufacturer must demonstrate the effectiveness of the emission control system. For example, the "useful life" of current passenger cars is 10 years or 100,000 miles, whichever first occurs. It does not mean that a vehicle is no longer useful or that the vehicle must be scrapped or turned in once these limits are reached. The term has no effect on the owners' ability to ride their motorcycles for as long as they want. In the ANPRM we requested comment on whether the current definitions of useful life for the three motorcycle classes remains appropriate, given that these definitions were established more than 20 years ago. For example, we question whether, given that the average distance traveled per year for highway motorcycles is around 4,200 km (2,600 miles), the useful life for Class III motorcycles of 30,000 km (18,680 miles) is really appropriate. A typical motorcycle would reach the useful life mileage in about seven years at that rate. Based on data received from an industry trade group, we estimated an average operating life of 12.5 years for on-highway motorcycles. We request comment on extending the useful life by up to 10,000 km (6,200 miles) to reflect a value more consistent with actual use.

a. Class I and Class II motorcycles

We are proposing that Class I and Class II motorcycles would have to meet the current California ARB exhaust emission standards on a nationwide basis starting with the 2006 model year. These standards, which have been in place in California since 1982, are 1.0 g/km HC and 12.0 g/km CO, as measured on the existing Federal Test Procedure (FTP) for motorcycles.

In addition to applying to motorcycles currently in Class I and Class II (i.e., those over 50cc), we are also proposing that these standards apply to those motorcycles encompassed by the proposed revised Class I definition, which would include the previously-excluded engines under 50cc, as described above. As discussed in further detail below, we are considering ways of including Class I and Class II motorcycles in the overall emissions averaging program, and request comment on this issue.

Class I motorcycles as currently defined are currently tested on a version of the Federal Test Procedure (FTP) that has lower top speeds and reduced acceleration rates relative to the FTP that is used for Class II and III motorcycles. The Class I FTP has a top speed of just under 60 km/hr, or around 37 mph, whereas the Class II/III

[39] See comments on the ANPRM from Harley-Davidson and the Motorcycle Industry Council, available in the public docket for review (Docket A-2000-01; document II-D-48).

FTP has a top speed of just over 90 km/hr, or just above 55 mph. By proposing to define motorcycles with engine displacements of less than 50cc as Class I motorcycles, these "new" Class I motorcycles would likewise be tested on the Class I FTP. We believe that this use of this test cycle is feasible and appropriate for the new Class I motorcycles (many are advertised with a top speed in the range of 40-50 mph). We request comment on the feasibility of the proposed test cycle for motorcycles with engine displacements of less than 50cc; in particular, we request comment on whether experience in meeting existing European or Asian requirements provides any insight on this issue. We request comment on alternative test cycles and certification options, including whether the cycle required for low-speed, small-displacement scooters and mopeds in Europe should be used or allowed by EPA.

Despite the fact that virtually all Class I and Class II motorcycles already meet and certify to these standards,[40] we are proposing nationwide implementation in 2006 for two reasons. First, there are those motorcycles under 50cc that require some lead time to meet new standards. Second, any averaging provisions, if finalized, that would provide flexibility in meeting the Class I and Class II standards would not be useful until the 2006 model year, when some exchange of emission credits between the three motorcycle classes may be allowed (see the request for comment on averaging flexibilities for Classes I and II in section C.2 below). Nevertheless, we request comment on the 2006 implementation date, and whether it should be earlier for the current Class I and II motorcycles, given that all 2002 motorcycles in these classes are already certified at emission levels that would meet the proposed standards. For example, we could implement standards for the over 50cc motorcycles in 2004 and for those under 50cc in 2006.

We recognize, as discussed in detail below, that the U.S. is a small market for scooters and mopeds with engine displacements of under 50cc, and that many of the factors that are currently driving technology development are actions by the governments in the major world markets for these types of two-wheelers. A U.S. attempt to drive technology to achieve emission limits more stringent or sooner than those applicable in the largest scooter markets (South Asia, Europe) might result in some manufacturers choosing to withdraw from the U.S. market, rather than develop specific technologies to address U.S. requirements. (This appeared to occur in the mid- to late-1980's when new California standards, combined with fairly active advertising by Honda, drove the European manufacturers from the U.S. market.) For the Class I motorcycles under 50cc, we therefore request comment on the cost and technology that would be associated with standards within a range of 1.0 to 2.0 grams per kilometer HC (or HC+NOx). We believe that, in view of the standards that apply or will soon apply in many of the major scooter markets around the world (see Table V.A-6), that a standard in this range is similar to standards in other countries and would allow the use of similar technologies for U.S. standards. Standards in this range would be intended to allow the U.S. to be more certain that we would receive the same scooters being marketed in the rest of major scooter markets.

[40] Based on analysis of motorcycle emissions certification data.

Table V.A-6
Summary of Current and Future Worldwide Emission Standards
for Motorcycles Less Than 50cc Displacement

Country	HC	CO	NOx	HC+NOx	Test Cycle	Notes
European Union		6.0		3.0	ECE R47	Current ("Euro1")
		1.0		1.2	ECE R47	2002 ("Euro 2")
Switzerland	0.5	0.5	0.1		ECE R47	Current
India		2.0		2.0	India Drive (IDC)	Current
		1.3		1.3	India Drive (IDC)	2003 Proposed
		1.0		1.0	India Drive (IDC)	2005 Proposed
China		6.0		3.0	ECE R47	Current
		1.0		1.2	ECE R47	2005
Japan	5.26	14.4	0.14		ISO 6460	Current 2-stroke
	2.93	20.0	0.51		ISO 6460	Current 4-stroke
Korea	4.0	8.0	0.1		ECE R47	Current
Singapore	5.0	12.0			FTP	Current
Taiwan		3.5	2.0		ECE R47	Current
		7.0		1.0	ECE R47	2003 2-stroke
		7.0		2.0	ECE R47	2003 4-stroke
Thailand	3.0	4.5			ECE R40	Current

b. Class III motorcycles

We are proposing to harmonize the federal Class III motorcycle standards with the exhaust emission standards of the recently finalized California program. Specifically, we propose to adopt the Tier 1 standard of 1.4 g/km HC+NOx starting in the 2006 model year, and the Tier 2 standard of 0.8 g/km starting in the 2010 model year. Because both HC and NOx are ozone precursors, this new standard would better reduce ozone than an HC-only standard. Implementation on a nationwide basis would therefore take place starting two model years after implementation of identical exhaust emission standards in California, ensuring that manufacturers have adequate lead time to plan for these new standards. As described below in further detail, these standards can be met on a corporate-average basis.

As noted earlier, California ARB plans a technology progress review in 2006 to evaluate manufacturers' progress in meeting the Tier 2 standards. We plan to participate in that review and work with California ARB, intending to make any appropriate adjustments to the standards or implementation schedule if warranted. For example, if California ARB determines in the review process that the standards are achievable, but in 2010 rather than 2008, we could follow with a rulemaking that would consider appropriate adjustment to the federal requirements.

2. Could I average, bank, or trade emission credits?

To provide flexibility in meeting the standards, we are proposing to adopt an emission-credit program comparable to the existing California ARB regulations, and requesting comment on some additional flexibility relative to California ARB's program that could be included in our proposed program. There is currently no federal emission-credit program for highway motorcycles. As proposed, the program allows manufacturers to meet the standards on a fleet-average basis (i.e., an averaging program).

Under the emission-credit program, manufacturers would be able to balance the certified HC+NOx emissions of their Class III motorcycles so that the sales-weighted HC+NOx emissions level meets the applicable standard. This means that some engine families may have HC+NOx emissions below the standards, while others have HC+NOx emissions higher than the standards. For enforcement purposes, manufacturers are required to specify a certification limit, or "Family Emission Limit" for each engine family. For example, one of a manufacturer's Class III engine families could be certified at 1.7 g/km HC+NOx; this would be allowable under the California regulations if the sales-weighted average of all the manufacturer's engine families met the applicable 1.4 or 0.8 g/km HC+NOx standard.

As discussed below, EPA is proposing early credits provisions where credits may be banked prior to the beginning of the program. In several other emissions control programs, EPA allows manufacturers to bank credits after the start of the program for future use, or trade them to another manufacturer. In general, EPA has been supportive of these additional flexibilities and sees the potential for added value here as a means to reduce cost and provide additional compliance flexibility as needed.. . California's current program, however, does not contain banking (except for early banking) and trading provisions and manufacturers have not shown an interest in such provisions. Harmonization with California has been the overarching concern. Banking and trading provisions that are out-of-step with the California program may have little use because manufacturers plan on carrying over their California products nationwide. In addition, such provisions complicate the certification and compliance protocols because EPA must set up systems for tracking credits and these systems must be established even if the use of the credit provisions is unlikely.

Because EPA believes banking and trading provisions would complicate the program, EPA is requesting comment on them rather than proposing them. EPA requests comment on an approach where manufacturers would establish HC+NOx family emissions limits (FELs) that are either below the standard, for generating credits, or above the standard, for using credits. These FELs, in effect, become the standard for the individual family. This would be similar in nature to the program for heavy-duty engines (see 40 CFR 86.004-15), but without transient conversion factors. Those commenting in support of credit banking and trading are encouraged to also provide detailed comments on any related provisions which would need to be considered in establishing the program for generating and using credits such as credit life, discounts (if any), cross displacement class trading issues, etc.

To maintain equity, California ARB adopted a cap on Family Emission Limits of 2.5 g/km HC for all individual engine families under the existing emission-credit program (i.e., for Class III motorcycles). Because the 2.5 g/km HC-only standard was in effect in California before the emission-credit program was adopted, the 2.5 g/km cap continues to prevent manufacturers from selling motorcycles with emissions higher than the previous standard. Based on this reasoning, we are proposing a similar cap. However, because the current federal standard is 5.0 g/km, we are proposing an emissions cap on individual engine families of 5.0 g/km HC+NOx. This will provide the added benefit of enabling manufacturers to retain some of the federally certified engine families that might otherwise have had some difficulty meeting the somewhat lower cap specified by California. Manufacturers producing these higher-emitting models would need to offset these emissions with other models certified below the standard.

To provide additional flexibility for manufacturers, we are requesting comment on the possible benefits of incorporating Class I and Class II motorcycles into the averaging program described above. This could be done in various ways. One option would be to define the proposed Class I and Class II HC-only standard of 1.0 g/km as an averaging standard, either within each class or for Class I and Class II combined. However, we believe this option would be of limited use, given the small number of engine families in these motorcycle classes. A second option would be to develop a credit program similar to that in place for the California Low-Emission Vehicle Program. Under this type of program, for example, credits accumulated by Class III motorcycles could be used to offset "debits" accumulated in one or both of the other classes. Credits would be accumulated by having a sales-weighted fleet- average value of the class below the applicable standard, while debits would result from having a class fleet-average value above the standard. A third option would be to allow the certification of Class I and II motorcycles to the Class III "averaging set." In other words, under this option the combined sales-weighted fleet average of Class I, II, and III motorcycles would, at the manufacturer's option, be certified to the Tier 1 and Tier 2 fleet average HC+NOx standards. We request comment on the value of provisions of this nature, and on the advantages and disadvantages of each of these basic approaches. We also request comment on whether there are any adaptations of this averaging program that would improve the flexibility for small volume manufacturers.

To encourage early compliance, we are also proposing incentives in the emission-credit program similar to those in place in California, with timing adjusted due to the differing federal implementation schedule. We believe such incentives will encourage manufacturers to introduce Tier 2 motorcycles nationwide earlier than required by this proposal. In addition, we believe some manufacturers can reduce emissions even further than required by the Tier 2 standard; we would like to encourage the early introduction of these very low-emission vehicles. This proposal would provide incentives for early compliance by assigning specific multiplier factors based on how early a manufacturer produces a Tier 2 motorcycle and a motorcycle certified at 0.4 g/km HC+NOx; these multipliers are shown in Table V.C-1.

Because we expect the Tier 2 technologies to become more widespread as 2010 approaches, the multipliers decrease linearly in value from 2006 until 2010, when the early compliance incentive would no longer have any value (i.e., the multiplier has a value of 1.0) and the program would terminate. As shown in Table V.C-1, each unit of early Tier 2 motorcycles (those certified at 0.8 g/km HC+NOx) would count as Y motorcycles at 0.8 g/km HC+NOx for purposes of corporate averaging in 2010, where Y is 1.5 for those motorcycles sold during model years (MY) 2003 through 2006, 1.375 for those sold in MY 2007, 1.250 for those sold in MY 2008, and 1.125 for those sold in MY 2009. A similar set of multipliers is shown in Table V.C-1 for pre-MY 2010 motorcycles certified even lower at 0.4 g/km HC+NOx.

Table V.C-1
Multipliers to Encourage Early Compliance
with the Proposed Tier 2 Standard and Beyond

Model Year Sold	Multiplier (Y) for Use in MY 2010 Corporate Averaging*	
	Early Tier 2	Certified at 0.4 g/km HC+NOx
2003 through 2006	1.5	3.0
2007	1.375	2.5
2008	1.250	2.0
2009	1.125	1.5

*Early Tier 2 motorcycles and motorcycles certified to 0.4 g/km are counted cumulatively toward the MY 2010 corporate average.

In 2010 and later model years the program would become a basic averaging program, where each manufacturer would have to meet the applicable HC+NOx standard on a fleet-average basis. See the proposed regulations at §86.449.

3. Is EPA proposing Blue Sky Standards for these engines?

We are not proposing Blue Sky Standards for motorcycles at this time. Under the proposed averaging program there is an incentive to produce very clean motorcycles early, but it is of limited duration. However, several possible approaches could include a Blue Sky program, such as the ones discussed for marine evaporative emissions earlier in this document. For example, a Blue Sky standard could be set at the 0.4 g/km HC+NOx level used under the proposed averaging program. We request comment on whether a Blue Sky program is desirable for motorcycles, and what standards would be appropriate for such a program.

