



Final Report of the Small Business Advocacy Review Panel On Control of Emissions from Nonroad Large Spark Ignition Engines, Recreational Engines (Marine and Land-based), and Highway Motorcycles

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Panel On Control of Emissions from Nonroad Large
Spark Ignition Engines, Recreational Engines (Marine
and Land-based), and Highway Motorcycles**

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Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

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*This technical report does not necessarily represent final EPA decisions or positions.
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1.	INTRODUCTION	6
2.	BACKGROUND AND REGULATORY HISTORY	7
2.1	Nonroad Engines	7
2.2	Highway Motorcycles	8
2.3	General	9
3.	OVERVIEW OF PROPOSAL UNDER CONSIDERATION	9
3.1	Introduction - Engine Certification	9
3.1.1	Burden Reduction Measures Considered by the Panel	9
3.2	Large SI Engines	11
3.2.1	Near-Term Emission Standards	11
3.2.2	Long-term Duty-cycle Emission Standards	11
3.2.3	Supplemental emission standards	11
3.2.4	Compliance Program Elements	12
3.3	Off-Road Motorcycles and All-Terrain Vehicles (ATVs)	12
3.3.1	California Emission Standards	13
3.3.2	Program Under Development	14
3.4	Marine Vessels	17
3.4.1	Evaporative Emissions	17
3.4.2	NTE	18
3.5	Snowmobiles	18
3.6	Highway Motorcycles	19
3.6.1	Federal Regulations	20
3.6.2	California Regulations	21
3.6.3	Emission Control Technologies	22
3.6.4	The Proposal Under Consideration	23
4.	APPLICABLE SMALL ENTITY DEFINITIONS	24
5.	SMALL ENTITIES THAT MAY BE SUBJECT TO THE PROPOSED REGULATION	25
5.1	Recreational Vehicles (off-highway motorcycles, ATVs, and snowmobiles)	25
5.2	Highway Motorcycles	26
5.3	Marine Vessels	26
5.3.1	Small Recreational Boat Builders	26
5.3.2	Small Marine Fuel Tank Manufacturers	27
5.3.3	Small Diesel Engine Marinizers	27
5.3.4	Small Gasoline Engine Marinizers	27
5.4	Large Spark Ignition Engines	27
6.	SUMMARY OF SMALL ENTITY OUTREACH	28
7.	LIST OF SMALL ENTITY REPRESENTATIVES	28

8.	SUMMARY OF COMMENTS FROM SMALL ENTITY REPRESENTATIVES	30
8.1	Number and Types of Entities Affected	30
8.2	Potential Reporting, Record Keeping, and Compliance	31
8.3	Related Federal Rules	31
8.3.1	Off-Road Motorcycles and All-Terrain Vehicles (ATVs)	31
8.3.2	Marine Vessels	31
8.4	Regulatory Flexibility Alternatives	31
8.4.1	Large SI Engines	31
8.4.1.1	Certified Engines from Other EPA Programs	31
8.4.2	Off-Road Motorcycles and All-Terrain Vehicles (ATVs)	31
8.4.2.1	Averaging, Banking, and Trading	31
8.4.2.2	Certified Engines from Other EPA Programs	32
8.4.2.3	Streamlining Test Requirements	32
8.4.3	Marine Vessels	32
8.4.3.1	Hardship Provisions	32
8.4.3.2	Extended Phase-in of Standards	32
8.4.3.3	Design Based Certification	33
8.4.4	Snowmobiles	33
8.4.4.1	Delaying Implementation Requirements	33
8.4.4.2	Streamlining Test Requirements	33
8.4.4.3	Averaging, Banking, and Trading	34
8.4.4.4	Certified Engines from Other EPA Programs	34
8.4.5	Highway Motorcycles	34
8.4.5.1	Adoption of CARB Standards	34
8.5	Other Issues	34
8.5.1	Large SI Engines	34
8.5.1.1	Contribution to Air Pollution	34
8.5.1.2	Level of the Standard	34
8.5.2	Off-Road Motorcycles and All-Terrain Vehicles (ATVs)	35
8.5.2.1	Hours of Usage and Inventory Contribution	35
8.5.2.2	Cost Issues	35
8.5.2.3	Technological Feasibility	35
8.5.2.4	CARB Off-highway Motorcycle Program	36
8.5.2.6	Level of the Standard	36
8.5.2.7	Basis of Information	36
8.5.3	Marine Vessels	37
8.5.3.1	Safety Issues	37
8.5.3.2	Cost Issues	37
8.5.3.3	Exemption for Small Volume Tank Manufacturers and Boat Builders	37
8.5.3.4	“Not-to-Exceed” Testing	38
8.5.3.5	Technological Feasibility	38
8.5.4	Snowmobiles	38
8.5.4.1	Technological Feasibility	38

	8.5.4.2 Permanent Exemptions	39
	8.5.4.3 Red Sticker Program	39
	8.5.4.4 Contribution to Emissions Inventory	39
	8.5.4.5 Level of the Standard	39
	8.5.4.6 Engine Design by Size of Production	40
8.5.5	Highway Motorcycles	40
	8.5.5.1 Technological Feasibility	40
	8.5.5.2 Cost Issues	40
	8.5.5.3 Certification Costs	40
	8.5.5.4 Level of the Standard	41
9.	PANEL FINDINGS AND DISCUSSIONS	41
9.1	Number and Types of Entities Affected	41
9.2	Potential Reporting, Record Keeping, and Compliance	41
9.3	Related Federal Rules	41
9.4	Regulatory Flexibility Alternatives	42
9.4.1	Large SI Engines	42
	9.4.1.1 Using Certification and Emissions Standards from Other EPA Programs	42
	9.4.1.2 Delay of Proposed Standards	43
	9.4.1.3 Production Line Testing	44
	9.4.1.4 Deterioration Factors	44
	9.4.1.5 Hardship Provision	44
9.4.2	Off-Road Motorcycles and All-Terrain Vehicles (ATVs)	45
	9.4.2.1 Additional Lead-time to Meet the Proposed Standards	46
	9.4.2.2 Design Certification	47
	9.4.2.3 Broaden Engine Families	48
	9.4.2.4 Production Line Testing Waiver	48
	9.4.2.5 Use of Assigned Deterioration Factors During Certification . . .	48
	9.4.2.6 Using Certification and Emissions Standards from Other EPA Programs	49
	9.4.2.7 Averaging, Banking, and Trading	49
	9.4.2.8 Hardship Provisions	49
9.4.3	Marine Vessels	50
	9.4.3.1 Burden Reduction Approaches Designed for Small Boat Builders and Fuel Tank Manufacturers	50
	9.4.3.2 Burden Reduction Approaches Designed for Small Marinizers of Marine Engines with Respect to NTE Provisions	53
9.4.4	Snowmobiles	53
	9.4.4.1 Delay of Proposed Standards	54
	9.4.4.2 Design-Based Certification	54
	9.4.4.3 Broader Engine Families	54
	9.4.4.4 Elimination of Production Line Testing Requirements	55
	9.4.4.5 Use of Assigned DF During Certification	55

9.4.4.6	Using Certification and Emission Standards from Other EPA Programs	55
9.4.4.7	Averaging, Banking and Trading	56
9.4.4.8	Hardship Provisions	56
9.4.4.9	Unique Snowmobile Engines	56
9.4.5	Highway Motorcycles	57
9.4.5.1	Delay of Proposed Standards	57
9.4.5.2	Broader Engine Families	58
9.4.5.3	Exemption from Production Line Testing	58
9.4.5.4	Averaging, Banking, and Trading (ABT)	58
9.4.5.5	Hardship Provisions	59
9.4.5.6	Reduced Certification Data Submittal and Testing Requirements	59
10.	APPENDICES	59
	Appendix A - EPA Summaries of SBAR Panel's Outreach Meeting with SERs on May 30 and May 31, 2001	60
	Appendix B - Written Comments Submitted by SERs	60
	Appendix C - List of Materials SBAR Panel Sent to SERs	60

1. INTRODUCTION

This report is presented by the Small Business Advocacy Review Panel (SBAR Panel or Panel) convened for the proposed rulemaking on the Control of Emissions from Nonroad Large Spark Ignition Engines, Recreational Engines (Marine and Land-based), and Highway Motorcycles (commonly called the Recreational Vehicles Rule) that is currently being developed by the U.S. Environmental Protection Agency (EPA). Under section 609(b) of the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), a Panel is required to be convened prior to publication of the initial regulatory flexibility analysis (IRFA) that an agency may be required to prepare under the RFA. In addition to EPA's Small Business Advocacy Chairperson, the Panel consists of representatives from the Small Business Administration's Office of Advocacy, the Office of Management and Budget's Office of Information and Regulatory Affairs, and EPA's Office of Transportation and Air Quality.

This report provides background information on the proposed Recreational Rule being developed and the types of small entities that would be subject to the proposed rule; a summary of the Panel's outreach activities; and the comments and recommendations of the Small Entity Representatives (SERs). In addition, Section 609(b) of the RFA directs the review Panel to report on the comments of SERs and make findings as to issues related to identified elements of an initial regulatory flexibility analysis (IRFA) under section 603 of the RFA. Those elements of an IRFA are:

- A description of, and where feasible, an estimate of the number of small entities to which the proposed rule will apply;
- A description of projected reporting, record keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements and the type of professional skills necessary for preparation of the report or record;
- An identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule; and
- A description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.

Once completed, the Panel report is provided to the Agency issuing the proposed rule and included in the rulemaking record. In light of the Panel report, the Agency is to make changes, where appropriate, to the draft proposed rule, the IRFA for the proposed rule, or the decision on whether an IRFA is required.

The Panel's findings and discussion are based on the information available at the time this report was drafted. EPA is continuing to conduct analyses relevant to the proposed rule. The Agency expects additional information will be developed or obtained during the remainder of the rule development process. It is important to note that the Panel makes its report at an early stage in the rule development process and should be considered in that light. At the same time, however, the report provides both the Panel and the Agency with an opportunity to identify and explore potential ways of shaping the proposed rule to minimize the burden of the rule on small entities while achieving the rule's statutory purposes.

Any options the Panel identifies for reducing the rule's regulatory impact on small entities may require further analyses and/or data collection to ensure that the options are practicable, enforceable, environmentally sound, protective of public health, and consistent with the Clean Air Act.

2. BACKGROUND AND REGULATORY HISTORY

2.1 Nonroad Engines

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 (NO_x), 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.¹ 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.²

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)

¹ “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.

² 59 FR 31306 (July 17, 1994).

- Locomotive engines

On December 7, 2000, EPA issued an Advance Notice of Proposed Rulemaking (ANPRM). 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. The proposal being developed covers compression-ignition recreational marine engines. It also covers several nonroad spark ignition (SI) engine applications, as follows:

- land-based recreational engines (for example, engines used in snowmobiles, off-highway motorcycles, and all-terrain vehicles (ATVs))
- marine sterndrive and inboard (SD/I) engines and boats powered by SI marine engines³
- land-based engines rated over 19 kW (Large SI) (for example, engines used in forklifts); this category includes auxiliary marine engines, which are not used for propulsion.

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.⁴ 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.

2.2 Highway Motorcycles

In addition to proposing standards for the nonroad vehicles and engines noted above, EPA also intends to review 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.

³ As a shorthand notation in this document, we are using “recreational marine engines” to mean recreational marine diesel engines and all gasoline SD/I engines, even though some SD/I applications could be commercial. We are similarly using “recreational boats” to mean boats powered by recreational marine diesel engines as well as all boats powered by gasoline engines, even though some gasoline engine-powered boats may be commercial.

⁴ *see* Final Finding, “Control of Emissions from New Nonroad Spark-Ignition Engines Rated above 19 Kilowatts and New Land-Based Recreational Spark-Ignition Engines” elsewhere in today’s Federal Register for EPA’s finding for Large SI engines and recreational vehicles. 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.