4. Do these standards apply to alternative-fueled engines?

The proposed emission standards would apply to all motorcycles, regardless of fuel. Although the federal numerical emission standards have not been updated in more than twenty years, the regulations were revised twice in the 1990's to apply the standards to certain alternative-fueled motorcycles. In 1990 the emission standards became applicable to methanol-fueled motorcycles (see 54 FR 14539, Apr. 11, 1989), and in 1997 the standards became applicable to natural gas-fueled and liquified petroleum gas-fueled motorcycles (see 59 FR 48512, Sept. 21, 1994).

We propose to apply the emission standards for highway motorcycles, regardless of fuel. This would have the effect of including any motorcycles that operate on diesel fuel. We do not believe the provisions in this proposal create any unique issues for motorcycles powered by alternative fuels. However, we request comment on whether there are unique aspects to motorcycles fueled with these alternative fuels (if there are any such motorcycles) that would make the proposed standards particularly challenging or infeasible.

5. Should highway and off-highway regulations be integrated?

We recognize that many motorcycle manufacturers produce both on- and off-highway motorcycles and are interested in receiving comment on integrating the two sets of requirements into a single part of the regulations. Currently, EPA regulations for highway motorcycles are in 40 CFR part 86, while the proposed regulations for recreational vehicles and engines are in 40 CFR part 1051. Given that the proposed requirements for off-highway motorcycles and ATVs would duplicate many of the requirements that apply to highway motorcycles (such as test procedures and certification protocol), it may be appropriate to integrate the highway motorcycle requirements with the recreational vehicle requirements in part 1051. This may help manufacturers with both on- and off-highway products by eliminating differing or inconsistent paperwork or testing requirements for the different products. We request comment on the value of centralizing the requirements in this way.

6. Is EPA proposing production line testing requirements for highway motorcycles?

Production line testing requirements have never been required for highway motorcycles, but we are seeking comment on them as part of this proposal. However, we recognize that production-line testing may serve as a valuable tool to ensure that newly assembled engines control emissions at least as well as the prototype models used for certification. We believe testing highway motorcycles from the production line would add little additional burden and could easily be incorporated into the existing production-line quality checks that most manufacturers routinely perform. In fact, some nonroad engine manufacturers use emission measurements as part of their standard quality-control protocol at the assembly line to ensure proper engine functioning. Also, we would waive testing requirements for manufacturers with consistently good emission results. We request comment on extending to highway motorcycles the production-line testing requirements recently proposed for nonroad engines and vehicles (66 FR 51098). If such requirements were extended to highway motorcycles, we request comment on the impact of such requirements on smaller manufacturers and whether such requirements should apply to small manufacturers (i.e., those with less than 3,000 annual unit sales). In the absence of production line testing we are not likely to allow post-certification changes to be made to the Family Emission Limits (FELs) applicable to a given engine family under the emissions averaging program.

7. What test fuel is specified for emission testing of motorcycles?

The specifications for gasoline to be used by the EPA and by manufacturers for emission testing can be found in 40 CFR 86.513-94. These regulations also specify that the fuel used for vehicle service accumulation shall be "representative of commercial fuels and engine lubricants which will be generally available through retail outlets." During the last twenty years of regulation of motorcycle emissions, the fuel specifications for motorcycle testing have been essentially identical to those for automotive testing. However, on February 10, 2000, EPA issued a final rule entitled "Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements" (65 FR 6697, Feb. 10, 2000). In addition to finalizing a single set of emission standards that will apply to all passenger cars, light trucks, and larger passenger vehicles (e.g., large SUVs), the rule requires the introduction of low-sulfur gasoline nationwide. To provide consistency with the fuels that will be in the marketplace, the rule amended the test fuel specifications, effective starting in 2004 when the new standards will take effect. The principal change that was made was a reduction in the allowable levels of sulfur in the test fuel, from a maximum of 0.10 percent by weight to a range of 0.0015 to 0.008 percent by weight.

Given that low-sulfur fuel will be the existing fuel in the marketplace when our proposed program would take effect (and therefore required for service accumulation), we propose to amend the motorcycle test fuel to reflect the true nature of the fuels available in the marketplace. Doing so would remove the possibility that a test could be conducted with an unrealistically high level of sulfur in the fuel.

8. Highway Motorcycle Evaporative Emissions

In addition to California's exhaust emission standards, California ARB has also established evaporative emission standards for highway motorcycles. These standards took effect with the 1983 model year for Class I and II motorcycles, and the 1984 model year for Class III motorcycles. An initial evaporative emission standard that applied for two model years was set at 6.0 grams of hydrocarbons per test. Following two model years at this level, the standard was reduced to a more stringent 2.0 grams of hydrocarbons per test for all motorcycle classes. This is the currently applicable standard, and it was not changed during California's recent revisions to their motorcycle exhaust emission standards.

We believe that it is not necessary at this time to propose adopting broad evaporative emission standards such as California's. The fuel tanks are generally small, resulting in diurnal and refueling emissions that we expect to be proportionately low. The use rates of motorcycles is likewise low, and we expect that hot soak emissions will be low as well. California has unique air quality concerns that may prompt the State to pursue and select emissions controls that we may find unnecessary for a national program. However, our investigation into the hydrocarbon emissions related to permeation of fuel tanks and fuel hoses with respect to marine applications has raised a new emissions concern that has a broad reach across many different vehicle types. Permeation of fuel tanks and hoses is one of four components of a vehicle's evaporative emissions. The other three primary evaporative components are: hot soak emissions, which occur when fuel evaporates from hot engine surfaces; diurnal emissions, which occur when fuel in tanks and hoses heats up in response to increases in ambient temperature; and refueling emissions, which occur when fuel vapors are displaced from the tank during refueling. As described in section III, the permeation emissions from boats outweigh other evaporative emissions significantly; in fact, permeation from tanks and hoses results in more emissions than the other three types of evaporative emissions combined. Given this, we are assessing other vehicle types, including highway motorcycles, off-road motorcycles, and all-terrain vehicles, that may use fuel tanks or hoses with less-than-optimal control of permeation emissions. The fact that the fuel tanks in these types of vehicles are generally small does not significantly affect the importance of these emissions; it is the fact that permeation is occurring every hour of every day when there is fuel in the tank that results in the significance of emissions related to permeation.

Section III.H of this preamble, as well as the Draft Regulatory Support Document, detail some of the technological strategies that may be employed to reduce fuel permeation. The application of several of these technologies to highway motorcycles appears to be relatively straightforward, with little cost and essentially no adverse performance or aesthetic impacts. These technologies, which are already available and which appear to be relatively inexpensive, could reduce permeation of tanks and hoses by 95 percent or more. In addition, the control technology may pay for itself in many instances due to positive fuel consumption impacts.

We request comment on finalizing standards that would require low permeability fuel tanks on highway motorcycles, starting with the 2006 model year. We would presume that the metal fuel tanks that equip most highway motorcycles would already meet the low permeability requirement, and thus, there would be no need for any fuel tank design or material changes on the vast majority of highway motorcycles. However, many if not all of the dual-sport motorcycles are equipped with plastic fuel tanks, as are some motorcycles in the sport or super-sport categories. These motorcycles, under the type of regulation that we are requesting comment on, would have to employ metal tanks or plastic fuel tanks using one of the barrier technologies (e.g., a fluorination or sulfonation treatment) described in section III.H to meet the standards. We expect that any standards finalized would be similar in design to those proposed regarding fuel tank permeation for marine engines, as discussed earlier in this preamble.

Retail sales data from Dealernews for the 2001 calendar year indicates that sales of motorcycles in the sport category amounted to just over 20 percent of total highway motorcycle sales, and dual-sport motorcycles were a much smaller 4 percent of the total. We may then conservatively estimate that approximately 25 percent of current motorcycles now have plastic tanks that would need upgrading. This is a conservative estimate for two reasons: (1) some of these motorcycles are probably using metal tanks; and (2) it is highly likely that some of the existing plastic tanks have already been upgraded with a barrier treatment in order to meet the California evaporative emission requirements. We are interested in collecting more information regarding the degree to which plastic fuel tanks are used on highway motorcycles, and, to the extent they are, what if any measures have been taken by manufacturers to reduce permeation emissions.

Highway motorcycle fuel tanks range in capacity from just over one gallon on some small scooters to about 7.5 gallons on some large touring and sport touring motorcycles. Most of the sport and super-sport motorcycles appear to have fuel tanks that fall generally in the range of 4 to 6 gallons, while dual-sport motorcycles may be slightly smaller on average, perhaps typically in the 3 to 5 gallon range. If we select 5 gallons as a conservative estimate of the average size of the fuel tanks for those types of motorcycles most likely to have to employ one of the fuel tank barrier technologies, the additional cost per tank (assuming fluorination treatment) is estimated to be about $3.25 (see section 5.2.1 of the Draft Regulatory Support Document). We estimate that shipping, handling, and overhead costs would be an additional $0.85, resulting in a total average cost of about $4.10. Therefore, the average industry-wide price increase that would be associated with a requirement of this nature would be about $1.00.

We also request comment on promulgating standards that would require the use of low permeability fuel hoses on all highway motorcycles, starting in the 2006 model year. Like low permeation fuel tanks, it is very likely that some manufacturers have already addressed permeation from the fuel hoses on some of their product line due to the California evaporative emission requirements. However, we will conservatively estimate that no current motorcycles are equipped with fuel hoses that significantly reduce or eliminate permeation. The cost of a fuel line with low permeation properties is estimated to be about $1.30 per foot (see section 5.2.1 of the Draft Regulatory Support Document). Highway motorcycles are estimated to have about one to two feet of fuel line on average; thus, using the average cost and a fuel line length of 18 inches, we estimate an average industry-wide price increase associated with a low permeation fuel line requirement to be about $2.00 per motorcycle. We therefore estimate that the total increased cost per motorcycle that would result from requiring low permeation fuel tanks and fuel hoses would be about $3.00. We are interested in collecting more information regarding fuel hoses currently used on highway motorcycles, in particular regarding the typical length, the material, and the permeation properties.

We request comment on the form these standards would take (e.g., whether there should be absolute numerical limits or percentage reduction requirements, if we determined they were appropriate.) We also request comment on implementing requirements such as those described above by allowing the manufacturer to submit a statement at the time of certification that the fuel tanks and hoses used on their products meet standards, specified materials, or construction requirements based on testing results. For example, a manufacturer using plastic fuel tanks could state that the engine family at issue is equipped with a fuel tank with a low permeability barrier treatment such as fluorination. Fuel hoses could be certified as being manufactured in compliance with certain accepted SAE specifications. These certification statements could be done on an engine family basis, or possibly a blanket statement could cover a manufacturer's entire product line. EPA expects that 95 percent reductions over uncontrolled emission levels for permeation are achievable for plastic fuel tanks. These reductions imply a tank permeability standard of about 0.024 g/gal/day for fuel tanks. For fuel hoses, we would consider the proposed standards for marine hoses of 5 grams per square meter per day. We request comment on these and other options that would enable regulation and enforcement of low permeability requirements.

As was discussed earlier regarding marine evaporative emissions, California ARB and EPA have conducted permeation testing with regard to evaporative emissions from HDPE plastic tanks. There are 8 data points for tanks of 3.9 to 7.5 gallons capacity. The permeation rates varied from 0.2 to1.0 grams per gallon per day with an average value of 0.75 g/gal/day. This data was based on tests with an average temperature of about 29 C. As discussed in Chapter 4 of the draft RSD, temperature has a first order effect on the rate of permeation. Roughly, permeation doubles with every 10 C increase in temperature. For the 5 gallon tank discussed above, at 23 C, the average emission rate is about 0.50 g/gal/day or 2.5 g/day.

For the purposes of this analysis we assumed a fuel hose with an inside diameter of about 1cm ($^{3}/_{8}$ inch) and a permeation rate of 550 grams per square meter per day at 23 C. This permeation rate is based on the SAE J30 requirement for R7 fuel hose, the type of hose found on a small sample of motorcycles we examined. For the 18 inch hose mentioned above this yields an emission rate of 7.5 g/day.

Combining the average emission rates determined for the fuel tanks and fuel hoses above and adjusting for the 25 percent of tanks that would be affected by permeation standards yields a daily average emission rate of 8.1 g/day (7.5 g/day + (0.25 x 2.5 g/day)). The total combined tank and hose emission rate for those motorcycles that we estimate will require fuel tank treatments (25 percent of motorcycles) is 9.9 g/day (7.5 g/day + 2.5 g/day).

Table V.C-2 presents national totals for permeation emissions from motorcycles. These permeation estimates are based on the emission rates discussed above and population, turnover, and temperature projections discussed in Chapter 6 of the draft RSD.

Table V.C-2: Projected Motorcycle Permeation Hydrocarbon Emissions [short tons]

Calendar Year	Baseline	Control	Reduction
2005	14,600	14,600	0
2010	16,900	10,800	6,100
2015	19,200	6,010	13,200
2020	21,500	1,950	19,600
2030	26,200	317	25,900

The average lifetime of a typical motorcycle is estimated to be about 12.5 years. Permeation control techniques can reduce emissions by 95 percent for tanks and more than 99 percent for hoses. Multiplying this efficiency and these emission rates by 12.5 years and discounting at 7 percent yields lifetime per motorcycle emission reductions of 0.0013 tons for the fuel tank, 0.017 tons for the fuel hose, and 0.019 tons on average overall. In turn, using the cost estimates above, these emission reductions yield HC cost per ton values of $794 for the 5 gallon tank, $112 for the fuel hose, and $160 for the average overall.