2.3 General

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. OVERVIEW OF PROPOSAL UNDER CONSIDERATION

3.1 Introduction - Engine Certification

Manufacturers certifying engines to EPA's existing emission standards for various types of engines face several common provisions to show that engines comply with standards. The certification process is most fundamental to the overall compliance process. To certify an engine, the manufacturer must do development work to apply emission controls, then do emission testing or otherwise provide data to show that emissions are at allowable levels. This includes testing on new engines and on aged engines. Aged-engine testing requires some form of service accumulation, followed by additional engine emissions testing in the laboratory.

In its application for certification, the manufacturer must also establish the following things for each engine family:

- any prescribed maintenance steps that are necessary to keep the engine's emissions in compliance with standards
- the ranges of adjustability over which the engine will meet emission standards (if any parameters are adjustable)
- an emissions label for each engine showing that it meets emission standards

Manufacturers must also test a small portion of engines from the assembly line (usually less than 1 percent of production) to show that engines meet the standards even taking production variables into account.

3.1.1 Burden Reduction Measures Considered by the Panel

EPA is considering a variety of provisions to reduce the burden of complying with new emission standards. Some of these provisions would apply to all companies, while others would be targeted at the unique circumstances faced by small businesses. The Panel presented the following options to the SERs.

If adopted, the following provisions would likely apply to all companies:

- Carryover of test data to allow manufacturers to certify new engine families each year without repeating emission measurements

- Testing to establish deterioration factors for demonstrating durability may apply to multiple engine families
- Allowing manufacturers to define their engine families more broadly than the prescribed parameters would historically have dictated, which would reduce the degree of certification testing needed
- Allowing manufacturers to develop alternate methods to show that production-line engines comply with standards (e.g., using simpler ppm analyzers based on correlation work for specific engines)
- Specifying a reduced testing rate for measuring emissions from production-line engines after a period of sustained testing without failures
- Allowing manufacturers to use averaging, banking, or trading of emission credits to allow a mix of engine models above and below the established standards.

For small businesses, EPA is considering the following additional provisions which would provide more time or alternative methods for demonstrating compliance at certification or during production that would reduce the economic burden on small entities:

- Additional lead time, which would allow companies more time to design, develop, and produce their product in compliance with emission standards
- A simplified process for defining broad engine families
- Reduced testing rates for production-line testing
- A simplified process for establishing deterioration factors for an engine family
- Recognizing certification of engines to other engine programs. If an engine is already certified under another program, that certification would be relied upon rather than require new testing unless changes were made that increase emissions.

To this list, another member of the Panel added and requested comment from the SERs on the following additional options:

- Different standards for small businesses and large businesses on a permanent basis.
- A permanent exemption from regulation for manufacturers which produce small volumes (e.g., less than 300 snowmobiles a year) or small engines (e.g. ATVs with a displacement less than 90cc).
- Allowing non-complying engines to be sold in the US only if used in areas that are in attainment with national ambient air quality standards for ozone or CO or in nonattainment areas but at certain times of the year (e.g., California's "red sticker" program).

The SERs' responses are summarized in Section 8 below. For the Panel's findings, please see section 9. A complete copy of the information package distributed to the SERs can be found in Appendix C.

3.2 Large SI Engines

3.2.1 Near-Term Emission Standards

For Large SI engines, EPA is considering near-term emission standards, including standards consistent with those adopted by California Air Resources Board (CARB). California standards are 4 g/kW-hr (3 g/hp-hr) for NMHC+NO_x emissions and 50 g/kW-hr (37 g/hp-hr) for CO emissions. CARB specifies the ISO C2 duty cycle for measuring emissions from variable-speed engines, and the ISO D2 duty cycle for testing constant-speed engines. The C2 duty cycle consists mostly of intermediate-speed points, while all the D2 test points are at rated speed.

CARB adopted its emission standards based on the capabilities of three-way catalytic converters and electronically controlled fuel systems. EPA believes that these systems would be similar to those used for many years in highway applications, but not necessarily with the same degree of sophistication. The CARB standards will be fully phased in by 2004.

3.2.2 Long-term Duty-cycle Emission Standards

EPA believes that, given additional time, manufacturers may be able to optimize designs to control emissions to lower levels using the same emission-control technologies used to meet the near-term standards.

Recent testing has shown that these systems can reduce NO_x, HC, and CO emissions by 90 percent or more over several thousand hours of normal operation.⁵ EPA is considering long-term emissions standards ranging from 1.5 to 2.5 g/kW-hr (1 to 2 g/hp-hr) HC+NO_x and from 4 to 10 g/kW-hr (3 to 7.5 g/hp-hr) CO. These standards would be based on both steady-state and transient duty cycles.

3.2.3 Supplemental emission standards

To address concerns for controlling emissions outside of the discrete procedures adopted for certification, EPA is considering requirements that would apply to a wider range of normal engine operation. We generally refer to this as off-cycle emissions.

Conceptually, EPA's goal is to achieve cost effective control of emissions over the broad range of in-use speed and load combinations that can occur in a Large SI engine to achieve real-world emission control, rather than just controlling emissions under certain laboratory conditions. An engine operating in any given piece of equipment may often operate at speed and load combinations not included in the certification duty cycle. Emission levels at speed and load

⁵“Evaluation of Emissions Durability of Off-Road LPG Engines Equipped with Three-Way Catalysts,” by Vlad Ulmet, Southwest Research Institute, November 2000, (Docket A-2000-01, document II-A-07).

points not represented in the duty cycles could be significantly higher than those measured with the duty cycles. Testing has highlighted this concern, showing that steady-state emission levels can increase ten-fold or more at speed-load points not included in the duty cycles.⁶

One way to address this concern that EPA has used in other engine categories, would be to specify "not-to-exceed" testing specifications, as this testing would help ensure that emissions are controlled from Large SI engines over the full range of speed and load combinations seen in the field. Under this approach, EPA would specify an emission standard that applies more broadly than a single duty-cycle standard. The standard would apply to all regulated pollutants (NO_x, HC, and CO) during a wide range of normal operation. This testing would also include a broad range of in-use ambient conditions (i.e., temperature, pressure, and humidity), but exclude measurement during any kind of abnormal operation.

The recent testing at Southwest Research Institute (SwRI) would appear to suggest that supplemental emission standards of 1.0 to 3.5 g/kW-hr (1.3 to 2.6 g/hp-hr) for NO_x+HC emissions and 7 to 13 g/kW-hr (5 to 10 g/hp-hr) for CO emissions may be achievable. EPA would intend to allow considerable development time for manufacturers to meet any such provisions, if they were adopted.

3.2.4 Compliance Program Elements

EPA is considering proposing the provisions of the compliance program adopted by CARB. This includes several elements, such as production-line testing and in-use testing by manufacturers; useful life, deterioration factors, and warranty requirements. The principal provisions under consideration that CARB has not already adopted include:

- Procedures for testing emissions in the field in lieu of laboratory dynamometer testing.
- Specification of basic engine diagnostics to keep engines operating in their certified configuration.
- Concepts for manufacturers to control evaporative emissions.

3.3 Off-Road Motorcycles and All-Terrain Vehicles (ATVs)

The engines used in recreational vehicles tend to be small, air- or liquid-cooled, reciprocating Otto-cycle engines that operate on gasoline.⁷ They are designed to be used in vehicles, where engine performance is characterized by highly transient operation, with a wide range of engine speed and load capability. Maximum engine speed is typically well above 5,000

⁶See "Emission Data and Procedures for Large SI Engines" for more information (Docket A-2000-01; item II-B-1).

⁷ Otto cycle is another name for a spark-ignition engine which utilizes a piston with homogeneous external or internal air and fuel mixture formation and spark ignition.

rpm. Also, the vehicles are equipped with transmissions to ensure performance under a variety of operating conditions.

These engines can be separated into two-stroke and four-stroke designs. The distinction between two-stroke and four-stroke engines is important for emissions because two-stroke engines tend to emit much greater amounts of unburned hydrocarbons (HC) and particulate matter (PM) than four-stroke engines of similar size and power. Two-stroke engines also have greater fuel consumption resulting in poorer fuel economy than four-stroke engines. Both the higher emissions and the higher fuel consumption result from both the intake and exhaust ports being open at the same time, allowing some of the fuel mixture to pass through the combustion chamber unburned. Two-stroke engines tend to have higher power output per unit displacement, lighter weight, and better cold starting performance. These advantages combined with a simple design and lower manufacturing costs tend to make two-stroke engines a popular choice as the power unit for recreational vehicles. Currently, about 60-65 percent of all off-highway motorcycles (predominantly in high performance, youth, and entry-level bikes) and 10-15 percent of all ATVs sold in the United States use two-stroke engines. The typical emissions levels of 2-stroke and 4-stroke equipped vehicles are provided in Table 3.3.

**Table 3.3
Typical Range of Exhaust Emissions for Off-road Motorcycles and ATVs (g/km)**

Recreational Vehicle Type	Engine Type	HC	CO	NOx
Off-highway Motorcycles/ATVs	2-stroke	30-60	30-50	0.01-0.02
	4-stroke	0.4 - 3	7-50	0.05 - 0.1

3.3.1 California Emission Standards

California established standards for off-highway motorcycles and ATVs which took effect in January 1997 (1999 for vehicles with engines of 90 cc or less). The standards, shown in Table 3.3.1, are based on the chassis-based Federal Test Procedure (FTP) also used for highway motorcycles. Manufacturers may certify ATVs to optional engine-based standards, also shown in Table 3.3.1, which are based on the utility engine test procedure.⁸ This is the test procedure over which Small SI engines are tested. The stringency level of the standards was based on the emissions performance of 4-stroke engines and advanced 2-stroke engines equipped with a

⁸ Notice to Off-Highway Recreational Vehicle Manufacturers and All Other Interested Parties Regarding Alternate Emission Standards for All-Terrain Vehicles, Mail Out #95-16, April 28, 1995, California Air Resources Board (Docket A-2000-01, document II-D-06).

catalytic converter. California anticipated that the standards would be met initially through the use of high performance 4-stroke engines.

**Table 3.3.1
California Off-highway Motorcycle and ATV Standards for Model Year
1997 and later (1999 and later for engines at or below 90 cc)**

	HC	NO _x	CO	PM
Off-highway motorcycle and ATV standards (g/km)	1.2*	---	15	---
<hr/>				
	HC + NO _x		CO	PM
Optional standards for ATV engines below 225 cc (g/bhp-hr)	12.0*		300	---
Optional standards for ATV engines at or above 225 cc (g/bhp-hr)	10.0*		300	---

* Corporate-average standard.

California revisited the program in the 1997 time frame because a lack of certified product from manufacturers was reportedly creating economic hardship for dealerships. The number of certified off-highway motorcycle models was particularly inadequate.⁹ In 1998, California revised the program, allowing the use of uncertified products in off-highway vehicle recreation areas with regional/seasonal use restrictions. Currently, noncomplying vehicles can be legally sold in California and used in attainment areas year-round and in nonattainment areas during months when exceedances of the state ozone standard are not expected. For enforcement purposes, certified and uncertified products are identified respectively with green and red stickers. Only about one-third of off-highway motorcycles sold in California are certified. All certified products are powered by 4-stroke engines.

3.3.2 Program Under Development

EPA is considering a proposal that would establish chassis-based standards based primarily on the emissions capabilities of 4-stroke engines. These standards would likely take

⁹ Initial Statement of Reasons, Public Hearing to Consider Amendments to the California Regulations for New 1997 and Later Off-highway Recreational Vehicles and Engines, State of California Air Resources Board, October 23, 1998 (Docket A-2000-01, II-D-08).

effect in mid-decade. Because 4-stroke engines are available and currently used by several manufacturers in these applications, EPA believes that this technology path represents a likely choice of manufacturers to significantly reduce emissions. Depending on the base emission rates of a particular engine, manufacturers may also rely on recalibration of engines or minor fuel system changes to reduce emissions. For a typical manufacturer, EPA has initially estimated that the cost of converting from a 2-stroke engine to a 4-stroke engine would be \$200 - \$400 per vehicle.

EPA currently anticipates that the proposed rule would include standards in the range shown in Table 3.3.2. These standards are based on the vehicle FTP test used for on-highway motorcycles, and used by California for their off-road motorcycle and ATV program. The 1.4 g/km HC + NOx level is similar in stringency to the California 1.2 g/km HC-only standard.

Table 3.3.2
Anticipated Emission Standards for Off-road Motorcycles and ATVs (g/km)

HC + NOx	CO
1.4 - 5.0	15-30

There are additional technologies that have been applied to 2-stroke engines in other nonroad and highway applications that have emissions control potential, including:

- Electronic fuel injection
- Direct fuel injection
- Compression wave injection
- Catalytic converter

With the exception of a 4-stroke ATV model recently introduced with electronic fuel injection, these technologies have not been used on off-road motorcycles and ATVs, and EPA would expect further research and development would be needed to apply them. However, manufacturers may explore the potential of these technologies to substantially reduce two-stroke engine emissions. In addition, EPA is considering proposing voluntary standards under the Blue Sky Engine Program that may encourage manufacturers to consider applying additional technologies to 4-stroke off-road motorcycles and ATVs, including catalytic converters. EPA is also considering an averaging approach to the standards, which may provide incentive for manufacturers to develop and apply new technologies for various segments of their product line.

3.3.2.1 Engine-based Testing

As noted above, California allows ATVs to be optionally certified to engine-based standards using the utility engine test cycle, SAE J1088. The utility engine cycle is a 5-mode steady-state test cycle which includes testing at only one engine speed (85 percent of rated speed). Such a test procedure is appropriate for engines used in lawn and garden applications, but we do not believe it to be appropriate for engines used in recreational vehicle applications.

Recreational vehicles in general experience highly transient operation, and therefore the vehicle-based FTP test procedure can be used to effectively provide emissions control. ATVs operate rarely in a manner represented by the J1088 cycle (constant engine speed, varying load). In addition, manufacturers have noted that relatively low engine speed and high torque engine operation is prevalent in ATV operation. Therefore, EPA believes that using the J1088 test cycle would provide much less assurance of in-use emissions reductions.

For the most part, manufacturers have certified ATVs in California using the engine-based option. EPA is considering allowing the carry-over use of this approach and any relevant data for the first few years of the federal program, recognizing that manufacturers may need additional lead-time and flexibility to certify their full ATV product line to the chassis-based standards. Long-term, however, EPA is considering phasing out the option of using data generated on the J1088 cycle.

The vehicle speeds and accelerations on the FTP are reduced for motorcycles equipped with small displacement engines so that these smaller vehicles can be operated over the test cycle. However, there may be instances where a vehicle still is unable to be tested over the chassis test. EPA is considering allowing the permanent use of the engine-based test for vehicles equipped with small displacement engines (for example, less than 100cc) that cannot be tested over the chassis-based test due to vehicle size or power limitations.

3.3.2.2 Competition Exemption

Currently, a large portion of off-highway motorcycles are marketed as competition/racing motorcycles. These models often represent a manufacturer's high performance offerings in the off-highway market. Most such motorcycles are of the motocross variety,¹⁰ although some high

¹⁰ A motocross bike is typically a high performance off-highway motorcycle that is designed to be operated in motocross competition. Motocross competition is defined as a circuit race around an off-highway closed-course. Motocross bikes are designed to be very light for quick handling and easy maneuverability. They also come with large knobby tires for traction, high fenders to protect the rider from flying dirt and rocks, aggressive suspension systems that allow the bike to absorb large amounts of shock, and are powered by high performance engines. They are not equipped with lights.

performance enduro models¹¹ are marketed for competition use. These high performance motorcycles are largely powered by 2-stroke engines, though some 4-stroke models have been introduced in recent years.

When used for competition, motocross motorcycles are mostly involved in closed course or track racing. Other types of off-highway motorcycles are usually marketed for trail or open area use. When used for competition, these models are likely to be involved in point-to-point competition events over trails or stretches of open land. There are also specialized off-highway motorcycles that are designed for competitions such as ice racing, drag racing, and observed trials competition. A few races involve professional manufacturer sponsored racing teams. Amateur competition events for off-highway motorcycles are also held frequently in many areas of the U.S.

Clean Air Act sections 216 (10) and (11) exclude engines and vehicles "used solely for competition" from nonroad engine and vehicle regulations. EPA intends to propose provisions to exclude competition vehicles from the regulations.

3.4 Marine Vessels

EPA intends to propose emission standards for new recreational compression-ignition marine engines ≥ 37 kW and new sterndrive/inboard spark-ignition marine engines. An SBAR panel for this part of EPA's proposal was completed in 1999. For further detail, see the "Report of the Small Business Advocacy Review Panel On Emissions Standards for New Compression-ignition and Spark-ignition Recreational Marine Engines," August 24, 1999.

3.4.1 Evaporative Emissions

EPA is considering evaporative emission control requirements for marine vessels using spark-ignition (SI) marine engines. In developing these standards, EPA is considering not only the potential emission reductions which are technologically feasible, but also the effects that these standards would have on cost, safety, and energy. Because of the important role of small businesses in the marine industry, EPA believes that it is critical that small business concerns be addressed in this rulemaking.

The following is a list of emission control technologies that EPA believes could be used to control evaporative emissions from boats:

¹¹ An enduro bike is very similar in design and appearance to a motocross bike. The primary difference is that enduros are equipped with lights and have slightly different engine performance that is more geared towards a broader variety of operation than a motocross bike. An enduro bike needs to be able to cruise at high speeds as well as operate through tight woods or deep mud.

- Closed venting with pressure relief valve or limiting flow orifice
- Volume compensation bag to limit pressure
- Non- or low permeable materials in tank walls, fuel hoses/tubes, and related gaskets
- Bladder tank
- Floating fuel/vapor barrier
- Insulated Tank

EPA has begun a test program to establish baseline emission levels and to evaluate the technology options listed above. Industry is providing technical information relevant to this work. This information will become part of the rulemaking record and will be at least part of the technical basis for the design based certification standards.

3.4.2 NTE

As part of the proposal under consideration, EPA is now looking at including requirements for emission control when the engine is operating in modes or engine map regions not covered under the standard test cycle. Emission control requirements for the “off-cycle” operating points are covered by a provision commonly referred to as “not-to-exceed” (NTE). Potential NTE requirements were not discussed in detail as part of the earlier marine SBAR Panel, and thus were included in this Panel for both new recreational marine compression-ignition engines $\geq 37\text{kW}$ and new sterndrive/inboard spark-ignition marine engines.

3.5 Snowmobiles

The engines used in snowmobiles are almost exclusively 2-stroke engines, although a very small number of 4-stroke engines are beginning to be offered. The main reasons that 2-stroke engines dominate the snowmobile market are their higher power to weight ratios as compared to 4-strokes, and ease of starting in cold conditions.

The 2-stroke engines used in snowmobiles can be either fan cooled or liquid cooled, and have two or three cylinders. They also are both carbureted and fuel injected.

The following is a list of technologies that EPA believes are presently available to reduce emissions from snowmobiles. These technologies are listed in the order of increasing potential to reduce emissions.

- Clean 2-stroke carburetion
- Electronic fuel injection for 2-strokes (EFI)
- Direct fuel injection for 2-strokes (DFI)
- 4-stroke engine technology

EPA believes that as a primary emission reduction strategy, the first two technologies would include making the air/fuel ratio leaner and making overall improvements in air/fuel

control. DFI technology has been used successfully to reduce emissions from 2-stroke outboard and personal watercraft engines. Finally, EPA believes 4-stroke engines could be used in snowmobiles, especially in those applications that are less sensitive to the lower power to weight ratio of a 4-stroke engine as compared to a comparable 2-stroke engine. EPA is considering proposing emission standards that achieve a 25 to 40 percent reduction in baseline snowmobile HC and CO emissions. EPA provided to the Panel a preliminary estimate that the cost of achieving such reductions for a baseline carbureted sled would be in the \$80-\$120 range for a typical manufacturer (excluding fuel savings), for carburetor improvements, recalibration, and engine modifications.

EPA used data from 23 different snowmobiles to estimate snowmobile baseline emissions. Based on these test results, EPA believes that current snowmobile baseline emissions are 296 g/hp-hr for CO, 111 g/hp-hr for HC, 2.7 g/hp-hr for PM, and 0.86 g/hp-hr for NOx. These snowmobiles were tested over the 5 mode steady-state test cycle developed by Southwest Research Institute. That cycle was based on a composite of a variety of actual snowmobile operations, and is the test cycle that we intend to propose for measuring snowmobile emissions.

In addition to the standards discussed above, EPA is considering an optional Blue Sky program whereby a manufacturer could certify some or all of its snowmobiles at levels much cleaner than the actual standards. Such snowmobiles would then be recognized as being very clean through some sort of labeling program.

3.6 Highway Motorcycles

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's 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). Motorcycles that have engine displacements less than 50 cubic centimeters (cc) (generally, youth motorcycles, most mopeds, and some motor scooters or "scooters") are currently not covered by Federal regulations. Also currently excluded are motorcycles that, "if 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). Small (i.e., less than 250 cc) motorcycles, mopeds, and scooters are typically used as short-distance commuting vehicles, while large motorcycles are typically used for recreation (racing or touring) and may travel long distances. Both EPA and California regulations further sub-divide highway motorcycles into classes based on engine displacement. Table 3.6 shows how these classes are defined. The U.S. market is dominated by Class III motorcycles, which account for more than 90 percent of U.S. sales in recent model years.

**Table 3.6
Motorcycle Classes**

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

The currently regulated highway motorcycle category includes motorcycles termed “dual-use” or “dual-sport,” meaning that their designs incorporate features that enable them to be reasonably competent on and off road. Dual-sport motorcycles generally amount to street-legal dirt bikes, since they tend to bear a closer resemblance in terms of design features and engines to true off-road motorcycles than to on-highway cruisers or sport bikes. In the 2000 calendar year approximately 18,500 dual-sport motorcycles were sold, compared to about 419,000 traditional highway motorcycles. As used in this document, the term “highway motorcycle” is intended to include all motorcycles covered by the current regulations; thus, dual-sport motorcycles are included in this definition.

Highway motorcycles incorporate a wide range of engine designs, using one, two, three, four, six, and even eight cylinders, in a variety of configurations (in-line, horizontal, and “V”). There is only one two-stroke highway motorcycle - a 100cc dual-sport motorcycle from Kawasaki - certified to the Federal emission standards for highway motorcycles. Highway motorcycles are dominated by larger engines, with engine displacements reaching 1800 cc or even higher. Current emission controls range from basic engine modifications to advanced fuel injection and multiple three-way catalysts with heated oxygen sensors.

3.6.1 Federal Regulations

The EPA published a final rule in 1977 (42 FR 1126, Jan. 5, 1977) which established interim standards effective for the 1978 and 1979 model years and final standards effective starting with the 1980 model year. The interim standards ranged from 5.0 to 14.0 g/km HC depending upon engine displacement, while the CO standard of 17.0 g/km applied to all motorcycles. The 1980 standards, which were more lenient than those that were proposed and which lacked a NOx standard, are essentially those that 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 are also prohibited. There are no current Federal standards for evaporative emissions from motorcycles. The current Federal standards are shown in Table 3.6.1.