Because evaporative emissions are composed of otherwise useable fuel that is lost to the atmosphere, measures that reduce evaporative emissions can result in potentially significant fuel savings. For a motorcycle with a 5 gallon fuel tank, we estimate that the low permeability measures discussed in this section could save 9.6 gallons over the 12.5 year average operating lifetime, which translates to a discounted lifetime savings of $6.75 at an average fuel price of $1.10 per gallon. Combining this savings with an estimated cost per motorcycle of $3.00 results in a discounted lifetime savings per motorcycle of $3.75. The cost per ton of the evaporative emission reductions described above is $160; however, if the fuel savings are included, the estimated cost per ton is actually -$203. This means that the fuel savings are larger than the cost of using low permeation technology.

D. Special Compliance Provisions

While the highway motorcycle market is dominated by large companies, there are over 30 small businesses manufacturing these products. They are active in both the federal and California markets. California has been much more active than EPA in setting new requirements for highway motorcycles, and indeed, the California requirements have driven the technology demands and timing for highway motorcycle emission controls. We have developed our special compliance provisions partly in response to the technology, timing, and scope of the requirements that apply to the small businesses in California’s program. The provisions discussed below would reduce the economic burden on small businesses, allowing harmonization with California requirements in a phased, but timely manner.

We propose that the flexibilities described below will be available for small entities with highway motorcycle annual sales of fewer than 3,000 units per model year (combined Class I, II, and III motorcycles) and fewer than 500 employees. These provisions are appropriate because of the significant research and development resources may be necessary to meet the proposed emission standards. These provisions would reduce the burden while ensuring the vast majority of the program is implemented to ensure timely emission reductions. We also understand that many small highway motorcycle manufacturers market "classic" and "custom" motorcycles, often with a "retro" appearance, that tends to make the addition of new technologies a uniquely resource-intensive prospect.

1. Delay of Proposed Standards

We propose to delay compliance with the Tier 1 standard of 1.4 g/km HC+NOx until the 2008 model year for small-volume manufacturers. We are proposing a Tier 1 standard beginning in the 2006 model year for highway motorcycles. Small manufacturers are required to meet the Tier 1 standard in 2008 in California. Given that the California requirements apply in 2008 for small businesses, we seek comment on whether additional time is needed for small businesses to comply with the federal program.

The current California regulations do not require small manufacturers to comply with the Tier 2 standard of 0.8 g/km HC+NOx. The California Air Resources Board found that the Tier 2 standard represents a significant technological challenge and is a potentially infeasible limit for these small manufacturers. We share the California ARB’s concern regarding this issue. As noted above, many of these manufacturers market a specialty product with a "retro" simplicity that may not easily lend itself to the addition of advanced technologies like catalysts. However, the ARB has acknowledged that, in the course of their progress review planned for 2006, they will revisit their small-manufacturer provisions. Therefore, we plan to participate with the ARB in the 2006 progress review as these provisions are revisited, and delay making decisions on the applicability to small businesses of Tier 2 or other revisions to the federal regulations that are appropriate following the review.

2. Broader Engine Families

Small businesses have met EPA certification requirements since 1978. Nonetheless, certifying motorcycles to revised emission standards has cost and lead time implications. Relaxing the criteria for what constitutes an engine or vehicle family could potentially allow small businesses to put all of their models into one vehicle or engine family (or more) for certification purposes. Manufacturers would then certify their engines using the "worst case" configuration within the family. This is currently allowed under the existing regulations for small-volume highway motorcycle manufacturers. We propose that these provisions remain in place.

3. Exemption from Production Line Testing

There is currently no mandatory production line testing requirement for highway motorcycles. The current regulations allow us to request production vehicles from any certifying manufacturer for testing. We are proposing no changes to these existing provisions at this time.

4. Averaging, Banking, and Trading

An emission-credit program allows a manufacturer to produce and sell engines and vehicles that exceed the applicable emission standards, as long as the excess emissions are offset by the production of engines and vehicles emitting at levels below the standards. The sales-weighted average of a manufacturer’s total production for a given model year must meet the standards. An emission-credit program typically also allows a manufacturer to bank credits for use in future model years, as well as buy credits from, or sell credits to, other manufacturers. Emission-credit programs are generally made available to all manufacturers, though special provisions for small businesses could be created to increase flexibility. We therefore propose an emission-credit program for highway motorcycles similar to that discussed above in V.C.2. for all motorcycle manufacturers.

For the reasons described in section V.C.2., we are not proposing post implementation emissions credits banking and trading provisions, but are requesting comment on them. This is not consistent with the Panel's recommendations for small entities. We request comment on the usefulness of banking and trading for small entities. For additional information on this subject, commenters may review a report prepared for the Small Business Administration on credits programs, "Emissions Trading for Small Business", for ideas on how such programs could be useful for small entities.[41]

5. Hardship Provisions

We are proposing two types of provisions to address unusual hardship circumstances for motorcycle manufacturers. The first type of hardship program would allow small businesses to petition EPA for additional lead time (e.g., up to 3 years) to comply with the standards. A small manufacturer would have to make the case that it has taken all possible business, technical, and economic steps to comply but the burden of compliance costs would have a significant impact on the company's solvency. A manufacturer would be required to provide a compliance plan detailing when and how it would achieve compliance with the standards. Hardship relief could include requirements for interim emission reductions and/or purchase and use of emission credits. The length of the hardship relief decided during review of the hardship application would be up to one year, with the potential to extend the relief as needed. The second hardship program would allow companies to apply for hardship relief if circumstances outside their control cause the failure to comply (i.e., supply contract broken by parts supplier) and if the failure to sell the subject engines would have a major impact on the company's solvency. See the proposed regulatory text in 40 CFR 1068.240 and 1068.241 for additional details.

In light of the California requirements, which do not include hardship provisions, we request comment on this alternative.

6. Reduced Certification Data Submittal and Testing Requirements

Current regulations allow significant flexibility for certification by manufacturers projecting sales below 10,000 units of combined Class I, II, and III motorcycles. For example, a qualifying manufacturer must submit an application for certification with a statement that their vehicles have been tested and, on the basis of the tests, conform to the applicable emission standards. The manufacturer retains adequate emission test data, for example, but need not submit it. Qualifying manufacturers also need not complete the detailed durability testing required in the regulations. We are proposing no changes to these existing provisions.

7. Nonconformance Penalties

Clean Air Act section 206(g) (42 U.S.C. 7525(g)), allows EPA to issue a certificate of conformity for heavy-duty engines or for highway motorcycles that exceed an applicable section 202(a) emissions standard, but do not exceed an upper limit associated with that standard, if the manufacturer pays a nonconformance penalty established by rulemaking. Congress adopted section 206(g) in the Clean Air Act Amendments of 1977 as a response to perceived problems with technology-forcing heavy-duty engine emissions standards. If strict standards were maintained, then some manufacturers, "technological laggards," might be unable to comply initially and would be forced out of the marketplace. Nonconformance penalties were intended to remedy this potential problem. The laggards would have a temporary alternative that would permit them to sell their engines or vehicles by payment of

[41] "Emissions Trading for Small Businesses", Final Report, Jack Faucett Associates, March 2002, http://www.sba.gov/advo/research/rs216tot.pdf (Docket A-2000-01; document IV-A-26).

a penalty. There are three criteria for determining the eligibility of emission standards for nonconformance penalties in any given model year. First, the emission standard in question must become more difficult to meet, either by becoming more stringent itself or by its interaction with another emission standard that has become more stringent. Second, substantial work must be required to meet the emission standard. We consider "substantial work" to mean the application of technology not previously used in that vehicle or engine class/ subclass, or a significant modification of existing technology, to bring that vehicle/engine into compliance. We do not consider minor modifications or calibration changes to be classified as substantial work. Third, it must be likely that a company will become a technological laggard. A technological laggard is defined as a manufacturer who cannot meet a particular emission standard due to technological (not economic) difficulties and who, in the absence of nonconformance penalties, might be forced from the marketplace.

Nonconformance penalties have been offered on occasion as a compliance option for several heavy-duty engine emission standards, but they have never been offered for highway motorcycles. However, as noted above, the Clean Air Act provides us with the authority to provide nonconformance penalties for highway motorcycles if they can be justified. While we do not currently believe that the three criteria established by rulemaking could be satisfied with respect to the Tier 1 standard (the "substantial work" criterion may not be applicable), there is a greater possibility that the criteria could be satisfied with respect to the Tier 2 standard. We request comment on whether the three criteria noted above could apply to the Tier 1 or Tier 2 standard, and if so, whether nonconformance penalties should be considered as an option. Typically, however, it is impossible at the time of a rulemaking to make the finding that a technological laggard has emerged with respect to a standard taking effect well into the future. For example, the proposed program would provide eight years of lead time to meet the Tier 2 standard, and making a judgment in this rulemaking regarding the existence of a technological laggard is impossible. It would be likely, for example, that we revisit this issue in the context of California ARB's 2006 progress review, or even later. However, we request comment nevertheless on whether nonconformance penalties would be a desirable option, should conditions develop that warrant them. We also request comment on, given the availability of the hardship provisions described above, whether non-conformance penalties would potentially be needed.

E. Technological Feasibility of the Standards

1. Class I and Class II motorcycles between 50 and 180cc

As noted above, we are proposing to adopt the current California standards for Class I and Class II motorcycles. These standards have been in place in California since 1982. The question of whether or not these standards are technically feasible has been answered in the affirmative, since 21 of the 22 EPA-certified 2001 model year motorcycle engine families in these classes are already certified to these standards, and all 24 of the 2002 model year engine families meet these standards. These 24 engine families are all powered by four-stroke engines, with a variety of emission controls applied, including basic engine modifications on almost all engine families, secondary air injection on three engine families, and a two-way oxidation catalyst on one engine family.

In past model years, but not in the 2002 model year, an engine family that does not meet the California standards had certified to the existing federal standards and not sold in California. It was a 100cc dual-sport motorcycle powered by a two-stroke engine, with an HC certification level of 3.9 g/km. This motorcycle no longer appears to be available as of the 2002 model year. Adopting the California standards for these motorcycle classes could preclude this motorcycle or others like it from being certified and sold federally, unless the federal program includes additional flexibility relative to the California program. As discussed above, we are proposing that the HC standard for Class I and Class II motorcycles be an averaging standard, in a departure from California's treatment of these motorcycle classes. This in itself could be of limited use given the low number of Class I and Class II engine families, but, as discussed in Section V.C.2 above, we are also proposing to allow credits accumulated by certifying Class III engine families to a level lower than the standard to be used to offset Class I or Class II engine families certified to levels above the fleet-average standard.[42]

2. Class I motorcycles under 50cc

As we have described earlier we are proposing to apply the current California standard for Class I motorcycles to motorcycles with displacements of less than 50cc (e.g., most motor scooters). These motorcycles are currently not subject to regulation by the U.S. EPA or by the State of California. They are, however, subject to emission standards in Europe and much of the rest of the world. Historically these motorcycles have been powered by 2-stroke engines, but a trend appears to be developing that would result in most of these being replaced by 4-stroke engines or possibly by advanced technology 2-stroke engines, in some cases with catalysts.

The 4-stroke engine is capable of meeting our proposed standards. Class I motorcycles above 50cc are already meeting it, most of them employing nothing more than a 4-stroke engine. For example, the existing Class I scooters certify at levels ranging from 0.4 to 0.8 grams per kilometer HC. All of these achieve the standards with 4-stroke engine designs, and only one incorporates additional technology (a catalyst). These engines range from 80 to 151cc in displacement, indicating that a smaller engine should encounter few problems meeting the proposed standards.

In order to meet more stringent standards being implemented worldwide, manufacturers are developing and implementing a variety of options. Honda, perhaps the largest seller of scooters in the U.S., has entirely eliminated 2-stroke engines from their scooter product lines as of the 2002 model year. They continue to offer a 50cc model, but with a 4-stroke engine. Both of Aprilia's 49cc scooters available in the U.S. have incorporated electronic direct injection technology, which, in the case of one model, enables it to meet the "Euro-2" standards of 1.2 grams per kilometer HC and 0.3 grams per kilometer NOx, without use of a catalytic converter.[43] Piaggio, while currently selling a 49cc basic 2-stroke scooter in the U.S., expects to begin production of a direct injection version in 2002, and a 4-stroke 50cc scooter is also in development. Numerous 49cc models marketed by Piaggio in Europe are available either as a 4-stroke or a 2-stroke with a catalyst. Piaggio, also an engine manufacturer and seller, is already offering a 50cc 4-stroke engine to its customers for incorporation into scooters.

The U.S. represents a very small portion of the market for small motorcycles and scooters. There are few, if any, manufacturers that develop a small-displacement motorcycle exclusively for the U.S. market; the domestic sales volumes do not appear large enough at this time to support an industry of this kind. The Italian company Piaggio (maker of the Vespa scooters), for example, sold about as many scooters worldwide in 2000 (about 480,000) as the entire volume of highway motorcycles of all sizes sold in the U.S. in that year. U.S. sales of Vespas in 2000 amounted to about 4800. The largest scooter markets today are in South Asia and Europe, where millions are sold annually. In Taiwan alone almost 800,000 motorcycles were sold domestically. More than one third of these were powered by 2-stroke engines. Two- and three-wheelers constitute a large portion of the transportation sector in Asia, and in some urban areas these vehicles - many of them powered by 2-stroke engines - can approach 75 percent of the vehicle population. According to a World Bank report, two-stroke gasoline engine vehicles are

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[42] The manufacturer that had certified this two-stroke for highway use has typically certified 4-5 other Class I or II engine families; therefore, a basic averaging program could enable them to continue to market their two-stroke dual-sport. However, other manufacturers may not have adequate additional engine families in these classes, making a basic averaging standard less useful to them.