**Table 3.6.1
Current Federal Exhaust Emission Standards for Motorcycles**

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

3.6.2 California Regulations

Motorcycle emission standards in California were originally identical to the Federal standards that applied to the 1978 through 1981 model years. However, California has revised their standards several times to bring them to their current levels. In 1982, the standards were modified to reduce the HC standard from 5.0 g/km to 1.0 for Class I and Class II motorcycles, and 2.5 g/km for Class III motorcycles. The 1982 standards for Classes I and II remain in effect today. California adopted an evaporative emission standard of 2.0 g/test for 1983 and later model year motorcycles. In 1985, the HC standard for Class III motorcycles was reduced to 1.4 g/km, then in 1984, California amended the regulations for 1988 and later model year Class III motorcycles to further lower emission standards and provide additional compliance flexibility to manufacturers. The 1988 and later standards for Class III motorcycles could be met on a corporate average basis, and Class III was split into two separate categories for the purpose of applying the new emission standards: 280cc to 699cc and 700cc and greater. These are the standards being met in California today. Like the Federal standards, there are no currently applicable NOx standards for on-highway motorcycles in California. Under the corporate averaging scheme, no individual engine family is allowed to exceed a cap of 2.5 g/km. Like the Federal program, California also prohibits crankcase emissions. Current California standards are shown in Table 3.6.2-1.

**Table 3.6.2-1
Current California On-Highway Motorcycle Exhaust Emission Standards**

Motorcycle Class	Engine Size (cc)	HC (g/km)	CO (g/km)
I & II	50 - 279	1.0	12.0
III	280 - 699	1.0	12.0
	700 and above	1.4	12.0

In 1999, the California Air Resources Board (CARB) finalized new standards for Class III on-highway motorcycles that will take effect in two phases - a "Tier 1" to start with the 2004 model year, followed by a "Tier 2" that will take effect starting with the 2008 model year. Existing California standards for Class I and II motorcycles remained unchanged. As with the

current standards, manufacturers will be able to meet the requirements on a corporate average basis. These standards bring some level of NOx control to motorcycles by establishing a combined HC+NOx standard. The CARB action made no changes to the CO standard, which remains at 12.0 g/km. The new California standards are shown in Table 3.6.2-2.

**Table 3.6.2-2
Tier 1 and Tier 2 California Class III On-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

3.6.3 Emission Control Technologies

3.6.3.1 Federal Standards

While highway motorcycles have had to apply some low-level control technologies to meet the current federal standards, the current federal standards require control technology comparable to the pre-catalyst stage for passenger cars. The federal standards set in 1977 essentially prompted the elimination of two-stroke highway motorcycles (with one current exception, as noted earlier), and required little more than a four-stroke engine with some basic modifications to control emissions. These modifications included leaner air-fuel mixtures, electronic ignition systems, PCV valves to control crankcase emissions, improvements in manufacturing tolerances to the carburetor, and some engine redesign and modifications.

3.6.3.2 California Standards

Despite the greater stringency of the current California standards (i.e., those that apply in the current model year), most manufacturers have been able to comply without the use of catalytic converters, and only a few expensive high-performance motorcycles have used fuel injection systems. The majority of motorcycles have been able to meet these standards by using, in addition to the measures noted above for the federal standards, engine modifications and more advanced calibration strategies, with secondary air injection systems being commonly used in the larger motorcycle models. Some models have been certified with 3-way catalytic converters and fuel injection systems.

The Tier 1 and Tier 2 standards taking effect in California in 2004 and 2008, respectively, will require some additional technologies. However, California did not base the Tier 1 standard effective in 2004 on the widespread application of catalytic converters. CARB has commented that the 1.4 g/km HC+NO_x standard will be largely feasible by reducing engine-out emissions using mostly engine systems (e.g., fuel injection, secondary air injection, advanced engine modifications), rather than relying on catalytic after-treatment. The Tier 2 standard will clearly be more of a challenge to industry and existing technologies are likely to be modified and optimized for motorcycle application to achieve 0.8 g/km HC+NO_x. Such technologies could include computerized fuel injection, high-efficiency closed-loop two- or three-way catalytic converters, precise air-fuel ratio controls, programmed secondary pulse-air injection, low-thermal capacity exhaust pipes, and others which are available today or in the foreseeable near future. Some manufacturers may even be able to meet the Tier 2 standards on some models without the use of catalytic converters.

3.6.4 The Proposal Under Consideration

EPA is considering updating the federal emission standards for highway motorcycles. The first stage of the proposal would be to harmonize with the California Tier 1 program, and the second stage would entail harmonizing with the Tier 2 California requirement. EPA currently expects to issue the proposal in the next few months and approximately one year later issue a final rule.

3.6.4.1 Harmonization with California Regulations

In the short term, EPA is considering harmonizing with the "Tier-1" California exhaust emission standards (see Table 3.5-4) for Class III motorcycles. EPA currently anticipates that Federal standards, similar to those effective in the 2004 model year in California, would likely be implemented a year or two later than in California in order to provide adequate lead time to manufacturers. As in California, EPA is considering a fleet average HC+NO_x standard, providing some flexibility to manufacturers to have some Class III engine families that exceed the standard (but no higher than a cap of 2.5 grams/kilometer), but balancing these out by certifying other engine families to HC+NO_x emission levels below the standard. EPA expects that small manufacturers, who do not have to meet the Tier-1 standard in California until the 2008 model year, would likewise be able to receive additional lead time in implementing the standards nationwide.

The proposal EPA is considering would also harmonize the federal standards for Class I and II motorcycles with the California standards currently applicable to these classes. These standards, which have been in place since 1982, are currently being met by all Class I and II motorcycle engine families except one. EPA is also considering proposing to adopt California Tier 2 requirements effective in the 2010 time frame with the possible options as discussed below.

3.6.4.2 Development of an International Motorcycles Test Cycle

In 1998 EPA signed an international agreement to pursue international harmonization of technical regulations for motor vehicles. Under this agreement, a process was initiated to develop a new test cycle, replacing the current Federal Test Procedure (FTP), that could be scientifically supported as an accurate representation of actual in-use motorcycle operation. This project is referred to as the World Motorcycle Test Cycle (WMTC). Such a test cycle would enable motorcycle manufacturers to perform one emissions test procedure that could enable the sale in multiple countries around the globe, something that is not possible today. This is an ongoing process in which EPA is actively involved. Once an international test procedure is agreed upon by the signatories to the 1998 agreement, EPA will have to conduct a rulemaking process to propose adopting the global test cycle as part of the U.S. regulations. The new test procedure could take effect later in the decade, and with the appropriate standards could be an option to the FTP-based program described above. EPA currently envisions that any standards for the new cycle would be of similar stringency to the California 2008 standards. Given the timing of the international process, however, EPA will not be proposing the new cycle in the 2001 rulemaking. Rather, EPA intends to have a detailed discussion of the international test cycle and its development and associated issues in the 2001 proposed rule, followed by a proposed rule in the future as soon as the process permits.

4. APPLICABLE SMALL ENTITY DEFINITIONS

The following table (Table 4) provides an overview of the primary SBA small business categories potentially affected by this regulation. EPA is in the process of developing a more detailed industry characterization of the entities potentially subject to this regulation.

Table 4
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
Snowmobile and ATV manufacturers	336999	<500 employees
Independent Commercial Importers of Vehicles and parts	421110	<100 employees
Nonroad SI engines	333618	< 1,000 employees
Internal Combustion Engines	333618	< 1000 employees
Boat Building and Repairing	336612	< 500 employees
Fuel Tank Manufacturers	336211	<1000 employees

NOTES:

- 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.

5. SMALL ENTITIES THAT MAY BE SUBJECT TO THE PROPOSED REGULATION

5.1 Recreational Vehicles (off-highway motorcycles, ATVs, and snowmobiles)

The ATV sector has the broadest assortment of manufacturers. There are seven companies representing over 95 percent of total domestic ATV sales. The remaining 5 percent come from importers who tend to import inexpensive, youth-oriented ATVs from China and other Asian nations. EPA has identified 21 small companies (as defined in Table 4.1, above) that offer off-road motorcycles, ATVs, or both products. Annual unit sales for these companies can range from a few hundred to several thousand units per year.

Based on available industry information, four major manufacturers, Arctic Cat, Bombardier (also known as Ski-Doo), Polaris, and Yamaha, account for over 99 percent of all domestic snowmobile sales. The remaining one percent comes from very small manufacturers who tend to specialize in unique and high performance designs .

We have identified three small manufacturers of snowmobiles and one potential small manufacturer who hopes to produce snowmobiles within the next year. Two of these manufacturers (Crazy Mountain and Fast), plus the potential newcomer (Redline) specialize in high performance versions of standard recreational snowmobile types (i.e., travel and mountain sleds). The other manufacturer (Fast Trax) produces a unique design, which is a scooter-like snowmobile designed to be ridden standing up. Most of these manufacturers build less than 50 units per year.

5.2 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.

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.

5.3 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 SBREFA Panel Report, would affect the engine manufacturers and may affect boat builders.

5.3.1 Small Recreational 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 SIC code 3732. 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.

5.3.2 Small Marine Fuel Tank Manufacturers

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 SIC Code 3713.

5.3.3 Small Diesel Engine Marinizers

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 SIC code 3519. 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.

5.3.4 Small Gasoline Engine Marinizers

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 SIC code 3519. 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.

5.4 Large Spark Ignition Engines

The Panel is aware of one engine manufacturer of Large SI engines that qualifies as a small business. This company plans to produce engines that meet the standards adopted by CARB in 2004, with the possible exception of one engine family. If EPA adopts long-term standards, this would require manufacturers to do additional calibration and testing work. If EPA adopts new test procedures (including transient operation), there may also be a cost associated with upgrading test facilities.

6. SUMMARY OF SMALL ENTITY OUTREACH

Prior to convening the Panel, EPA conducted several meetings and conference calls with entities potentially impacted by this regulation. Fact sheets were distributed in February of 2001 to small entities potentially impacted by the regulations. EPA also conducted a pre-panel briefing for potential Small Entity Representatives that may be subject to the proposed rulemaking on April 17, 2001 at EPA's Office of Transportation and Air Quality. Copies of the briefing materials and a summary of the meeting can be found in the docket.

The SBAR Panel for the Recreation Vehicles Rule was convened on May 3, 2001. On May 18, 2001, the Panel distributed an outreach package to the final group of SERs, which included many of the participants in EPA's April 17, 2000 outreach conference call. The package included: a cover letter which identifies issues related to the key elements of an IRFA, a summary of flexibility regulatory approaches under consideration for small businesses, emissions inventories and the contribution from small business sources, and a preliminary description of programs under consideration including a preliminary assessment of the technology required and cost to meet the range of standards that EPA is currently considering. A complete list of these documents can be found in Appendix C.

The SERs were asked to review the information package and provide verbal comments to the Panel during conference calls for each of the categories on May 30 and May 31, 2001. During the conference calls, SERs were also encouraged to submit written comments. During the calls, SERs were asked to comment on the costs and viability of the proposed alternatives under consideration by the Panel. EPA's summary of the conference call can be found in Appendix A. Following the calls, the Panel received six sets of written comments from SERs. The complete set of these comments is included in Appendix B and a summary of them is provided in Section 8 of this Report.

7. LIST OF SMALL ENTITY REPRESENTATIVES

The following 27 SERs were selected to advise the Small Business Advocacy Review Panel convened for this rule.