[43] Aprilia website, http://www.apriliausa.com/ridezone/ing/models/scarabeo50dt/moto.htm. Available in the public docket for review.

estimated to account for about 60 percent of the total vehicle fleet in South Asia.[44]

Many nations are now realizing that the popularity of these vehicles and the high density of these vehicles in urban areas are contributing to severe air quality problems. As a consequence, some of the larger small motorcycle markets in Asia and India are now placing these vehicles under fairly strict regulation. It is clear that actions in these nations will move the emission control technology on small motorcycles, including those under 50cc, in a positive direction. For example, according to the World Bank report, as of 2000 catalytic converters are installed in all new two-stroke engine motorcycles in India, and 2003 standards in Taiwan will effectively ban new two-strokes with emission standards so stringent that only a four-stroke engine is capable of meeting them.

Given the emerging international picture regarding emission standards for scooters, we believe that scooter manufacturers will be producing scooters of less than 50cc displacement that meet our proposed standards well in advance of the 2006 model year, the first year we propose to subject this category of motorcycle to U.S. emission standards. We would expect that small entities that import scooters into the U.S. from the larger scooter markets would be able to import complying vehicles. We request comment on this assessment.

There are other numerous factors in the international arena that may affect the product offerings in the less than 50cc market segment. For example, the European Union recently changed the requirements regarding insurance and helmet use for under 50cc scooters and mopeds. Previously, the insurance discounts and lack of helmet requirements in Europe provided two relatively strong incentives to purchasers to consider a 49cc scooter. Recently, however, the provisions were changed such that helmets are now required and the insurance costs are comparable to larger motorcycles. The result was a drop of about 30% in European sales of 49cc scooters in 2001 due to customers perceiving little benefit from a 49cc scooter relative to a larger displacement engine.

3. Class III motorcycles

a. Tier 1 standards

In the short term, the proposed Tier 1 HC+NOx standard of 1.4 g/km HC+NOx reflects the goal of achieving emission reductions that could be met with reasonably available control technologies, primarily involving engine modifications rather than catalytic converters. As noted earlier, we are proposing that this standard be effective for the 2006 model year. Based on current certification data, a number of existing engine families already comply with this standard or would need relatively simple modifications to comply. In other cases, the manufacturers will need to use control technologies that are available but are not yet used on their particular vehicles (e.g., electronic fuel injection to replace carburetors, changes to cam lobes/timing, etc.). For the most part, manufacturers will not need to use advanced technologies such as close-coupled, closed-loop three way catalysts.

While manufacturers will use various means to meet the Tier 1 standard, there are four basic types of existing, non-catalyst-based, emission-control systems available to manufacturers. The most important of these is the use of secondary pulse-air injection. Other engine modifications and systems include more precise fuel control, better fuel atomization and delivery, and reduced engine-out emission levels from engine changes. The combinations of low-emission technologies ultimately chosen by motorcycle manufacturers are dependent on the engine-out emission levels of the vehicle, the effectiveness of the prior emission-control system, and individual

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[44] Improving Urban Air Quality in South Asia by Reducing Emissions from Two-Stroke Engine Vehicles. Masami Kojima, Carter Brandon, and Jitendra Shah. December 2000. Prepared for the World Bank. Available in the public docket for review (Docket A-2000-01; document II-D-191), or on the internet at: http://www.worldbank.org/html/fpd/esmap/publication/airquality.html.

manufacturer preferences.

Secondary pulse-air injection, as demonstrated on current motorcycles, is applied using a passive system (i.e., no air pump involved) that takes advantage of the flow of gases ("pulse") in the exhaust pipes to draw in fresh air that further combusts unburned hydrocarbons in the exhaust. Engine modifications include a variety of techniques designed to improve fuel delivery or atomization; promote "swirl" (horizontal currents) and "tumble" (vertical currents); maintain tight control on air-to-fuel (A/F) ratios; stabilize combustion (especially in lean A/F mixtures); optimize valve timing; and retard ignition timing.

Secondary pulse air injection involves the introduction of fresh air into the exhaust pipe immediately after the gases exist the engine. The extra air causes further combustion to occur, thereby controlling more of the hydrocarbons that escape the combustion chamber. This type of system is relatively inexpensive and uncomplicated because it does not require an air pump; air is drawn into the exhaust through a one-way reed valve due to the pulses of negative pressure inside the exhaust pipe. Secondary pulse-air injection is one of the most effective non-catalytic emission-control technologies; compared to engines without the system, reductions of 10 to 40 percent for HC are possible with pulse-air injection. Sixty-five of the 151 2001 model year Class III engine families certified for sale in the U.S employ secondary pulse-air injection to help meet the current California standards. We anticipate that most of the remaining engine families will use this technique to help meet the Tier 1 and Tier 2 standards.

Improving fuel delivery and atomization primarily involves the replacement of carburetors, currently used on most motorcycles, with more precise fuel injection systems. There are several types of fuel injection systems and components manufacturers can choose. The most likely type of fuel injection manufacturers will choose to help meet the Tier 1 standard is sequential multi-point fuel injection (SFI).

Unlike conventional multi-point fuel injection systems that deliver fuel continuously or to paired injectors at the same time, sequential fuel injection can deliver fuel precisely when needed by each cylinder. With less than optimum fuel injection timing, fuel puddling and intake-manifold wall wetting can occur, both of which hinder complete combustion. Use of sequential-fuel- injection systems help especially in reducing cold start emissions when fuel puddling and wall wetting are more likely to occur and emissions are highest.

Motorcycle manufacturers are already beginning to use sequential fuel injection (SFI). Of the 152 Class III motorcycle engine families certified for sale this year, 36 employ SFI systems. We anticipate increased applications of this or similar fuel injection systems to achieve the more precise fuel delivery needed to help meet the Tier 1 and Tier 2 standards.

In addition to the techniques mentioned above, various engine modifications can be made to improve emission levels. Emission performance can be improved, for example, by reducing crevice volumes in the combustion chamber. Unburned fuel can be trapped momentarily in crevice volumes before being subsequently released. Since trapped and re-released fuel can increase engine-out emissions, the elimination of crevice volumes would be beneficial to emission performance. To reduce crevice volumes, manufacturers can evaluate the feasibility of designing engines with pistons that have reduced, top "land heights" (the distance between the top of the piston and the first ring).

Lubrication oil which leaks into the combustion chamber also has a detrimental effect on emission performance since the heavier hydrocarbons in oil do not oxidize as readily as those in gasoline and some components in lubricating oil may tend to foul the catalyst and reduce its effectiveness. Also, oil in the combustion chamber may trap HC and later release the HC unburned. To reduce oil consumption, manufacturers can tighten the tolerances and improve the surface finish on cylinders and pistons, piston ring design and materials, and exhaust valve stem seals to prevent excessive leakage of lubricating oil into the combustion chamber.

Increasing valve overlap is another engine modification that can help reduce emissions. This technique helps reduce NOx generation in the combustion chamber by essentially providing passive exhaust gas recirculation (EGR). When the engine is undergoing its pumping cycle, small amounts of combusted gases flow past the intake valve at the start of the intake cycle. This creates what is essentially a passive EGR flow, which is then either drawn back into the cylinder or into another cylinder through the intake manifold during the intake stroke. These combusted gases, when combined with the fresh air/fuel mixture in the cylinder, help reduce peak combustion temperatures and NOx levels. This technique can be effected by making changes to cam timing and intake manifold design to optimize NOx reduction while minimizing impacts to HC emissions.

Secondary pulse-air injection and engine modifications already play important parts in reducing emission levels; we expect increased uses of these techniques to help meet the Tier 1 standard. Direct evidence of the extent these technologies can help manufacturers meet the Tier 1 standard can be found in EPA's highway motorcycle certification database. This database is comprised of publicly-available certification emission levels as well as some confidential data reported by the manufacturers pursuant to existing motorcycle emission certification requirements.

We do not expect any of these possible changes to adversely affect performance. Indeed, the transition to some of these technologies (e.g., advanced fuel injection) would be expected to improve performance, fuel economy, and reliability. A direct comparison of several motorcycle models in the EPA certification database between the "California" model (where one is offered; it is the exception rather than the rule that a manufacturer offers a separate engine system for California) and the model sold in the rest of the U.S. reveals no change in the performance characteristics in the database (e.g., rated horsepower, torque). We request comment on the impact these anticipated changes might have on performance-related factors.

b. Tier 2 standards

In the long term, the proposed Tier 2 HC+NOx standard of 0.8 g/km would ensure that manufacturers will continue to develop and improve emission control technologies. We are proposing the Tier 2 standard to be effective by the 2010 model year. We believe this standard is technologically feasible, though it will present some challenges for manufacturers. Several manufacturers are, however, already using some of the technologies that will be needed to meet this standard. In addition, our proposed implementation time frame gives manufacturers two years of experience in meeting this standard in California before having to meet it on a nationwide basis. At least one manufacturer already uses closed-loop, three-way catalysts on several of its product lines. One manufacturer has already certified a large touring motorcycle to the Tier 2 standards for sale in California. Depending on assumptions regarding NOx levels, other manufacturers have products currently in the market with emission levels close to the Tier 2 standards using two-way catalysts, fuel injection, secondary pulse-air injection, and other engine modifications. The current average HC certification level for Class III motorcycles is just under 1.0 g/km, with a number of motorcycles from a variety of manufacturers at levels of 0.5 g/km or lower. We expect that the proposed eight years of lead time prior to meeting these standards on a nationwide basis would allow manufacturers to optimize these and other technologies to meet the Tier 2 standard.

To meet the proposed Tier 2 standard for HC+NOx, manufacturers would likely use more advanced engine modifications and secondary air injection. Specifically, we believe manufacturers would use computer-controlled secondary pulse-air injection (i.e., the injection valve would be connected to a computer-controlled solenoid). In addition to these systems, manufacturers would probably need to use catalytic converters on some motorcycles to meet the proposed Tier 2 standards. There are two types of catalytic converters currently in use: two-way catalysts (which control only HC and CO) and three-way catalysts (which control HC, CO, and NOx). Under the proposed Tier 2 standard, manufacturers would need to minimize levels of both HC and NOx. Therefore, to the extent catalysts are used, manufacturers would likely use a three-way catalyst in addition to engine modifications and computer-controlled, secondary pulse-air injection.

As discussed previously, improving fuel control and delivery provides emission benefits by helping to reduce engine-out emissions and minimizing the exhaust variability which the catalytic converter experiences. One method for improving fuel control is to provide enhanced feedback to the computer-controlled fuel injection system through the use of heated oxygen sensors. Heated oxygen sensors (HO2S) are located in the exhaust manifold to monitor the amount of oxygen in the exhaust stream and provide feedback to the electronic control module (ECM). These sensors allow the fuel control system to maintain a tighter band around the stoichiometric A/F ratio than conventional oxygen sensors (O2S). In this way, HO2S assist vehicles in achieving precise control of the A/F ratio and thereby enhance the overall emissions performance of the engine. At least one manufacturer is currently using this technology on several 2001 engine families.

In order to further improve fuel control, some motorcycles with electronic controls may utilize software algorithms to perform individual cylinder fuel control. While dual oxygen sensor systems are capable of maintaining A/F ratios within a narrow range, some manufacturers may desire even more precise control to meet their performance needs. On typical applications, fuel control is modified whenever the O2S determines that the combined A/F of all cylinders in the engine or engine bank is "too far" from stoichiometric. The needed fuel modifications (i.e., inject more or less fuel) are then applied to all cylinders simultaneously. Although this fuel control method will maintain the "bulk" A/F for the entire engine or engine bank around stoichiometric, it would not be capable of correcting for individual cylinder A/F deviations that can result from differences in manufacturing tolerances, wear of injectors, or other factors.

With individual cylinder fuel control, A/F variation among cylinders will be diminished, thereby further improving the effectiveness of the emission controls. By modeling the behavior of the exhaust gases in the exhaust manifold and using software algorithms to predict individual cylinder A/F, a feedback fuel control system for individual cylinders can be developed. Except for the replacement of the conventional front O2S with an HO2S sensor and a more powerful engine control computer, no additional hardware is needed in order to achieve individual cylinder fuel control. Software changes and the use of mathematical models of exhaust gas mixing behavior are required to perform this operation.

In order to maintain good driveability, responsive performance, and optimum emission control, fluctuations of the A/F must remain small under all driving conditions including transient operation. Virtually all current fuel systems in automobiles incorporate an adaptive fuel control system that automatically adjusts the system for component wear, varying environmental conditions, varying fuel composition, etc., to more closely maintain proper fuel control under various operating conditions. For some current fuel control systems, this adaptation process affects only steady-state operating conditions (i.e., constant or slowly changing throttle conditions). However, most vehicles are now being introduced with adaptation during "transient" conditions (e.g., rapidly changing throttle, purging of the evaporative system).

Accurate fuel control during transient driving conditions has traditionally been difficult because of the inaccuracies in predicting the air and fuel flow under rapidly changing throttle conditions. Because of air and fuel dynamics (fuel evaporation in the intake manifold and air flow behavior) and the time delay between the air flow measurement and the injection of the calculated fuel mass, temporarily lean A/F ratios can occur during transient driving conditions that can cause engine hesitation, poor driveability and primarily an increase in NOx emissions. However, by utilizing fuel and air mass modeling, vehicles with adaptive transient fuel control are more capable of maintaining accurate, precise fuel control under all operating conditions. Virtually all cars will incorporate adaptive transient fuel control software; motorcycles with computer controlled fuel injection can also benefit from this technique at a relatively low cost.

Three-way catalytic converters traditionally utilize rhodium and platinum as the catalytic material to control the emissions of all three major pollutants (hydrocarbons (HC), CO, NOx). Although this type of catalyst is very effective at converting exhaust pollutants, rhodium, which is primarily used to convert NOx, tends to thermally deteriorate at temperatures significantly lower than platinum. Recent advances in palladium and tri-metal (i.e., palladium-platinum-rhodium) catalyst technology, however, have improved both the light-off performance (light-off is defined as the catalyst bed temperature where pollutant conversion reaches 50-percent efficiency) and high temperature durability over previous catalysts. In addition, other refinements to catalyst technology, such as higher cell density substrates and adding a second layer of catalyst washcoat to the substrate (dual-layered washcoats), have further improved catalyst performance from just a few years ago.

Typical cell densities for conventional catalysts used in motorcycles are less than 300 cells per square inch (cpsi). To meet the Tier 2 standard, we expect manufacturers to use catalysts with cell densities of 300 to 400 cpsi. If catalyst volume is maintained at the same level (we assume volumes of up to 60 percent of engine displacement), using a higher density catalyst effectively increases the amount of surface area available for reacting with pollutants. Catalyst manufacturers have been able to increase cell density by using thinner walls between each cell without increasing thermal mass (and detrimentally affecting catalyst light-off) or sacrificing durability and performance.

In addition to increasing catalyst volume and cell density, we believe that increased catalyst loading and improved catalyst washcoats will help manufacturers meet the Tier 2 standard. In general, increased precious metal loading (up to a certain point) will reduce exhaust emissions because it increases the opportunities for pollutants to be converted to harmless constituents. The extent to which precious metal loading is increased will be dependent on the precious metals used and other catalyst design parameters. We believe recent developments in palladium/rhodium catalysts are very promising since rhodium is very efficient at converting NOx, and catalyst suppliers have been investigating methods to increase the amount of rhodium in catalysts for improved NOx conversion.

Double layer technologies allow optimization of each individual precious metal used in the washcoat. This technology can provide reduction of undesired metal-metal or metal-base oxide interactions while allowing desirable interactions. Industry studies have shown that durability and pollutant conversion efficiencies are enhanced with double layer washcoats. These recent improvements in catalysts can help manufacturers meet the Tier 2 standard at reduced cost relative to older three-way catalysts.

New washcoat formulations are now thermally stable up to 1050 ^{o}C. This is a significant improvement from conventional washcoats, which are stable only up to about 900 ^{o}C. With the improvements in light-off capability, catalysts may not need to be placed as close to the engine as previously thought. However, if placement closer to the engine is required for better emission performance, improved catalysts based on the enhancements described above would be more capable of surviving the higher temperature environment without deteriorating. The improved resistance to thermal degradation will allow closer placement to the engines where feasible, thereby providing more heat to the catalyst and allowing them to become effective quickly.

It is well established that a warmed-up catalyst is very effective at converting exhaust pollutants. Recent tests on advanced catalyst systems in automobiles have shown that over 90 percent of emissions during the Federal Test Procedure (FTP) are now emitted during the first two minutes of testing after engine start up. Similarly, the highest emissions from a motorcycle occur shortly after start up. Although improvements in catalyst technology have helped reduce catalyst light-off times, there are several methods to provide additional heat to the catalyst. Retarding the ignition spark timing and computer-controlled, secondary air injection have been shown to increase the heat provided to the catalyst, thereby improving its cold-start effectiveness.

In addition to using computer-controlled secondary air injection and retarded spark timing to increase the heat provided to the catalyst, some vehicles may employ warm-up, pre-catalysts to reduce the size of their main catalytic converters. Palladium-only warm-up catalysts (also known as "pipe catalysts" or "Hot Tubes") using ceramic or metallic substrates may be added to further decrease warm-up times and improve emission performance. Although metallic substrates are usually more expensive than ceramic substrates, some manufacturers and suppliers believe metallic substrates may require less precious metal loading than ceramic substrates due to the reduced light-off times they provide.

Improving insulation of the exhaust system is another method of furnishing heat to the catalyst. Similar to close-coupled catalysts, the principle behind insulating the exhaust system is to conserve the heat generated in the engine for aiding catalyst warm-up. Through the use of laminated thin-wall exhaust pipes, less heat will be lost in the exhaust system, enabling quicker catalyst light-off. As an added benefit, the use of insulated exhaust pipes will also reduce exhaust noise. Increasing numbers of manufacturers are expected to utilize air-gap exhaust manifolds (i.e., manifolds with metal inner and outer walls and an insulating layer of air sandwiched between them) for further heat conservation.

Besides the hardware modifications described above, motorcycle manufacturers may borrow from other current automobile techniques. These include using engine calibration changes such as a brief period of substantial ignition retard, increased cold idling speed, and leaner air-fuel mixtures to quickly provide heat to a catalyst after cold-starts. Only software modifications are required for an engine which already uses a computer to control the fuel delivery and other engine systems. For these engines, calibration modifications provide manufacturers with an inexpensive method to quickly achieve light-off of catalytic converters. When combined with pre-catalysts, computer-controlled secondary air injection, and the other heat conservation techniques described above, engine calibration techniques may be very effective at providing the required heat to the catalyst for achieving the Tier 2 standard. These techniques are currently in use on most low emission vehicle (LEV) automobiles and may have applications in on-road motorcycles.

The nature of motorcycling makes riders particularly aware of the many safety issues that confront them. Many riders that submitted comments to us following the publication of the ANPRM in December of 2000 questioned whether catalytic converters could be implemented on motorcycles without increasing the risk of harm to the rider and/or passenger. The primary concern is regarding the close proximity of the riders to hot exhaust pipes and the catalytic converter. Protecting the rider from the excessive heat is a concern for both riders and manufacturers. The current use of catalytic converters on a number of motorcycles (accounting for tens of thousands of motorcycles in the current U.S. fleet and over 15 million worldwide) already indicates that these issues are not insurmountable on a variety of motorcycle styles and engine sizes. Countries that have successfully implemented catalyst-based emission control programs for motorcycles (some of which have many years of experience) do not report any safety issues associated with the use of catalytic converters on motorcycles under real-world conditions.[45] A number of approaches to shielding the rider from the heat of the catalytic converter are possible, such as exterior pipe covers, shielded foot rests, and similar components. Some manufacturers have found that placing the converter on the underside of the engine can keep it adequately distant from the rider. Others may use double-pipe systems that reduce overall heat loss while remaining cooler on the exterior. Based on the significant lead time proposed that would be allowed for meeting these standards, as well as on the two years of prior experience in California before meeting the requirements federally, we believe that these issues can be satisfactorily resolved for the proportion of motorcycles for which catalytic converters would likely be used to meet the proposed standards.

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[45] See written testimony of the Manufacturers of Emission Controls Association on the Proposed Rulemaking on Control of Emissions from Nonroad Large Spark-Ignited Engines and Recreational Engines. Available in the public docket for review (Docket A-2000-01; document IV-D-213).

We do not expect any of these possible changes to adversely affect performance. Indeed, the transition to some of these technologies (e.g., advanced fuel injection) would be expected to improve performance, fuel economy, and reliability. A direct comparison of several motorcycle models in the EPA certification database between the "California" model (where one is offered; it is the exception rather than the rule that a manufacturer offers a separate engine system for California) and the model sold in the rest of the U.S. reveals no change in the performance characteristics in the database (e.g., rated horsepower, torque). We request comment on the impact these anticipated changes might have on performance-related factors.

VI. Projected Impacts

This section summarizes the projected impacts of the proposed emission standards. The anticipated environmental benefits are compared with the projected cost of the program for an assessment of the cost per ton of reducing emissions for this proposal.

A. Environmental Impact

Diurnal evaporative emission factors from marine vessels were developed using established equations for determining evaporative emission factors as a function of ambient conditions and fuel tank size. Permeation emissions were developed based on known material permeation rates as a function of surface area and temperature. Other inputs for these calculations were taken from the latest version of our NONROAD model. Emission estimates for highway motorcycles were developed using information on the emission levels of current motorcycles and updated information on motorcycle use provided by the motorcycle industry. A more detailed description of the methodology used for projecting inventories and projections for additional years can be found in the Chapter 6 of the Draft Regulatory Support Document. We request comment on all aspects of the emission inventory analysis, including the usage rates and other inputs used in the analysis.

Tables V.A-1 and V.A-2 contain the projected emission inventories for the years 2010 and 2020, respectively, from the engines and vehicles subject to this proposal. The inventories are presented for the base case which assumes no change from current conditions (i.e., without the proposed standards taking effect) and assuming the proposed standards take effect. The inventories for 2010 and 2020 include the effect of growth. The percent reductions based on a comparison of estimated emission inventories with and without the proposed emission standards are also presented.

Table VI.A-1
2010 Projected Emissions Inventories (thousand short tons)

Category	NOx			HC*		
	base case	with proposed standards	percent reduction	base case	with proposed standards	percent reduction
Marine SI Evap	0	0	0%	106	91	14%
Highway motorcycles	11	10	9%	46	41	11%
Total	11	10	9%	152	132	13%

* Evaporative HC for marine SI; exhaust HC for highway motorcycles.

Table VI.A-2
2020 Projected Emissions Inventories (thousand short tons)

Category	NOx			HC*		
	base case	with proposed standards	percent reduction	base case	with proposed standards	percent reduction
Marine SI Evap	0	0	0%	114	50	56%
Highway motorcycles	14	7	50%	58	29	50%
Total	14	7	50%	172	79	53%

* Evaporative HC for marine SI; exhaust HC for highway motorcycles.

As described in Section II, there will also be environmental benefits associated with reduced haze in many sensitive areas.

Finally, anticipated reductions in hydrocarbon emissions will correspond with reduced emissions of the toxic air emissions referenced in Section II. In 2020, the projected reduction in hydrocarbon emissions should result in an equivalent percent reduction in air toxic emissions.

B. Economic Impact

In assessing the economic impact of setting emission standards, we have made a best estimate of the technologies and their associated costs to meet the proposed standards. In making our estimates we have relied on our own technology assessment, which includes information supplied by individual manufacturers and our own in-house testing. Estimated costs include variable costs (for hardware and assembly time) and fixed costs (for research and development, retooling, and certification). We projected that manufacturers will recover the fixed costs over the first five years of production and used an amortization rate of 7 percent in our analysis. The analysis also considers total operating costs, including maintenance and fuel consumption. Cost estimates based on the projected technologies represent an expected change in the cost of engines as they begin to comply with new emission standards. All costs are presented in 2001 dollars. Full details of our cost analysis can be found in Chapter 5 of the Draft Regulatory Support Document. We request comment on this cost information.

Cost estimates based on the current projected costs for our estimated technology packages represent an expected incremental cost of vehicles in the near term. For the longer term, we have identified factors that would cause cost impacts to decrease over time. First, as noted above, we project that manufacturers will spread their fixed costs over the first five years of production. After the fifth year of production, we project that the fixed costs would be retired and the per unit costs would be reduced as a result.

For highway motorcycles above 50cc, the analysis also incorporates the expectation that manufacturers and suppliers will apply ongoing research and manufacturing innovation to making emission controls more effective and less costly over time. Research in the costs of manufacturing has consistently shown that as manufacturers gain experience in production and use, they are able to apply innovations to simplify machining and assembly operations, use lower cost materials, and reduce the number or complexity of component parts.[46] (see the Draft Regulatory Support Document for additional information). The cost analysis generally incorporates this learning effect by decreasing estimated variable costs by 20 percent starting in the third year of production and an additional 20 percent starting in the sixth year of production. Long-term impacts on costs are expected to decrease as manufacturers fully amortize their fixed costs and learn to optimize their designs and production processes to meet the standards more efficiently. The learning curve has not been applied to the marine evaporative controls or the motorcycles under 50cc because we expect manufacturers to use technologies that will be well established prior to the start of the program. We request comment on the methodology used to incorporate the learning curve into the analysis.

Evaporative emission controls for boats with marine SI engines have an average projected cost of about $36 per boat. While manufacturers may choose from a wide variety of technologies to meet emission standards, we base these cost estimates on all boats using limited flow orifices for diurnal emission control, fluorination for fuel tank permeation control and low permeability barrier for fuel hose permeation control. Under the proposed emission-credit program, manufacturers would have the option of offering different technologies to meet emission standards. Where there is a current demand for more sophisticated fuel-tank technology, we would expect a greater cost impact than from the lower-cost, high-production models. Emissions are reduced by preventing evaporation of fuel, so these controls translate directly into a fuel savings, which we have estimated to be about $27 per boat (net present value at the point of sale). Therefore, we get an average cost of $9 per boat when the fuel savings are considered.

We project average costs of $26 per Class III highway motorcycle to meet the Tier 1 standard and $35 to meet the Tier 2 standards. We anticipate the manufacturers will meet the proposed emission standards with several technology changes, including electronic fuel injection, catalysts, pulse-air systems, and other general improvements to engines. For motorcycles with engines of less than 50cc, we project average costs of $44 per motorcycle to meet the proposed standards. We anticipate the manufacturers of these small motorcycles (mostly scooters) will meet the proposed emission standards by transitioning any remaining two-stroke engines to four-strokes. The costs are based on the conversion to 4-stroke because we believe this to be the most likely technology path for the majority of scooters. Manufacturers could also choose to employ advanced technology two-stroke (e.g., direct injection and/or catalysts) designs. The process of developing clean technologies is very much underway already as a result of regulatory actions in Europe and the rest of world where the primary markets for small motorcycles exist. Chapter 4 of the Draft Regulatory Support Document describes these technologies further. Because several models are already available with the anticipated long-term emission-control technologies, we believe that manufacturers and consumers will be able to bear the added cost associated with the new emission standards.