LARGE SI

Carl Bryant

Westerbeke Corp.
Taunton, MA

HIGHWAY MOTORCYCLES

Bill Rucker
American IronHorse
Fort Worth, TX

Gary Carter
Kasea Motorsports
Seattle, WA

John Scholl
Ural America
Preston, WA

Kenneth M. Crepea
Panzer Motorcycle Works
Canon City, CO

BOAT BUILDERS AND TANK MANUFACTURERS

Bishop Jordan
Panther Marine Engines
Cocoa, FL

Chris Brown
Ezell Industries
Perry, FL

Dick Rowe
Indmar Products
Millington, TN

John Brooks and Buck Peg
Chaparral Boats
Nashville, GA

John McKnight
National Marine Manufacturers
Association
Washington, DC

Jim Porter
INCA Moulded Products
Nashville, TN

Orestes Monterrey and Rosemarie Fiori
Florida Marine Tanks Inc.
Miami, FL

Owen Maxwell
Regulator Marine
Edenton, NC

Russell Lowe
Caravelle Marine Inc.
Americus, GA

Steve Johnson
Acrotech Midwest
Crosby, MN

Tony Martens and Jim Viestanz
KCS International Inc.
Oconto, WI

SNOW MOBILE MANUFACTURERS

Gerard Karpik
FAST, Inc.
Eveleth, MN

Mark Hoffman
Crazy Mountain Motor Sports, LLC
Clyde Park, MT

Kent Harle
Redline Snowmobiles
Vista, CA

ATV'S AND OFF-ROAD MOTORCYCLES

Dave Cracraft
Moss
Murray, UT

Ken Patisol
Powergroup International Alphasports
Augusta, GA

Dave Schreiber
Panda Motorsports
Chantilly, VA

Kent Rice
Manco Products
Ft. Wayne IN

Frank White
ATK America
Centerville, UT

Loius De Cuzzi
D.R.R. Inc.
Brunswick, OH

Gary Carter
Kasea Motorsports
Seattle, WA

Michael Chan
Benzai Motor Company
Brooklyn, NY

8. SUMMARY OF COMMENTS FROM SMALL ENTITY REPRESENTATIVES

In addition to the comments made by the SERs during the May 30 and May 31 conference calls, the Panel received six sets of written comments from SERs. This Section summarizes the main issues raised by the SERs in their oral and written comments. Under each main issue, the SERs' comments have been organized by the following sectors: Large SI, ATVs and Off-road Motorcycles, Snowmobiles, Marine Engines, and Highway Motorcycles. The complete written comments are provided in Appendix B and EPA's summaries of the conference calls are in Appendix A.

8.1 Number and Types of Entities Affected

SERs generally agreed with the descriptions of their industries provided to them by the Panel (see Appendix A). One SER commented that the market for small snowmobile manufacturers is very dynamic. He noted that competition is very stiff and he noted that, even

during this process, two small companies had gone out of business, leaving only two small businesses in this industry.

8.2 Potential Reporting, Record Keeping, and Compliance

SER comments were received on some aspects of the proposed compliance program. These comments are summarized by category below.

8.3 Related Federal Rules

8.3.1 Off-Road Motorcycles and All-Terrain Vehicles (ATVs)

One SER in this category commented that the Consumer Product Safety Commission (CPSC) has requirements governing engine speed for certain size/types of ATVs and other requirements covering vehicle features.

8.3.2 Marine Vessels

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

8.4 Regulatory Flexibility Alternatives

8.4.1 Large SI Engines

8.4.1.1 Certified Engines from Other EPA Programs

The one SER representing this subcategory of engines commented that it would support a provision that would allow the use of certified engines from other EPA programs to meet the requirements of this proposed rule. Specifically, this manufacturer would use engines that could be certified to EPA's small spark-ignition program for a specific subset of their engines. The SER commented that it would prefer this flexibility indefinitely. The commenter also stated that if this flexibility were not available to his company indefinitely, he would recommend that the flexibility be available to small businesses until EPA proposes its second phase of standards for large SI engines and that they then be given a comparable interval prior to being required to meet the second phase. This would give small businesses additional time to spread research and development costs over a longer period of time. The SER for this subcategory also expressed support for this flexibility at the SER outreach meeting.

8.4.2 Off-Road Motorcycles and All-Terrain Vehicles (ATVs)

8.4.2.1 Averaging, Banking, and Trading

One SER expressed support for a provision that would allow corporate average standards and an averaging, banking, and trading program. SERs did not comment on this at the SER outreach meeting.

8.4.2.2 Certified Engines from Other EPA Programs

One SER commented that EPA should consider an "engine only" certification rather than "vehicle specific" certification. The SER commented that this would relieve some of the burden of the certification process for small businesses because small businesses often have several products that share common engines and could be grouped under a single certification. The commenter further states that if this flexibility were not available, his/her company could also support "cross certification" of products that use a common engine and drive system. Under this scenario, this small manufacturer could use an engine certified for use in an ATV in go-carts. This SER also uses engines that are already certified to meet EPA's small SI regulations and would support a provision that would allow small manufacturers to use these engines to meet the proposed requirements would be potentially helpful. This issue was not discussed at the SER outreach meeting.

8.4.2.3 Streamlining Test Requirements

The SER commented that his/her company would also support flexibility in the definition of engine families. This would allow a small business to minimize the total amount of testing required, which would also minimize costs. This issue was not discussed at the SER outreach meeting.

8.4.3 Marine Vessels

8.4.3.1 Hardship Provisions

One SER commented that EPA should propose hardship provisions for small tank manufacturers and boat builders. The commenter states that small business fuel tank and boat builders would be allowed to petition EPA for additional time to comply with the standards when the cases could be made that the burden of compliance costs would have a major impact on the viability of the company. Another SER added that problems with tooling inventories or manufacturer processing issues should also be a basis for a hardship exemption for small businesses.

8.4.3.2 Extended Phase-in of Standards

Several SERs commented that they would support an extended phase-in of the requirements for small business tank manufacturers and boat builders in order to address the safety and feasibility of the emission reduction technologies under consideration. SERs also

support a "grandfather clause" for existing products. This issue was not discussed at the SER outreach meeting.

8.4.3.3 Design Based Certification

One SER commented that it would support a provision that would allow small business engine manufacturers to certify to a performance-based standard by demonstration that their engines meet design criteria rather than subjecting engines to more traditional certification testing. The SER further commented that, even with a performance based standard, the Not-to-Exceed (NTE) zone is still an issue. The commenter recommended that a finite series of points defining the NTE zone should be agreed upon regardless of the duty-cycle. In this SER's view, any other option would impose a higher burden and level of stringency than most businesses in the industry can accept. SERs also expressed support for this type of provision at the SER outreach meeting.

8.4.4 Snowmobiles

8.4.4.1 Delaying Implementation Requirements

One SER commented at the outreach meeting that increased lead-time to meet standards would be of some help to small businesses. This would allow the larger companies to develop the technology, some of which could trickle down to smaller businesses. Another SER disagreed. He commented that a delay would not be helpful for small snowmobile manufacturers because technology developments would not be shared and so costs for small manufacturers would not decline over time. In this SER's view, the costs associated with complying with the regulations would be too costly for small businesses.

8.4.4.2 Streamlining Test Requirements

One SER commented that this flexibility would not be helpful for small snowmobile manufacturers as long as small manufacturers are required to go through the certification process. The costs would be prohibitive for a vast majority of the small snowmobile manufacturers. SERs expressed similar concerns at the SER outreach meeting.

8.4.4.3 Averaging, Banking, and Trading

One SER commented that an ABT program for small manufacturers would not be helpful due to the fact that manufacturers would have to have an even mix of 2- and 4-stroke engines to take advantage of averaging. This SER goes on to comment that the cost of producing that many products with 4-stroke engines would be prohibitive given the relatively low demand for 4-stroke products.

8.4.4.4 Certified Engines from Other EPA Programs

One SER commented that this would be a potentially attractive flexibility for small snowmobile manufacturers. The SER commented that purchasing certified engines from another company to meet the proposed requirements could be helpful, provided that there was some additional flexibility built into this approach to allow the use of intake and exhaust systems developed by a different manufacturer. This approach would be crucial given the need for some manufacturers to purchase these systems separately from the engine. This issue was discussed at the SER outreach meeting. When asked if purchasing engines that have already certified by another engine manufacturer was a viable option, both SERs commented that it seemed unlikely that larger companies would want to do business with small competitors.

8.4.5 Highway Motorcycles

8.4.5.1 Adoption of CARB Standards

At the SER outreach meeting, the one SER who participated commented that if EPA harmonized with CARB standards the Federal standards would be hard to meet. No written comments were received on this or any regulatory flexibility from any of the SERs for highway motorcycles. However, comments were received on other issues and are summarized below in Section 8.5.5.

8.5 Other Issues

8.5.1 Large SI Engines

8.5.1.1 Contribution to Air Pollution

A SER questioned whether the very low volume his company sells (200 engines representing .1% of total annual production), and thus their minimal contribution to mobile-source emissions, warrants regulation.

8.5.1.2 Level of the Standard

A SER stated that without significant flexibility, his company could not afford the Federal emissions limits under consideration for Large SI engines, which are based on three-way catalyst and EGR technology. Without Large SI engines, his company may have to exit the market since business depends to a large extent on his ability to offer customers a complete range of products. Otherwise, customers would go elsewhere, where there is still “one-stop shopping.”

An emissions standard based just on three-way catalyst technology however, could reduce development costs considerably while still achieving significant emissions reduction. Costs would be significantly lower because most of the development work to adapt this technology to his large SI engines would be complete. His company uses catalyst technology in small SI engines it sells, to comply with federal regulations for small SI engines.

8.5.2 Off-Road Motorcycles and All-Terrain Vehicles (ATVs)

8.5.2.1 Hours of Usage and Inventory Contribution

One SER questioned EPA's assumption for the hours of usage for ATVs. The commenter stated that the average annual usage for an ATV is less than 100 hours, not the 350 hours stated by EPA. The SER commented that using 100 hours of usage to calculate the contribution of ATVs to the mobile source inventory highlights even more dramatically that ATVs contribute very little, and that small businesses producing or selling ATVs contribute even less. Given the costs of compliance with the proposed regulations, the SER questioned the need for any regulation for the ATV sector.

EPA will continue to work with the off-road motorcycle and ATV industries to update its usage estimates for these types of vehicles. The Panel understands that EPA intends to seek comment in the proposed rule on its usage estimates for these categories and to seek information on different usage patterns for vehicles for large versus small manufacturers.

8.5.2.2 Cost Issues

One SER commented that EPA has underestimated the cost of compliance with the proposed rule. From the costs of implementing new technologies to testing to certification, small businesses produce too few units over which to spread the cost of complying with the proposed rule. The SER commented that passing these costs on to their customers would put them at a competitive disadvantage to larger manufacturers. One SER commented that regulating small ATV manufacturers is not likely to be cost effective. The Panel understands that EPA will continue to update its cost estimates. The Panel recommends that EPA seek comment in the proposed rule on these estimates and on any differences in costs between large and small manufacturers.

8.5.2.3 Technological Feasibility

One SER commented that the technology EPA anticipates will be used to comply with the standards that EPA is considering proposing have not been fully tested. The SER commented that there is no data available to suggest that there is currently a catalyst available that will reduce emissions on this subcategory of engines. Additionally, no testing has been done on the durability and performance impact on this subcategory of engines. Several SERs also commented on technological feasibility at the SER outreach meeting. These SERs stated that emission-control technology and the resources needed for manufacturing may need to be outsourced, which would involve capital investment. SERs were also concerned about what the consumer would be willing to pay for regulated products. If their products become much more expensive relative to the large companies, these importers and manufacturers would no longer be competitive in the market place. Also, manufacturers who supply importers may be reluctant to

change from 2-stroke to 4-stroke if they sell only a small volume through the importer. SERs commented that additional lead time would help. Finally, several of the SERs had concerns about tooling cost if they had to convert from 2-stroke engines to a 4-stroke engines.