The above analysis presents unit cost estimates for each engine type. These costs represent the total set of costs the engine manufacturers will bear to comply with emission standards. With current and projected estimates of engine and equipment sales, we translate these costs into projected direct costs to the nation for the new emission standards in any year. A summary of the annualized costs to manufacturers by equipment type is presented in Table VI.B-1. (The annualized costs are determined over the first twenty-years that the proposed standards would be effective.) The annual cost savings for marine vessels and highway motorcycles (<50cc only) are due to reduced fuel costs. The total fleetwide fuel savings start slowly, then increase as greater numbers of compliant vessels or motorcycles (<50cc only) enter the fleet. Table VI.B-1 presents a summary of the annualized reduced operating

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[46] For further information on learning curves, see previous final rules for Tier 2 highway vehicles (65 FR 6698, February 10, 2000), marine diesel engines (64 FR 73300, December 29, 1999), nonroad diesel engines (63 FR 56968, October 23, 1998), and highway diesel engines (62 FR 54694, October 21, 1997).

costs as well.

Table VI.B-1
Estimated Annual Cost to Manufacturers and Annual Fuel Savings
Due to the Proposed Standards

Category	Annualized Cost to Manufacturers (millions/year)	Annual Fuel Savings (millions/year)
Marine SI Evap	$27.5	$15.6
Highway Motorcycles	$18.8	$0.2
Aggregate*	$42.0	$13.3

* Because of the different proposed implementation dates for the two classes, the aggregate is based on a 22 year (rather than 20 year) annualized cost. Therefore, the aggregate is not equal to the sum of the costs for the two engine types.

C. Cost per Ton of Emissions Reduced

We calculated the cost per ton of emission reductions for the proposed standards. For these calculations, we attributed the entire cost of the proposed program to the control of ozone precursor emissions (HC or NOx or both). Table VI.C-1 presents the discounted cost-per-ton estimates for this proposal. Reduced operating costs offsets a portion of the increased cost of producing the cleaner marine vessels and highway motorcycles (<50cc only).

Table VI.C-1
Estimated Cost-per-Ton of the Proposed Emission Standards

Category	Effective Date	Discounted Reductions per Engine (short tons)	Pollutants	Discounted cost per ton	
				Without Fuel Savings	With Fuel Savings
Marine SI diurnal tank permeation hose permeation **aggregate**	2008	0.01 0.02 0.04 **0.07**	Evaporative HC	$745 $523 $367 **$478**	$382 $160 $4 **$115**
Highway motorcycles >50cc	2006	0.03	Exhaust HC+NOx	$970	$970
Highway motorcycles >50cc	2010	0.03	Exhaust HC+NOx	$1,230	$1,230
Highway motorcycles <50cc	2006	0.02	Exhaust HC	$2,130	$1,750

Because the primary purpose of cost-effectiveness is to compare our program to alternative programs, we made a comparison between the cost per ton values presented in this chapter and the cost-effectiveness of other programs. Table VI.C-2 summarizes the cost effectiveness of several recent EPA actions for controlled emissions from mobile sources. Additional discussion of these comparisons is contained in the Regulatory Impact Analysis.

Table VI.C-2
Cost-effectiveness of Previously Implemented
Mobile Source Programs (Costs Adjusted to 2001 Dollars)

Program	*$/ton*
Tier 2 vehicle/gasoline sulfur	1,437 - 2,423
2007 Highway HD diesel	1,563-2,002
2004 Highway HD diesel	227 - 444
Off-highway diesel engine	456 - 724
Tier 1 vehicle	2,202 - 2,993
NLEV	2,069
Marine SI engines	1,255 - 1,979
On-board diagnostics	2,480
Marine CI engines	26 - 189

D. Additional Benefits

For the marine evaporative emission standards, we expect there will be a fuel savings as manufacturers redesign their vessels to comply with the proposed standards. This savings is the result of preventing fuel from evaporating into the atmosphere. Overall, the fuel savings associated with the anticipated changes in technology are estimated to be about 31 million gallons per year once the program is fully phased in.

For the motorcycle emission standards, we expect there will be a fuel savings as manufacturers redesign their engines to comply with the proposed standards. This savings is the result of converting motorcycles <50cc from 2-stroke designs to more fuel efficient 4-stroke designs. Overall, the fuel savings associated with the anticipated changes in technology are estimated to be about 0.3 million gallons per year once the program is fully phased in.

The controls in this rule are a highly cost-effective means of obtaining reductions in HC and NOx emissions. A related subject concerns the value of the health and welfare benefits these reductions might produce. While we have not conducted a formal benefit-cost analysis for this rule, we believe the benefits of this rule clearly will greatly outweigh any cost.

Ozone causes a range of health problems related to breathing, including chest pain, coughing, and shortness of breath Exposure to PM (including secondary PM formed in the atmosphere from NOx and NMHC emissions) is associated with premature death, increased emergency room visits, and increased respiratory symptoms and disease Children, the elderly, and individuals with pre-existing respiratory conditions are most at risk regarding both ozone and PM. In addition, ozone, NOx, and PM adversely affect the environment in various ways, including crop damage, acid rain, and visibility impairment.

In two recent mobile-source control rules, for light-duty vehicles (the Tier 2/Gasoline Sulfur rule) and for highway heavy-duty engines and diesel fuel, we conducted a full analysis of the expected benefits once the rules were fully implemented. These rules, which primarily reduced NOx and NMHC emissions, were seen to yield health and welfare benefits far exceeding the costs. Besides reducing premature mortality, there were large projected reductions in chronic bronchitis cases, hospital admissions for respiratory and cardiovascular causes, asthma attacks and other respiratory symptoms, and a variety of other effects.

Given the similarities in pollutants being controlled, we would expect this rule to produce substantial benefits compared to its cost.

VII. Public Participation

This rule was proposed under the authority of section 307(d) of the Clean Air Act. We request comment on all aspects of this proposal. This section describes how you can participate in this process.

A. How Do I Submit Comments?

We are opening a formal comment period by publishing this document. We will accept comments for the period indicated under "DATES" above. If you have an interest in the program described in this document, we encourage you to comment on any aspect of this rulemaking. We request comment on various topics throughout this proposal.

We attempted to incorporate all the comments received in response to the Advance Notice of Proposed Rulemaking, though not all comments are addressed directly in this document. Anyone who has submitted comments on the Advance Notice, or any previous publications related to this proposal, and feels that those comments have not been adequately addressed is encouraged to resubmit comments as appropriate.

Your comments will be most useful if you include appropriate and detailed supporting rationale, data, and analysis. If you disagree with parts of the proposed program, we encourage you to suggest and analyze alternate approaches to meeting the air quality goals described in this proposal. You should send all comments, except those containing proprietary information, to our Air Docket (see "Addresses") before the end of the comment period.

If you submit proprietary information for our consideration, you should clearly separate it from other comments by labeling it "Confidential Business Information." You should also send it directly to the contact person listed under "FOR FURTHER INFORMATION CONTACT" instead of the public docket. This will help ensure that no one inadvertently places proprietary information in the docket. If you want us to use your confidential information as part of the basis for the final rule, you should send a nonconfidential version of the document summarizing the key data or information. We will disclose information covered by a claim of confidentiality only through the application of procedures described in 40 CFR part 2. If you don't identify information as confidential when we receive it, we may make it available to the public without notifying you.

B. Will There Be a Public Hearing?

We will hold a public hearing for issues related to highway motorcycles on September 17 in Ypsilanti, MI. We will hold a public hearing for issues related to marine vessels on September 23 in Ann Arbor, MI. The hearings will start at 9:30 am and continue until testimony is complete. See "ADDRESSES" above for location and phone information.

If you would like to present testimony at a public hearing, we ask that you notify the contact person listed above at least ten days before the hearing. You should estimate the time you need for your presentation and identify any needed audio/visual equipment. We suggest that you bring copies of your statement or other material for the EPA panel and the audience. It would also be helpful if you send us a copy of your statement or other materials before the hearing.

We will make a tentative schedule for the order of testimony based on the notification we receive. This schedule will be available on the morning of each hearing. In addition, we will reserve a block of time for anyone else in the audience who wants to give testimony.

We will conduct the hearing informally, and technical rules of evidence won't apply. We will arrange for a written transcript of the hearing and keep the official record of the hearing open for 30 days to allow you to submit supplementary information. You may make arrangements for copies of the transcript directly with the court reporter.

VII. Administrative requirements

A. Administrative Designation and Regulatory Analysis (Executive Order 12866)

Under Executive Order 12866 (58 FR 51735, October 4, 1993), the Agency must determine whether the regulatory action is "significant" and therefore subject to review by the Office of Management and Budget (OMB) and the requirements of this Executive Order. The Executive Order defines a "significant regulatory action" as any regulatory action that is likely to result in a rule that may:

Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, Local, or Tribal governments or communities;
Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients thereof; or
Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

A Draft Regulatory Support Document has been prepared and is available in the docket for this rulemaking and at the internet address listed under "ADDRESSES" above. Pursuant to the terms of Executive Order 12866, OMB has notified EPA that it considers this a "significant regulatory action" within the meaning of the Executive Order. EPA has submitted this action to OMB for review. Changes made in response to OMB suggestions or recommendations will be documented in the public record.

B. Regulatory Flexibility Act

1. Overview

The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this action on small entities, small entity is defined as: (1) a small business that meet the definition for business based on SBA size standards; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field. The following table provides an overview of the primary SBA small business categories potentially affected by this regulation.

Table VIII.B-1: Primary SBA Small Business Categories Potentially Affected by this Proposed Regulation

Industry	NAICS[a] Codes	Defined by SBA as a Small Business If:[b]
Motorcycles and motorcycle parts manufacturers	336991	<500 employees
Independent Commercial Importers of Vehicles and parts	421110	<100 employees
Boat Building and Repairing	336612	< 500 employees
Fuel Tank Manufacturers	336211	<1000 employees

a. North American Industry Classification System
b. According to SBA's regulations (13 CFR 121), businesses with no more than the listed number of employees or dollars in annual receipts are considered "small entities" for purposes of a regulatory flexibility analysis.

2. Background

In accordance with Section 603 of the RFA, EPA prepared an initial regulatory flexibility analysis (IRFA) that examines the impact of the proposed rule on small entities along with regulatory alternatives that could reduce that impact. In preparing this IRFA, we looked at both the effect of this proposal and the October 5, 2001 proposal for other nonroad categories (66 FR 51098). The IRFA is available for review in the docket and is summarized below.

The process of establishing standards for nonroad engines began in 1991 with a study to determine whether emissions of carbon monoxide (CO), oxides of nitrogen (NOx), and volatile organic compounds (VOCs) from new and existing nonroad engines, equipment, and vehicles are significant contributors to ozone and CO concentrations in more than one area that has failed to attain the national ambient air quality standards for ozone and CO.[47] In 1994, EPA finalized its finding that nonroad engines as a whole "are significant contributors to ozone or carbon monoxide concentrations" in more than one ozone or carbon monoxide nonattainment area.[48]

Upon this finding, the Clean Air Act (CAA or the Act) requires EPA to establish standards for all classes or categories of new nonroad engines that cause or contribute to air quality nonattainment in more than one ozone or carbon monoxide (CO) nonattainment area. Since the finding in 1994, EPA has been engaged in the process of establishing programs to control emissions from nonroad engines used in many different applications. Nonroad categories already regulated include:

Land-based compression ignition (CI) engines (e.g., farm and construction equipment),
Small land-based spark-ignition (SI) engines (e.g., lawn and garden equipment, string trimmers),
Marine engines (outboards, personal watercraft, CI commercial, CI engines <37kW)
Locomotive engines

[47] "Nonroad Engine and Vehicle Emission Study Report and Appendices," EPA-21A-201, November 1991 (available in Air docket A-91-24). It is also available through the National Technical Information Service, referenced as document PB 92-126960.

[48] 59 FR 31306 (July 17, 1994).

On December 7, 2000, EPA issued an Advance Notice of Proposed Rulemaking (ANPRM) for the control of emissions from nonroad large SI engines, recreational vehicles (marine and land-based), and highway motorcycles. As discussed in the ANPRM, the proposal under development will be a continuation of the process of establishing standards for nonroad engines and vehicles, as required by CAA section 213(a)(3). If, as expected, standards for these engines and vehicles are established, essentially all new nonroad engines will be required to meet emissions control requirements.

This proposal is the second part of an effort to control emissions from nonroad engines that are currently unregulated and for updating Federal emissions standards for highway motorcycles. The first part of this effort was a proposal published on October 5, 2001 for emission control from large spark-ignition engines such as those used in forklifts and airport tugs; recreational vehicles using spark-ignition engines such as off-highway motorcycles, all-terrain vehicles, and snowmobiles; and recreational marine diesel engines.

EPA found that the nonroad engines described above cause or contribute to air quality nonattainment in more than one ozone or carbon monoxide (CO) nonattainment area.[49] CAA section 213 (a)(3) requires EPA to establish standards that achieve the greatest degree of emissions reductions achievable taking cost and other factors into account. EPA plans to propose emissions standards and related programs consistent with the requirements of the Act.

In addition to proposing standards for the nonroad vehicles and engines noted above, this proposal reviews EPA requirements for highway motorcycles. The emissions standards for highway motorcycles were established twenty-three years ago. These standards allow motorcycles to emit about 100 times as much per mile as new cars and light trucks. California recently adopted new emissions standards for highway motorcycles, and new standards and testing cycles are being considered internationally. There may be opportunities to reduce emissions in a cost-effective way.

The program under consideration will cover engines and vehicles that vary in design and use, and many readers may only be interested in one or two of the applications. There are various ways EPA could group the engines and present information. For purposes of the proposed rule EPA has chosen to group engines by common applications (e.g, recreational land-based engines, marine engines, large spark ignition engines used in commercial applications).

3. Summary of Regulated Small Entities

The small entities directly regulated by this proposed rule are the following:

a. Highway Motorcycles

Of the numerous manufacturers supplying the U.S. market for highway motorcycles, Honda, Harley Davidson, Yamaha, Kawasaki, Suzuki, and BMW are the largest, accounting for 95 percent or more of the total U.S. sales. All of these companies except Harley-Davidson and BMW also manufacture off-road motorcycles and ATVs for the U.S. market. Harley-Davidson is the only company manufacturing highway motorcycles exclusively in the U.S. for the U.S. market.