8.5.2.4 CARB Off-highway Motorcycle Program

Several SERs commented at the SER outreach meeting on the CARB off-highway motorcycle program. In particular, SERs commented that there were administrative difficulties in the implementation of the CARB Red/Green sticker program and that it should not be implemented nationwide.

8.5.2.5 Definition of Competition

Several SERs commented at the SER outreach meeting on the definition of competition. One SER did not agree with EPA's draft definition of competition bikes. He commented that some competition machines, enduro bikes for example, are indeed equipped with lights and a spark arrester. One SER noted that many competition bikes are purchased also for recreation. He noted that the Consumer Product Safety Commission has requirements governing engine speed for certain size/types of ATVs and other requirements covering vehicle features which could affect the competition definition.

8.5.2.6 Level of the Standard

A SER stated that it may be possible to support a Federal emissions limit for HC+NO_x of 25 g/km, but the costs of a more stringent standard could be prohibitively higher, especially for small entities. This SER indicated that according to its internal estimates, the per-unit cost of regulation would be significantly higher for small-volume manufacturers than for the typical manufacturer. He also questioned whether any of this cost difference could be passed through to the end user. This SER recommended that allowances (such as a less stringent standard) be made to account for these cost differences.

8.5.2.7 Basis of Information

SERs raised questions about the basis for estimates of cost and technological feasibility. They indicated that without additional information, it would be difficult to accurately assess the impact of regulation or the feasibility of alternatives.

8.5.3 Marine Vessels

8.5.3.1 Safety Issues

Several SERs commented on safety concerns associated with new regulations on the marine industry. One SER representing boat builders commented that fuel systems on boats are

designed to comply with the U.S. Coast Guard and the American Boat and Yacht Council rules and recommendations for safety. These rules and recommendations have been developed over many years and much research. This SER argued that EPA should not rush any additional regulations that would compromise the efforts already undertaken to address safety concerns. Two SERs representing fuel tank manufacturers expressed similar concerns. This issue was also discussed at the SER outreach meeting, with similar concerns expressed.

8.5.3.2 Cost Issues

EPA and the Panel received several comments expressing concern about the costs of the proposed regulations EPA is considering. Fuel tank SERs commented that the fuel tank technologies EPA is considering as a means to reduce evaporative emissions have not been properly tested and that EPA has underestimated the cost estimates for implementing these technologies. For example, one fuel tank SER estimates that alterations such as fitting changes or adding openings for bags would cost from \$500,000 - \$700,000 due to tooling and fitting changes and other testing needed to prove out its effectiveness in use. A SER representing boat builders made similar comments regarding the modified tanks that would be required as a result of evaporative emissions standards for marine engines. Tank modifications would necessitate changing the design of the entire fuel system and the boat itself. This would lead to an increase in manufacturing costs, which would have to be passed on to customers.

Several SERs also commented that resources to meet the proposed regulations would have to be diverted from the development of new products, and this would have a significant impact on the viability of small businesses. Similar concerns were expressed at the SER outreach meetings.

8.5.3.3 Exemption for Small Volume Tank Manufacturers and Boat Builders

One SER commented that EPA should include an exemption for small business boat builders with orders less than 250 tanks of a specific design per year. The commenter stated that small boat builders that purchase less than 150 - 250 tanks per year would face the unique burden of not being able to rely on a fuel tank manufacturer to build small volumes of a tank to accommodate their boats, which ultimately would put a small volume boat builder out of business. This exemption would allow boat builders to remain competitive.

One SER also commented that small business fuel tank manufacturers should be exempted from the rule when an order of a specific design is less than 250 units and requires a specific tool. This flexibility would allow small business tank manufacturers to avoid the extensive redesign and testing necessary to develop and implement new tank and fuel systems that would be required by the proposed regulation.

These issues were also discussed at the SER outreach meeting, with similar concerns expressed.

8.5.3.4 “Not-to-Exceed” Testing

One SER commented at the SER outreach meeting that small businesses do not have the resources to conduct this sort of engine testing. This SER is aware of only one large manufacturer who has attempted to do this testing and the results are not yet available.

8.5.3.5 Technological Feasibility

SERs expressed a concern that EPA had not completed its testing of technologies being considered as the basis for evaporative emissions standards at the time of the Panel. For example, some could pose greater challenges for aluminum tank manufacturers, and vice versa, but without additional testing by EPA, it would be difficult to assess the feasibility of alternatives.

8.5.4 Snowmobiles

8.5.4.1 Technological Feasibility

8.5.4.1.1 Clean Carburetion Technology

One snowmobile SER commented that the feasibility of clean carburetion technology has not yet been successfully demonstrated on snowmobile engines. This SER stated that the costs to “prove out” this technology, particularly for small businesses, would be prohibitive and the cost estimates provided by EPA are not accurate. The SER further stated that clean carburetion coupled with electronic fuel injection or direct fuel injection would also be prohibitively costly to implement. The SER does not believe that larger companies who may be in a position to do the research and development on this technology would share any information or engines with smaller businesses. One larger snowmobile manufacturer tried to implement clean carburetion technology with direct fuel injection and subsequently went out of business. Similar concerns were expressed at the SER outreach meeting.

8.5.4.1.2 4-Stroke Technology

One snowmobile SER commented that the cost of developing 4-stroke technology for small snowmobile manufacturers would be prohibitive and demand for 4-stroke snowmobiles is low at the present time. The SER commented that requiring small manufacturers to implement 4-stroke technology to meet the proposed regulations would put them out of business. SERs also expressed concern that 4-stroke technology does not reliably start, especially in cold conditions. The SER commented that this could be life threatening for a snowmobile user whose sled could become unusable in an isolated area in extremely cold conditions because the snowmobile failed to start. Similar concerns were expressed at the SER outreach meeting.

8.5.4.2 Permanent Exemptions

The SER recommended that small businesses be given permanent exemptions from the proposed requirements until it produces 1000 units or more. In his view, the small manufacturers' contribution to mobile-source emissions inventories is too insignificant and their per-unit costs of regulation too high to warrant regulation at this time. He noted that despite significantly increases in production, average cost remained virtually the same and he does not believe this will change until his production exceeds 1000 units. There was also discussion at the SER outreach meeting regarding the engine production threshold described above. This SER also commented that EPA should consider the environmental benefits of lighter weight snowmobiles and might provide exemptions for small businesses who produce these products. This SER commented that lighter snowmobiles produce less emissions. This issue was discussed at the SER outreach meeting.

8.5.4.3 Red Sticker Program

One SER commented that it could possibly support a red sticker program that would prohibit the use of their products in non-attainment areas. The SER commented that the list of CO non-attainment areas is shrinking, and that if Fairbanks, Alaska were the only area where they would be prohibited from distributing their products, this would not be much of an issue for a small snowmobile manufacturer. This issue was discussed at the SER outreach meeting.

8.5.4.4 Contribution to Emissions Inventory

At the SER outreach meeting, SERs questioned their contributions to the emissions inventory. A SER questioned whether the very low volumes small entities in this category sells (less than 500 annually representing .3% of total annual production) and thus minimal contributions to mobile-source emissions. SERs also indicated that their customers tend to operate their snowmobiles less than average, further reducing their contribution.

8.5.4.5 Level of the Standard

A SER commented that while the flexibility under consideration for certification and testing could help, it does not address potentially more significant costs if his company had to redesign his engines or retool his facility, even with this flexibility. He stated that small entities need flexibility not only in testing and certification but also in the level of the standard.

8.5.4.6 Engine Design by Size of Production

A SER indicated that small entities serve niche markets including mountain riding. Thus, small entities tend to produce sleds that are lighter weight and operate at leaner air/fuel mixtures and higher temperatures than the average sled, which reduces CO and HC emissions.

8.5.5 Highway Motorcycles

8.5.5.1 Technological Feasibility

At the SER outreach meeting, there was extensive discussion about the technological feasibility of the proposed regulations. The one SER who participated was asked what he thought about the possibility of using three-way catalyst systems. The SER stated that there were several problems with this technology. First, the SER expressed concern about how implementing this technology would negatively effect the aesthetics of the product. The SER also expressed concern about the need to protect the rider from the heat produced by the catalyst with a heat shield, which would also detract from the looks of the motorcycle. There was also discussion about which manufacturers currently use catalysts. EPA responded that BMW, Honda, and Harley-Davidson, as well as others, all have some models with catalysts. No written comments were received.

8.5.5.2 Cost Issues

At the SER outreach meeting, the one SER who participated expressed concern over CARB cost estimates. He commented that the costs are not realistic and that CARB based their cost estimates on information from large manufacturers and did not consider the cost impacts for small manufacturers. He also stated that the conversion from carburetors to fuel injection would add at least \$200 to the cost of the bike. He is currently investigating the viability of using fuel injection systems on his motorcycles. He stated that he has questions about the longevity of these fuel injection systems and concerns about how much hotter the engine may run with fuel injection. He was also concerned about the complexity of fuel injection systems and how hard it might be to maintain the system.

8.5.5.3 Certification Costs

Both EPA and the California Air Resources Board require test data to demonstrate certification emission levels. One SER commented that he has been able to comply with these requirements in the past, but that it is costly and logistically complicated because his emissions work is conducted by an outside contractor. In the context of meeting the California Tier 1 requirement, he stated that this would continue to be the case because he was not sure of the NOx levels of his current product.

8.5.5.4 Level of the Standard

A SER indicated that, if the Federal emissions limit for HC+NOx were lowered to Tier 2 levels (0.8 g/km), he would make the business decision to exit the market. In his estimation, the development costs would be too high.

9. PANEL FINDINGS AND DISCUSSIONS

9.1 Number and Types of Entities Affected

For a complete description and estimate of the small entities to which the proposed rule will likely apply, see Section 5. This includes OEMs, importers, and second-stage manufacturers which occasionally alter engine design and calibrations in ways that affect emissions.

9.2 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.

9.3 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.

9.4 Regulatory Flexibility Alternatives

As described above, EPA is developing standards for the categories to be addressed in this rulemaking. Because of the potential costs and technology challenges involved in meeting these standards, the Panel recommends that EPA consider and seek comments on a wide range of alternatives, including the flexibility options described below. We believe that the following set of flexibility options, taken together, potentially could significantly reduce burden without compromising the environmental benefits of the program.

9.4.1 Large SI Engines

The Panel identified one small-volume manufacturer that produces houseboat generators, some of which have power ratings slightly above 19 kW. This SER expressed concern that the standards that EPA is considering proposing would require extensive testing, design, and development, which could potentially place this firm at a competitive disadvantage to larger entities in the industry. Although the Panel has identified only one small company manufacturing large SI engines, the concerns that this manufacturer has expressed would likely apply to other small manufacturers that may produce these engines in the future. Providing additional lead time for small manufacturers to meet the standards and/or alternative methods of demonstrating compliance would reduce the economic burden and allow the vast majority of a potential program to be implemented, ensuring timely emission reductions. The Panel recommends several provisions to address this concern. These provisions are described below.

9.4.1.1 Using Certification and Emissions Standards from Other EPA Programs

EPA is already contemplating a proposal in which Large SI engines under 1 liter displacement may be certified to emission standards that apply to engines rated under 19 kW (Small SI, Class II). The Panel recommends temporarily expanding this arrangement to allow small numbers of constant-speed engines up to 2.5 liters (up to 30kW) to be certified to the Small SI standards. These are mostly steady-state power generators which are different than most other large SI engines since they operate at constant speed. This approach would provide for a significant measure of control consistent with previous technology development already undertaken for similar engines. The Panel believes that limiting this additional provision to 300 large SI engines per year per company total sales would be responsive to small-volume manufacturer needs without expanding its applicability unnecessarily. The Panel recommends that EPA seek comment on the appropriateness of the sales level. The Panel recommends requesting comment on the anticipated cap of 30 kW on the special treatment provisions outlined above, or whether a higher cap on power rating is appropriate. Given the relatively high CO

standard applicable to small SI engines, the fact that these large SI engines are often installed in applications that are used in places with limited ventilation (e.g., house boats), EPA may wish to seek comment on a lower CO standard (e.g. 100g/BHP-hr) for these reclassified engines.