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[49] see Final Finding, "Control of Emissions from New Nonroad Spark-Ignition Engines Rated above 19 Kilowatts and New Land-Based Recreational Spark-Ignition Engines" for EPA's finding for Large SI engines and recreational vehicles (65 FR 76790, December 7, 2000). EPA's findings for marine engines are contained in 61 FR 52088 (October 4, 1996) for gasoline engines and 64 FR 73299 (December 29, 1999) for diesel engines.

Since highway motorcycles have had to meet emission standards for the last twenty years, EPA has good information on the number of companies that manufacture or market highway motorcycles for the U.S. market in each model year. In addition to the big six manufacturers noted above, EPA finds as many as several dozen more companies that have operated in the U.S. market in the last couple of model years. Most of these are U.S. companies that are either manufacturing or importing motorcycles, although a few are U.S. affiliates of larger companies in Europe or Asia. Some of the U.S. manufacturers employ only a few people and produce only a handful of custom motorcycles per year, while others may employ several hundred and produce up to several thousand motorcycles per year.

The proposed emission standards impose no new development or certification costs for any company producing compliant engines in California. If fact, implementing the California standards with a two-year delay also allows manufacturers to streamline their production to further reduce the cost of compliance. The estimated hardware costs are less than one percent of the cost of producing a highway motorcycle, so none of these companies should have a compliance burden greater than one percent of revenues. We expect that a small number of companies affected by EPA emission standards will not already be certifying products in California. For these companies, the modest effort associated with applying established technology will add compliance costs representing between 1 and 3 percent of revenues. The flexible approach we are proposing to limit testing, reporting, and recordkeeping burden prevent excessive costs for all these companies.

b. Marine Vessels

Marine vessels include the boat, engine, and fuel system. The evaporative emission controls discussed above may affect the boat builders and/or the fuel tank manufacturers. Exhaust emission controls including NTE requirements, as addressed in the August 29, 1999 SBAR Panel Report, would affect the engine manufacturers and may affect boat builders.

EPA has less precise information about recreational boat builders than is available about engine manufacturers. EPA has utilized several sources, including trade associations and Internet sites when identifying entities that build and/or sell recreational boats. EPA has also worked with an independent contractor to assist in the characterization of this segment of the industry. Finally, EPA has obtained a list of nearly 1,700 boat builders known to the U.S. Coast Guard to produce boats using engines for propulsion. At least 1,200 of these companies install engines that use gasoline fueled engines and would therefore be subject to the evaporative emission control program discussed above. More than 90% of the companies identified so far would be considered small businesses as defined by SBA. EPA continues to develop a more complete picture of this segment of the industry and will provide additional information as it becomes available.

Based on information supplied by a variety of recreational boat builders, fuel tanks for boats using SI marine engines are usually purchased from fuel tank manufacturers. However, some boat builders construct their own fuel tanks. The boat builder provides the specifications to the fuel tank manufacturer who helps match the fuel tank for a particular application. It is the boat builder’s responsibility to install the fuel tank and connections into their vessel design. For vessels designed to be used with small outboard engines, the boat builder may not install a fuel tank; therefore, the end user would use a portable fuel tank with a connection to the engine.

EPA has determined that total sales of tanks for gasoline marine applications is approximately 550,000 units per year. The market is broken into manufacturers that produce plastic tanks and manufacturers that produce aluminum tanks. EPA has determined that there are at least seven companies that make plastic fuel tanks with total sales of approximately 440,000 units per year. EPA has determined that there at least four companies that make aluminum fuel tanks with total sales of approximately 110,000 units per year. All but one of these plastic and aluminum fuel tank manufacturers is a small business as defined under SBA.

EPA has determined that there are at least 16 companies that manufacture CI diesel engines for recreational vessels. Nearly 75 percent of diesel engines sales for recreational vessels in 2000 can be attributed to three large companies. Six of the 16 identified companies are considered small businesses as defined by SBA. Based on sales estimates for 2000, these six companies represent approximately 4 percent of recreational marine diesel engine sales. The remaining companies each comprise between two and seven percent of sales for 2000.

EPA has determined that there are at least 24 companies that manufacture SD/I gasoline engines (including airboats and jet boats) for recreational vessels. Seventeen of the identified companies are considered small businesses as defined by SBA. These 17 companies represent approximately 6 percent of recreational gasoline marine engines sales for 2000. Approximately 70-80 percent of gasoline SD/I engines manufactured in 2000 can be attributed to one company. The next largest company is responsible for about 10-20 percent of 2000 sales.

For any boat builders that would certify to the proposed requirements, the costs of compliance would be much less than one percent of their revenues. Incremental costs of fuel tanks are dwarfed by the capital and variable costs associated with manufacturing power boats. Of the six known small businesses producing plastic fuel tanks for gasoline-powered marine vessels, these companies would have costs approaching 10 percent of revenues. While this is a large percentage, it comes predominantly from increasing variable costs to upgrade the fuel tanks. Capital expenses to upgrade to compliant products are relatively small. Also, to the extent that tank manufacturers certify their products, they will be increasing the value of their product for their customers, who would otherwise need to assume certification responsibilities. As a result, we believe that these companies will be able to largely recover their compliance costs over time. The net cost absorbed by tank manufacturers will be much less than one percent.

For this proposal as a whole, there are hundreds of small businesses that will have total compliance costs less than 1 percent of their annual revenues. We estimate that three companies will have compliance costs between 1 and 3 percent of revenues and six companies will have compliance costs exceeding 3 percent of revenues.

4. Potential Reporting, Record Keeping, and Compliance

For any emission control program, EPA must have assurances that the regulated engines will meet the standards. Historically, EPA programs have included provisions placing manufacturers responsible for providing these assurances. The program that EPA is considering for manufacturers subject to this proposal may include testing, reporting, and record keeping requirements. Testing requirements for some manufacturers may include certification (including deterioration testing), and production line testing. Reporting requirements would likely include test data and technical data on the engines including defect reporting. Manufacturers would likely have to keep records of this information.

5. Related Federal Rules

The Panel is aware of several other current Federal rules that relate to the proposed rule under development. During the Panel's outreach meeting, SERs specifically pointed to Consumer Product Safety Commission (CPSC) regulations covering ATVs, and noted that they may be relevant to crafting an appropriate definition for a competition exclusion in this category. The Panel recommends that EPA continue to consult with the CPSC in developing a proposed and final rule in order to better understand the scope of the Commission's regulations as they may relate to the competition exclusion.

Other SERs, representing manufacturers of marine engines, noted that the U.S. Coast Guard regulates vessel tanks, most notably tank pressure and anti-siphoning requirements for carburetted engines. Tank manufacturers would have to take these requirements into account in designing evaporative control systems. The

Panel recommends that EPA continue to work with the Coast Guard to evaluate the safety implications of any proposed evaporative emissions standards and to avoid interference with Coast Guard safety regulations.

The Panel is also aware of other Federal rules that relate to the categories that EPA would address with the proposed rule, but are not likely to affect policy considerations in the rule development process. For example, there are now EPA noise standards covering off-road motorcycles; however, EPA expects that most emission control devices are likely to reduce, rather than increase, noise, and that therefore the noise standards are not likely to be important in developing a proposed rule.

OTAQ is currently developing a proposal that would revise the rule assigning fees to be paid by parties required to certify engines in return for continuing Government oversight and testing. Among other options, EPA could propose to extend the fee structure to several classes of non-road engines for which requirements are being established for the first time under the Recreation Rule. The Panel understands that EPA will carefully examine the potential impacts of the Fees Rule on small businesses. The Panel also notes that EPA's Office of Air Quality, Planning, and Standards (OAQPS) is preparing a Maximum Achievable Control Technology (MACT) standard for Engine Testing Facilities, which is a related matter.

6. Significant Panel Findings

The Panel considered a wide range of options and regulatory alternatives for providing small businesses with flexibility in complying with the proposed emissions standards and related requirements. As part of the process, the Panel requested and received comment on several ideas for flexibility that were suggested by SERs and Panel members. The major options recommended by the Panel are summarized below. The complete set of recommendations can be found in Section 9 of the Panel's full Report.

The panel recommendations for motorcycles described below were developed for the exhaust emission standards. Potential controls for permeation emissions from motorcycles were not part of the panel process, because review of the need for such controls resulted from comments received on the related recreational vehicles proposal and further investigation by EPA following the end of the panel process. However, EPA believes that the potential permeation emission controls on motorcycles would not, if promulgated, have a significant effect on the burdens of this rule on regulated entities, or on small entities in particular, due to the relatively low cost and the availability of materials and treatment support by outside vendors. Low permeation fuel hoses are available from vendors today, and we would expect that surface treatment for tanks would be applied through an outside company. We request comment on the need for flexibilities for the potential permeation standards, if they are adopted. If the comments or other information the Agency receives indicate that flexibilities similar to (or the same as) those for the motorcycle exhaust standards are appropriate for the motorcycle permeation standards, then we will adopt such flexibilities as part of our final rule if we adopt such permeation standards.

Many of the flexible approaches recommended by the Panel can be applied to either marine vessels or highway motorcycles. These approaches are listed below:

1. Additional lead time for compliance
2. Hardship provisions
3. Certification flexibility
4. Broadly defined product certification families
5. Averaging, banking, and trading

Based on consultations with SERs, the Panel believes that the first two provisions listed above are likely to provide the greatest flexibility for many small entities. These provisions are likely to be most valuable because they either provide more time for compliance (e.g., additional lead time and hardship provisions). The remaining three approaches have the potential to reduce near-term and even long-term costs once a small entity has a product it is preparing to certify. These are important in that the reducing costs of testing several emission families and/or developing deterioration factors. Small businesses could also meet an emission standard on average or generate credits for producing engines which emit at levels below the standard; these credits could then be sold to other manufacturers for compliance or banked for use in future model years.

During the consultation process, it became evident that, in a few situations, it could be helpful to small entities if unique provisions were available. Two such provisions are described below.

a. Marine Vessel Tanks

Most of this sector involves small fuel tank manufacturers and small boat builders. The Panel recommends that the program be structured with longer lead times and an early credit generation program to enable the fuel tank manufacturers to implement controls on tanks on a schedule consistent with their normal turnover of fuel tank molds. Also, the panel recommends that the program allow small businesses have the option of certifying to the evaporative emission performance standards based on fuel tank design characteristics designed to reduce emissions.

b. Highway Motorcycles

The California Air Resources Board (CARB) has found that California's Tier 2 standard is potentially infeasible for small manufacturers. Therefore, the Panel recommends that EPA delay making decisions on the applicability to small businesses of Tier 2 or other such revisions to the federal regulations until California's 2006 review is complete.

7. Summary of SBREFA Process and Panel Outreach

As required by section 609(b) of the RFA, as amended by SBREFA, EPA also conducted outreach to small entities and convened a Small Business Advocacy Review Panel to obtain advice and recommendations of representatives of the small entities that potentially would be subject to the rule's requirements.

On May 3, 2001, EPA's Small Business Advocacy Chairperson convened this Panel under Section 609(b) of the Regulatory Flexibility Act(RFA) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA). In addition to the Chair, the Panel consisted of the Director of the Assessment and Standards Division (ASD) within EPA's Office of Transportation and Air Quality, the Chief Counsel for Advocacy of the Small Business Administration, and the Deputy Administrator of the Office of Information and Regulatory Affairs within the Office of Management and Budget. As part of the SBAR process, the Panel met with small entity representatives (SERs) to discuss the potential emission standards and, in addition to the oral comments from SERs, the Panel solicited written input. In the months preceding the Panel process, EPA conducted outreach with small entities from each of the five sectors as described above. On May 18, 2001, the Panel distributed an outreach package to the SERs. On May 30 and 31, 2001, the Panel met with SERs to hear their comments on preliminary alternatives for regulatory flexibility and related information. The Panel also received written comments from the SERs in response to the discussions at this meeting and the outreach materials. The Panel asked SERs to evaluate how they would be affected under a variety of regulatory approaches, and to provide advice and recommendations regarding early ideas for alternatives that would provide flexibility to address their compliance burden.

SERs representing companies in each of the sectors addressed by the Panel raised concerns about the potential costs of complying with the rules under development. For the most part, their concerns were focused on two issues: (1) the difficulty (and added cost) that they would face in complying with certification requirements associated with the standards EPA is developing, and (2) the cost of meeting the standards themselves. SERs observed that these costs would include the opportunity cost of deploying resources for research and development, expenditures for tooling/retooling, and the added cost of new engine designs or other parts that would need to be added to equipment in order to meet EPA emission standards. In addition, in each category, the SERs noted that small manufacturers (and in the case of one category, small importers) have fewer resources and are therefore less well equipped to undertake these new activities and expenditures. Furthermore, because their product lines tend to be smaller, any additional fixed costs must be recovered over a smaller number of units. Thus, absent any provisions to address these issues, new emission standards are likely to impose much more significant adverse effects on small entities than on their larger competitors.

The Panel discussed each of the issues raised in the outreach meetings and in written comments by the SERs. The Panel agreed that EPA should consider the issues raised by the SERs and that it would be appropriate for EPA to propose and/or request comment on various alternative approaches to address these concerns. The Panel's key discussions centered around the need for and most appropriate types of regulatory compliance alternatives for small businesses. The Panel considered a variety of provisions to reduce the burden of complying with new emission standards and related requirements. Some of these provisions would apply to all companies (e.g., averaging, banking, and trading), while others would be targeted at the unique circumstances faced by small businesses. A complete discussion of the regulatory alternatives recommended by the Panel can be found in the Final Panel Report. Copies of the Final Report can be found in the docket for this rulemaking or at http://www.epa.gov/sbrefa. Summaries of the Panel's recommended alternatives for each of the sectors subject to this action can be found in the respective sections of the preamble.

As required by section 609(b) of the RFA, as amended by SBREFA, EPA also conducted outreach to small entities and convened a Small Business Advocacy Review Panel to obtain advice and recommendations of representatives of the small entities that potentially would be subject to the rule's requirements. EPA's Small Business Advocacy Chairperson convened this on May 3, 2001. In addition to the Chair, the Panel consisted of the Director of the Assessment and Standards Division (ASD) within EPA's Office of Transportation and Air Quality, the Chief Counsel for Advocacy of the Small Business Administration, and the Deputy Administrator of the Office of Information and Regulatory Affairs within the Office of Management and Budget.

The proposal being developed includes marine sterndrive and inboard (SD/I) engines and boats powered by SI marine engines. In addition, EPA also intends to update EPA requirements for highway motorcycles. Finally, the proposal being developed included evaporative emission control requirements for gasoline fuel tanks and systems used on marine vessels.

The Panel met with Small Entity Representatives (SERs) to discuss the potential emissions standards and, in addition to the oral comments from SERs, the Panel solicited written input. In the months preceding the Panel process, EPA conducted outreach with small entities from each of the five sectors as described above. On May 18, 2001, the Panel distributed an outreach package to the SERs. On May 30 and 31, 2001, the Panel met with SERs to hear their comments on preliminary options for regulatory flexibility and related information. The Panel also received written comments from the SERs in response to the discussions at this meeting and the outreach materials. The Panel asked SERs to evaluate how they would be affected under a variety of regulatory approaches, and to provide advice and recommendations regarding early ideas to provide flexibility. See Section 8 of the Panel Report for a complete discussion of SER comments, and Appendices A and B for summaries of SER oral comments and SER written comments.

Consistent with the RFA/SBREFA requirements, the Panel evaluated the assembled materials and small-entity comments on issues related to the elements of the IRFA. A copy of the Panel report is included in the docket for this proposed rule. The following are Panel recommendations adopted by the Agency. Please note all Panel recommendations were adopted for this proposal.

a. Related Federal Rules

The Panel recommends that EPA continue to consult with the CPSC in developing a proposed and final rule in order to better understand the scope of the Commission's regulations as they may relate to the competition exclusion. In addition, the Panel recommends that EPA continue to work with the Coast Guard to evaluate the safety implications of any proposed evaporative emissions standards and to avoid interference with Coast Guard safety regulations.

b. Regulatory Flexibility Alternatives

The Panel recommends that EPA consider and seek comments on a wide range of alternatives, including the flexibility options described below.

1. Marine Vessels

a. *Smooth Transition to Proposed Standards*

The Panel recommends that EPA propose an approach that would implement any evaporative standards five years after a regulation for marine engines takes effect. The Panel also recommends that EPA seek comment on this five year period and on whether there are small entities whose product line is dominated by tanks that turn over at a time rate slower time than five years.

b. Design-Based Certification

The Panel recommends that EPA propose to grant small businesses the option of certifying to the evaporative emission performance requirements based on fuel tank design characteristics that reduce emissions. The Panel also recommends that EPA seek comment on and consider proposing an approach that would allow manufacturers to use this averaging approach with designs other than those listed in the final rule.

c. ABT of Emission Credits with Design-Based Certification

The Panel recommends that EPA allow manufacturers using design-based certification to generate credits. The Panel also recommends that EPA provide adequately detailed design specifications and associated emission levels for several technology options that could be used to certify.

d. Broadly Defined Product Certification Families

The Panel recommends that EPA take comment on the need for broadly defined emission families and how these families should be defined.

e. Hardship Provisions

The Panel recommends that EPA propose two types of hardship programs for marine engine manufacturers, boat builders and fuel tank manufacturers: 1)allow small businesses to petition EPA for additional lead time to comply with the standards; and 2)allow small businesses to apply for hardship relief if circumstances outside their control cause the failure to comply (i.e. supply contract broken by parts supplier) and if the failure to sell the subject fuel tanks or boats would have a major impact on the company's solvency. The Panel also recommends that EPA work with small manufacturers to develop these criteria and how they would be used.

2. Highway Motorcycles

The Panel recommends that EPA include the flexibilities described below for small entities with highway motorcycle annual sales of less than 3,000 units per model year (combined Class I, II, and III motorcycles) and fewer than 500 employees.

a. Delay of Proposed Standards

The Panel recommends that EPA propose to delay compliance with the Tier 1 standard of 1.4 g/km HC+NOx until the 2008 model year for small volume manufacturers. The Panel also recommends that EPA seek comment on whether additional time is needed for small businesses to comply with the Federal program. The Panel recommends that EPA participate with CARB in the 2006 progress review as these provisions are revisited, and delay making decisions on the applicability to small businesses of Tier 2 or other revisions to the federal regulations that are appropriate following the review. The Panel also recommends that any potential Tier 2 requirements for small manufacturer motorcycles consider potential test procedure changes arising from the ongoing World Motorcycle Test Cycle work described in the Panel Report.

b. Broader Engine Families

The Panel recommends that EPA keep the current existing regulations for small volume highway motorcycle manufacturers.

c. Exemption from Production Line Testing

The Panel recommends that EPA keep the current provisions for no mandatory production line testing requirement for highway motorcycles and allow the EPA to request production vehicles from any certifying manufacturer for testing.

d. Averaging, Banking, and Trading (ABT)

The Panel recommends that EPA propose an ABT program for highway motorcycles.

e. Hardship Provisions

The Panel recommends that EPA propose two types of hardship programs for highway motorcycles: 1)allow small businesses to petition EPA for additional lead time to comply with the standards; and 2) allow small businesses to apply for hardship relief if circumstances outside their control cause the failure to comply (i.e. supply contract broken by parts supplier) and if failure to sell the subject engines or vehicles would have a major impact on the company’s solvency. The Panel also recommends that EPA request comment on the California requirements, which do not include hardship provisions.

f. Reduced Certification Data Submittal and Testing Requirements

The Panel recommends that EPA keep current EPA regulations allow significant flexibility for certification by manufacturers who project fewer than 10,000 unit sales of combined Class I, II, and III motorcycles.

We invite comments on all aspects of the proposal and its impacts on small entities.

C. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq.* Information Collection Requests (ICR No. 1897.03 for marine vessels and 0783.43 for highway motorcycles) have been prepared by EPA, and a copy may be obtained from Susan Auby, Collection Strategies Division; U.S. Environmental Protection Agency (2822); 1200 Pennsylvania Ave., NW; Washington, DC 20460, by email at auby.susan@epamail.epa.gov, or by calling (202) 566-1672. A copy may also be downloaded off the internet at http://www.epa.gov.icr.

The information being collected is to be used by EPA to ensure that new marine vessels and fuel systems and new highway motorcycles comply with applicable emissions standards through certification requirements and various subsequent compliance provisions.

For marine vessels, the annual public reporting and recordkeeping burden for this collection of information is estimated to average 6 hours per response, with collection required annually. The estimated number of respondents is 810. The total annual cost for the first 3 years of the program is estimated to be $230,438 year and includes no annualized capital costs, $14,000 in operating and maintenance costs, at a total of 4,838 hours per year.

For highway motorcycles, the annual public reporting and recordkeeping burden for this collection of information is estimated to average 228 hours per response, with collection required annually. The estimated number of respondents is 73. The total annual cost for the first 3 years of the program is estimated to be $3,430,908 per year and includes no annualized capital costs, $2,728,000 in operating and maintenance costs, at a total of 16,647 hours per year.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, disclose, or provide information to or for a federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjusting the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are displayed in 40 CFR part 9 and 48 CFR chapter 15.

Comments are requested on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, Collection Strategies Division; U.S. Environmental Protection Agency (2822); 1200 Pennsylvania Ave., NW; Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th St., NW, Washington, DC 20503, marked "Attention: Desk Officer for EPA." Include the ICR number in any correspondence. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the FEDERAL REGISTER]**, a comment to OMB is best ensured of having its full effect if OMB receives it by **[Insert date 30 days after publication in the FEDERAL REGISTER]**. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

D. Intergovernmental Relations

1. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), P.L. 104-4, establishes requirements for federal agencies to assess the effects of their regulatory actions on state, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "federal mandates" that may result in expenditures to state, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the Administrator publishes with the final rule an explanation of why that alternative was not adopted.

Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

This rule contains no federal mandates for state, local, or tribal governments as defined by the provisions of Title II of the UMRA. The rule imposes no enforceable duties on any of these governmental entities. Nothing in the rule would significantly or uniquely affect small governments.

EPA has determined that this rule contains federal mandates that may result in expenditures of less than $100 million to the private sector in any single year. EPA believes that the proposal represents the least costly, most cost-effective approach to achieve the air quality goals of the rule. The costs and benefits associated with the proposal are discussed in Section VI and in the Draft Regulatory Support Document.

2. Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments)

Executive Order 13175, entitled "Consultation and Coordination with Indian Tribal Governments" (65 FR 67249, November 6, 2000), requires EPA to develop an accountable process to ensure "meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications." "Policies that have tribal implications" is defined in the Executive Order to include regulations that have "substantial direct effects on one or more Indian tribes, on the relationship between the Federal government and the Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes."

This proposed rule does not have tribal implications. It will not have substantial direct effects on tribal governments, on the relationship between the Federal government and Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes, as specified in Executive Order 13175. This rule contains no federal mandates for tribal governments. Thus, Executive Order 13175 does not apply to this rule. However, in the spirit of Executive Order 13175, and consistent with EPA policy to promote communications between EPA and tribal governments, we specifically solicit additional comment on this proposed rule from tribal officials.

E. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law 104-113, § 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rule involves technical standards. The following paragraphs describe how we specify testing procedures for engines subject to this proposal.

We are proposing to test highway motorcycles with the Federal Test Procedure, a chassis-based transient test. There is no voluntary consensus standard that would adequately address engine or vehicle operation for suitable emission measurement.

For marine vessels, we are proposing to use an evaporative emission test procedure based on the highway Federal Test Procedure. There is no voluntary consensus standard for testing evaporative emission from marine vessels. In addition, we are proposing the option of using design-based certification.

F. Protection of Children (Executive Order 13045)

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (62 F.R. 19885, April 23, 1997) applies to any rule that (1) is determined to be "economically significant" as defined under Executive Order 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, Section 5-501 of the Order directs the Agency to evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

This proposed rule is not subject to the Executive Order because it does not involve decisions on environmental health or safety risks that may disproportionately affect children.

The effects of ozone and PM on children's health were addressed in detail in EPA's rulemaking to establish the NAAQS for these pollutants, and EPA is not revisiting those issues here. EPA believes, however, that the emission reductions from the strategies proposed in this rulemaking will further reduce air toxics and the related adverse impacts on children's health.

G. Federalism (Executive Order 13132)

Executive Order 13132, entitled "Federalism" (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure "meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications" is defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government."

Under Section 6 of Executive Order 13132, EPA may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

Section 4 of the Executive Order contains additional requirements for rules that preempt State or local law, even if those rules do not have federalism implications (i.e., the rules will not have substantial direct effects on the States, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government). Those requirements include providing all affected State and local officials notice and an opportunity for appropriate participation in the development of the regulation. If the preemption is not based on express or implied statutory authority, EPA also must consult, to the extent practicable, with appropriate State and local officials regarding the conflict between State law and Federally protected interests within the agency’s area of regulatory responsibility.

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132.

Although Section 6 of Executive Order 13132 does not apply to this rule, EPA did consult with representatives of various State and local governments in developing this rule. EPA has also consulted representatives from STAPPA/ALAPCO, which represents state and local air pollution officials.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

H. Energy Effects (Executive Order 13211)

This rule is not a "significant energy action" as defined in Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 Fed. Reg. 28355 (May 22, 2001)) because it is not likely to have a significant adverse effect on the supply, distribution or use of energy. The proposed standards have for their aim the reduction of emission from certain nonroad engines, and have no effect on fuel formulation, distribution, or use. Generally, the proposed program leads to reduced fuel usage due to the reduction of wasted fuel through evaporation.

I. Plain Language

This document follows the guidelines of the June 1, 1998 Executive Memorandum on Plain Language in Government Writing. To read the text of the regulations, it is also important to understand the organization of the Code of Federal Regulations (CFR). The CFR uses the following organizational names and conventions.

Title 40 Protection of the Environment
Chapter I Environmental Protection Agency
Subchapter C Air Programs. This contains parts 50 to 99, where the Office of Air and Radiation has usually placed emission standards for motor vehicle and nonroad engines.
Subchapter U Air Programs Supplement. This contains parts 1000 to 1299, where we intend to place regulations for air programs in future rulemakings.
Part 1045 Control of Emissions from Marine Spark-ignition Engines and Vessels
Part 1068 General Compliance Provisions for Engine Programs. Provisions of this part apply to everyone.

Each part in the CFR has several subparts, sections, and paragraphs. The following illustration shows how these fit together.

Part 1045
  Subpart A
    Section 1045.1
      (a)
      (b)
        (1)
        (2)
          (i)
          (ii)
            (A)
            (B)

A cross reference to §1045.1(b) in this illustration would refer to the parent paragraph (b) and all its subordinate paragraphs. A reference to "§1045.1(b) introductory text" would refer only to the single, parent paragraph (b).

List of Subjects in 40 CFR part 86

Administrative practice and procedure, Confidential business information, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements

List of Subjects in 40 CFR part 90

Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Labeling, Reporting and recordkeeping requirements, Research, Warranties

List of Subjects in 40 CFR part 1045

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Labeling, Penalties, Reporting and recordkeeping requirements, Research, Warranties

List of Subjects in 40 CFR part 1068

Environmental protection, Administrative practice and procedure, Confidential business information, Imports, Motor vehicle pollution, Reporting and recordkeeping requirements, Warranties.

Dated_____________

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Christine Todd Whitman
Administrator.