The Panel recommends that EPA propose to allow small-volume manufacturers producing engines up to 30kW to certify to the small SI standards during the first 3 model years of the program. Thereafter, the standards and test procedures which could apply to other companies at the start of the program would apply to small businesses. This would allow for more lead time to develop three-way catalyst technology for companies with the most limited capital and engineering resources. These technologies have already been adapted and are available for Large SI engines. The additional lead time would give small-volume manufacturers extra time to select suppliers of the desired control technology that are best tailored to the individual product offerings. The extra time would also allow companies to integrate emission-control improvements into the overall plan for ongoing research and development for their engines. Finally, more lead time would give small-volume manufacturers the opportunity to benefit from the efforts of other companies to develop deterioration factors, as described below. Since the closed-loop systems with three-way catalysts have substantially better performance (fuel economy, performance, power density, noise, etc.). EPA expects that small-volume manufacturers may find it advantageous to introduce these technologies ahead of the schedule recommended here.

9.4.1.2 Delay of Proposed Standards

EPA is considering proposing a new test cycle and accompanying standards that would apply to engines beginning in the 2007 timeframe. The standards would require manufacturers generally to optimize their three-way catalyst designs for lower emissions. To meet these standards, manufacturers would need to ensure that their engine calibrations are effective at controlling air-fuel ratios across the engine map. For engines that operate at constant engine speeds, this is relatively simple. In fact, with the longer lead time for small-volume manufacturers to meet the Phase 1 standards and to obtain transient test cycle capability, it is possible that the design effort to introduce three-way catalyst systems would allow the companies to certify their engines at emission levels consistent with the Phase 2 emission standards that EPA is contemplating. These companies might, however, need to undertake further design work to adequately optimize their designs. To accommodate this possibility and to allow them to recover the costs associated with the Phase 1 emission standards that EPA is contemplating, the Panel recommends that if EPA includes such a second phase of standards in its proposal, EPA propose to delay the applicability of these standards to small-volume manufacturers for three years beyond the date at which they would generally apply. As described above, the additional lead time would allow small-volume manufacturers to integrate emission-control development into their ongoing research activities.

9.4.1.3 Production Line Testing

Production-line testing is another area where small-volume manufacturers typically face a difficult testing burden. To address this concern, the Panel recommends adopting provisions that allow more flexibility than is available under the California Large SI program or other EPA programs generally. First, the Panel recommends allowing small-volume manufacturers to have a reduced testing rate if they have consistently good test results from testing production-line engines. The Panel also recommends allowing small-volume manufacturers to use alternative low-cost testing options to show that production-line engines meet emission standards. Small-volume manufacturers currently must test production-line engines to meet CARB requirements.

9.4.1.4 Deterioration Factors

Development of deterioration factors is an additional area of concern for small manufacturers. The Panel recommends allowing small-volume manufacturers to develop a deterioration factor based on available emissions measurements and good engineering judgement. This would allow them to use appropriate deterioration factors already established for engines that they have developed for other programs, or from other companies already certifying comparable engines to the Large SI emission standards.

9.4.1.5 Hardship Provision

The Panel recommends that EPA propose two types of hardship provisions for Large SI engines. 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 would be decided during review of the hardship application. The second hardship program would 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 engines would have a major impact on the company's solvency.

9.4.2 Off-Road Motorcycles and All-Terrain Vehicles (ATVs)

SERs representing small importers and manufacturers of off-road motorcycles and ATVs expressed considerable concern that the standards EPA is considering could have a serious adverse effect on their business. EPA is considering a proposal that could include standards at levels that, if implemented, would likely necessitate the use of 4-stroke engines in off-road motorcycles and ATVs. Today, most small volume off-road motorcycle and ATV importers and, to a lesser degree, small volume manufacturers use 2-stroke engines. While 4-stroke engines are in widespread use in motorcycles and ATVs in general, their adoption by any manufacturer is still a significant business challenge. Small manufacturers of these engines could face additional

challenges in certifying engines to an EPA emissions standard (unless they are granted relief), because the cost of certification would be spread over the relatively few engines that they produce. These higher per-unit costs could place small manufacturers at a competitive disadvantage if they are not granted some relief.

In addition, there are some small entities whose entire business is built around importing and selling off-road motorcycles and ATVs. For some companies, most or all of the products they sell use 2-stroke engines. While these companies do not face the technological task of developing 4-stroke engines, they will need to either work with their off-shore suppliers to get 4-stroke engines or identify alternate suppliers. Because 2-stroke engines tend to dominate the less expensive end of the ATV and off-road motorcycle markets, these manufacturers may lose the niche that they currently occupy if EPA promulgates a “4-stroke forcing” emission standard, and in the case of importers, these companies cannot find complying products from their suppliers. Manufacturers that supply importers may be reluctant to supply 4-stroke engines if they sell only a small volume to their importers.

After examining this market, the Panel recommends that EPA propose to apply the flexibilities described below to engines produced or imported by small entities with combined off-road motorcycle and ATV annual sales of less than 5,000 units per model year. The Panel believes that these provisions would be needed to address the potentially significant adverse effects on small entities if EPA establishes a four-stroke forcing standard. The 5,000 unit threshold is intended to focus these flexibilities on those segments of the market where the need is likely to be greatest; the Panel also expects that EPA may wish to establish a threshold in order to assure that the flexibilities do not result in significant adverse environmental effects during the period of additional lead-time recommended in 9.4.2.1, below.¹² The Panel recommends that EPA request comment on the appropriateness of the 5,000 unit per model year threshold. The Panel understands that EPA may also wish to limit use of some or all of these flexibilities to entities that are in existence or have product sales at the time of proposal in order to avoid creating arbitrary opportunities in the import sector, and to guard against the possibility of corporate reorganization, entry into the market, or other action for the sole purpose of obtaining a more flexible standard. In doing so, EPA should request comment on any such restrictions.

The Panel also recommends that EPA request comment on allowing small entities with sales in excess of 5,000 units to certify using the flexible approaches described below for a number of engines equal to their 2000 or 2001 sales level. This would assure that all small entities currently in the market would be able to take advantage of these approaches.

¹²For example, importers may have access to large supplies of vehicles from major overseas manufacturers and potentially could substantially increase their market share by selling less expensive noncomplying products. Note, however, that the Panel has not examined the environmental implications of choosing a 5,000 unit threshold versus a threshold at some other level. EPA may wish to evaluate this issue in developing a proposed and final rule.

During the Panel's outreach meeting with small entities on issues related to recreational ATVs and off-road motorcycles, SERs expressed particular concern that a federal emissions standard that essentially required manufacturers to switch to four-stroke engines might increase costs to the point that many small importers and manufacturers could experience significant adverse effects. As noted above, the Panel believes that taken together, the flexible approaches under consideration by the Panel potentially could reduce burden on small entities without compromising the environmental benefits of the program. However, it is possible that even with the broad flexibility under consideration, the costs to small entities may still be too high and because they may operate on an elastic portion of the market demand curve, they may not be able to recover costs without losing much or all of their business. The Panel recommends that EPA describe and seek comment on the effect of the proposed standard on these entities, including a request for any data and/or related studies to estimate the extent to which sales of their products are likely to be reduced as a result of changes in product price that are attributable to the proposed standards. The Panel further recommends that, in the final rule, EPA assess any information received in response to this request for purposes of informing the final rule decision making process on whether additional flexibility (beyond that considered in this report) is warranted. One Panel member recommends, in addition, that EPA collect the requisite information and perform the appropriate analysis prior to proposal and include the results in the IRFA and Final Regulatory Flexibility Analysis required by the RFA.

9.4.2.1 Additional Lead-time to Meet the Proposed Standards

Several SERs supported additional lead-time as a way of reducing their burden to meet the proposed standards. This would provide extra time for technology to develop and, in the case of importers, extra time to resolve supplier issues which may arise. This flexibility would consist of a delay of the applicable date of the standards (e.g., one or two years) beyond the date larger businesses would be required to comply. The Panel recommends that EPA propose at least a two year delay, but seek comment on whether a larger time period is appropriate given the costs of compliance for small businesses and the relationship between importers and their suppliers.

EPA is considering proposing standards for off-road motorcycles and ATVs that would be phased in the mid- to latter part of this decade, and a second phase of more stringent standards for ATVs that would be phased in three years later. The Panel believes delaying requirements for small entities would provide additional time for small volume manufacturers to revise their manufacturing process, and would allow importers to change their supply chain to acquire complying products. EPA would expect that a two year delay may be sufficient, given that most small businesses affected import their products, and foreign manufacturers tend to be large or mid-sized businesses that would tend to be capable of meeting the general standards that EPA would set for these categories. Nevertheless, the Panel recommends that EPA request comment on the appropriate length for such a delay.

9.4.2.2 Design Certification

The process of certification is a business cost and lead time issue, which potentially places a disproportionate burden on small entities, particularly importers. Certification is a fixed cost of doing business which is potentially more burdensome on a unit cost basis for small entities. It is potentially an even greater challenge since some small entities will either contract emission testing work to other parties or, in the case of importers, perhaps rely on off-shore manufacturers to develop and certify the imported engines.

This approach would allow EPA to issue a certificate to a small business for the emissions performance standard based on the small business demonstrating that their engines or vehicles meet design criteria rather than by emission testing. The demonstration would be based in part on emissions test data from engines of a similar design. Under a design-based certification program a manufacturer would provide evidence in the application for certification that an engine or vehicle would meet the applicable standards for its useful life based on its design (e.g., use of a particular technology or calibration). The design criteria could include specifications for engine type, calibrations (spark timing, air /fuel ratio, etc.), and other emissions critical features, including, if appropriate, catalysts (size, efficiency, precious metal loading). The manufacturer would submit adequate engineering and other information about its individual design such that EPA could determine that the individual design would conform with the emissions standards for the useful life.

SERs, especially importers, noted support for flexibilities that would allow them to avoid the costs associated with emissions testing. Certifying using design criteria, along with use of an assigned DF and a waiver from durability testing and production line testing (see 9.4.2.4 and 5, below) would allow for certification and production without mandatory emissions testing for each engine and vehicle family. The Panel recommends that EPA propose to permit small entities to use design certification. The Panel further recommends that EPA work with these entities and other members of the industry to develop appropriate criteria for such design based certification.

9.4.2.3 Broaden Engine Families

This approach would allow relax the criteria used to determine what constitutes an engine or vehicle family. It would allow small businesses to put all of their models into one vehicle or engine family (or more) for certification purposes if appropriate. Manufacturers would then certify their engines using the “worst case” configuration within the family.

The Panel understands that EPA may wish to examine further the relationship between this flexibility and design certification provisions. However, a small manufacturer might need to conduct certification emissions testing rather than pursuing a design-based certification, and in such cases, would likely find engine family flexibility useful. The Panel therefore recommends that EPA request comment on this approach.

9.4.2.4 Production Line Testing Waiver

EPA is considering requiring manufacturers to test a sampling of production engines to ensure that production engines meet emissions standards. Under such an approach manufacturers could be required to test a small fraction of production. A waiver approach would eliminate or substantially limit production line testing requirements for small businesses. It could be limited to engine/vehicle families under a given production volume limit or could be applied broadly to small businesses. For example, in California, highway motorcycle manufacturers who project less than 10,000 units of production in a given model year are currently exempted from production line testing requirements under existing regulations. A similar approach could be taken for off-road motorcycles and ATVs. This is likely to be important to small businesses, many of which do not have testing facilities on-site and would rely on outside contractors for testing.

The Panel recommends that EPA propose to provide small manufacturers and small importers a waiver from manufacturer production line testing. The Panel further recommends that EPA request comment on whether limits or the scope of this waiver are appropriate.

9.4.2.5 Use of Assigned Deterioration Factors During Certification

Rather than performing a durability demonstration for each family as part of the certification testing requirement, manufacturers could elect to use deterioration factors determined by EPA to demonstrate end of useful life emission levels, thus reducing development/testing burden. This could be a very useful and cost-effective option for a small manufacturer opting to perform certification emissions testing in lieu of design certification.

The Panel recommends that EPA propose to provide small business with the option to use assigned deterioration factors.

9.4.2.6 Using Certification and Emissions Standards from Other EPA Programs

A wide array of engines have been certified to other EPA programs and could potentially be used in recreational vehicles. For example, there is a large variety of engines certified to EPA lawn and garden standards (Small SI). Under this approach, engines certified to the Small SI standards could be used in recreational vehicles, and such engines would be subject to the Small SI standards and related provisions rather than the Recreational Vehicle program. The small business using the engine would not have to recertify the engine provided the manufacturer does not alter the engine in such a way as to cause it to exceed the emission standards it was originally certified as meeting. Also, the recreational vehicle application could not be the primary intended application for the engine.

The Panel recommends that EPA propose to provide small business with this flexibility through the fifth year of the proposed program and request comment on which of the already established standards and programs are believed to be a useful certification option for the small businesses.

9.4.2.7 Averaging, Banking, and Trading

For the overall program, EPA plans to propose corporate average emissions standards with opportunities for banking and trading of emissions credits. The Panel would expect the averaging provisions to be most helpful to manufacturers with broad product lines. Small manufacturers and small importers with only a few models might not have as much opportunity to take advantage of these flexibilities. However, EPA received comment from one SER supporting these types of provisions as a critical component of the program.

The Panel recommends that EPA propose to provide small business with the same averaging, banking, and trading program flexibilities proposed for large manufacturers and request comment on how the provisions could be enhanced for small business to make them more useful.

9.4.2.8 Hardship Provisions

The Panel recommends that EPA propose two types of hardship program for off-road motorcycles and ATVs. The first type of hardship program would allow small manufacturers and small importers to petition EPA for limited additional lead-time to comply with the standards. A 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 or, in the case of importers, failed best efforts to locate an adequate supplier of complying products, would have a significant adverse effect on the company's solvency. Hardship relief could include requirements for interim emission reductions and/or purchase and use of emission credits. The length of the hardship relief would be established during the initial review and would likely need to be reviewed annually thereafter. EPA anticipates that one to two years would normally be sufficient. The second hardship program would allow small manufacturers and small importers 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 terms and time frame of the relief would depend on the specific circumstances of the company and the situation involved. The Panel recommends that EPA propose both aspects of the hardship provisions for small off-road motorcycle and ATV manufacturers and importers and seek comment on the implementation provisions. As part of its application, a company would be required to provide a compliance plan detailing when and how it would achieve compliance with the standards under both types of hardship relief.

9.4.3 Marine Vessels

In 1999, a SBAR Panel was conducted to address small business issues related to emission control requirements for sterndrive and inboard SI engines and recreational diesel marine engines. The reader is referred to that August 29, 1999 Panel report for background, consultations, and recommendations.

In 1999, the Panel did not fully address the off-cycle emission NTE test requirement and standards EPA is considering for the proposal. These potential additional requirements are important for emissions control and potentially add to the overall compliance burden. The impact of these potential provisions on small entities is considered below.

Evaporative emissions from gasoline marine fuel tanks are currently uncontrolled. There are over 500,000 tanks built annually, both aluminum and plastic. The majority of these are portable tanks used in outboard and related applications, but about 25% are installed in a vessel. Many of the tank and vessel manufacturers involved are small entities, and the potential requirements and design challenges could be a significant burden if manufacturers have to retool and redesign molds frequently.

9.4.3.1 Burden Reduction Approaches Designed for Small Boat Builders and Fuel Tank Manufacturers

9.4.3.1.1 Smooth Transition to Proposed Standards

As discussed earlier in this report, there are a number of strategies available to reduce evaporative emissions (diurnal and permeation) from marine gasoline 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 have about a five year life before replacement. However, for the low production fuel tanks, they may use their molds for 10-15 years. Plastic fuel tank manufacturers have commented that evaporative control requirements could induce them to redesign many of their molds. They have stated that their costs would be greatly reduced if they could redesign their fuel tank molds as they normally turn over (an orderly approach more consistent with their current business practice) rather than doing so solely in response to an evaporative control requirement.

The Panel recommends that EPA propose an approach that would implement any evaporative standards five years after a regulation for marine engines takes effect. This would provide a 5 year tank turnover as discussed above, which allows more orderly businesses practices to implement controls. This would also provide the opportunity for generation of early credits as discussed below. The Panel also recommends that EPA seek comment on this 5 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 5 years.

9.4.3.1.2 Design-Based Certification

SERs have commented that performing evaporative emission testing could be prohibitively costly for many fuel tank manufacturers or boat builders. In addition, the Panel understands that many of the technologies that can be used to reduce evaporative emissions are

straightforward design strategies. For these reasons, 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. SERs have expressed support for this approach.

EPA is considering an approach that would identify design specifications for fuel tanks and related equipment (e.g., tank insulation; see section 3.4.1 of this report for illustrative examples) and specify a benchmark percentage reduction in evaporative emissions that would be associated with each technology. Companies would be permitted to average -- on a volumetrically-weighted basis -- the evaporative emissions performance of the tanks in their products to comply with an evaporative emissions standard. At certification, manufacturers would submit adequate information about their individual designs such that EPA could determine conformity with the emissions standards and/or regulatory provisions based on the descriptions provided. The Panel believes that this approach, which combines elements of a performance standard and a design standard, would be very helpful in addressing the concerns of small entities if EPA promulgates an evaporative emissions standard. 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.

9.4.3.1.3 ABT of Emission Credits with Design-Based Certification

Averaging, banking, and trading (ABT) would allow the use of credits by some fuel tanks to be offset by the generation of credits by other fuel tanks. Averaging would allow manufacturers to use credits from fuel tank designs cleaner than the standard to offset shortfalls from fuel tank designs that do not meet the standard. Banking would allow manufacturers to save emission credits for use in the future. Trading would allow manufacturers to purchase credits from other marine gasoline fuel tank manufacturers. Generally, when this type of provision is applied, manufacturers are required to test their products and certify them to an emission level. This emission level is used to calculate a company's baseline credit.

This provision would allow manufacturers using design-based certification to generate credits. The Panel believes that this would give manufacturers some relief by providing them with flexibility in how they apply emission control technology to their products. Under this approach, EPA would not only have to define various control technologies, but also prescribe control efficiency. This would allow some tanks to incorporate technology providing percentage reductions less than the standard and some achieving more than the standard, provided they comply overall on a volumetrically weighted basis. Credits generated using this provision could be used in all aspects of the ABT program, and banked or traded credits could be used to comply with this provision.

The Panel recommends that EPA propose this approach and recommends that EPA provide adequately detailed design specifications and associated emission levels for several technology options that could be used to certify.

9.4.3.1.4 Broadly Defined Product Certification Families

For the on-highway evaporative emission requirements, each motor vehicle 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.

For an evaporative emissions standard applicable to marine vessels, the emission families would likely be based on fuel type, control technology(ies) used, tank material, and possibly size. Most if not all SI marine engines use gasoline and most manufacturers make either plastic or aluminum fuel tanks but generally not both. Therefore, it is not likely that the criteria for determining emission families could be limited to fewer than the four criteria mentioned above. However, the Panel recommends that EPA take comment on the need for broadly defined emission families and how these families should be defined.

Hardship Provisions

The Panel recommends that EPA propose two types of hardship programs for marine engine manufacturers and fuel tank manufacturers. The first type of hardship program would allow small businesses to petition EPA for additional lead time to comply with the standards. This option is intended to be in addition to the time provided by the leadtime, phase-in, and averaging strategy in section 9.4.3.1.1. 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. The length of the hardship relief would be decided during review of the hardship application. EPA anticipates that one to two years would normally be sufficient. Hardship relief could include requirements for interim emission reductions and/or purchase and use of emission credits. The second hardship program would 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 recommends that EPA work with small manufacturers to develop these criteria and how they would be used.

9.4.3.2 Burden Reduction Approaches Designed for Small Marinizers of Marine Engines with Respect to NTE Provisions

Small business burden reduction approaches were developed for small marinizers who would need to certify to exhaust emission standards in a previous SBREFA Panel conducted in 1999. However, one SER requested that we revisit the issue of not-to-exceed (NTE) provisions. This NTE concept would require engine marinizers to show emission compliance over a range of engine operation other than just the five modes in the certification test procedure under consideration by EPA. This SER did not comment on the potential burden of NTE provisions in the earlier Panel and no recommendations were discussed with regard to NTE in the Panel report.

During the current Panel, this SER commented that testing and designing for a zone rather than for discrete test points would be overly burdensome for small marinizers. Therefore, this SER recommended that small marinizers have the option of certifying their engines with a design-based approach only and not be required to perform NTE testing.

In the 1999 Panel report, the Panel recommended that EPA propose to allow small marinizers of **SD/I engines** to certify to a performance standard through design-based certification **and recommended that EPA take comment on a similar approach for small marinizers of CI recreational marine engines**. The Panel now recommends that EPA propose to specifically include NTE in this design-based approach, if EPA proposes a standard that includes NTE for this category.

9.4.4 Snowmobiles

As discussed above, there are only a few small snowmobile manufacturers and they sell only a few hundred engines a year, which represents less than 0.5% of total annual production. Therefore, the per-unit cost of regulation could be significantly higher for these small manufacturers because they produce very low volumes. Additionally, these companies do not have the design and engineering resources to tackle compliance with emission standard requirements at the same time as large manufacturers and tend to have limited ability to invest the capital necessary to conduct emission testing related to R & D and certification. Finally, the requirements of the full program as described in section 3.5 may be infeasible or highly impractical because small volume manufacturers typically produce engines with unique designs and/or calibrations to serve niche markets including mountain riding. Therefore, significant requirements potentially could impose significant economic hardship on these few manufacturers whose market presence is small and who, according to the SERs, face considerable capital constraints (two small entities shut down during the Panel.) Based on these facts, the Panel believes that significant flexibility is necessary and appropriate for this category of small entities, as described below.

9.4.4.1 Delay of Proposed Standards

The Panel recommends that EPA propose to delay the standards for small snowmobile manufacturers by two years from the date at which other manufacturers would be required to comply. The Panel also recommends that EPA propose that the emission standards for small

snowmobile manufacturers be phased in over an additional two years. This would give a small entity as many as four years to fully implement the standard.

9.4.4.2 Design-Based Certification

As is the case with other categories, certification has cost and lead time implications. Design-based certification could allow small snowmobile manufacturers to certify to a performance standard by demonstrating that their engines or vehicles meet design criteria rather than by emission testing. Under a design-based certification program, a manufacturer would provide evidence in the application for certification that an engine or vehicle would meet the applicable standards for its useful life based on its design (e.g., use of a particular technology such as 4-stroke technology or two-stroke technology with a catalyst or calibration such as significant enleanment). Such a demonstration would need to be based on some test data, but not necessarily data from the engine being certified. The certification application would have to include or refer to enough relevant information relating engine design and calibrations to emission levels to allow EPA to make a determination of conformity. EPA does not anticipate that the snowmobile emission standards it is considering would result in major changes in engine technology. Therefore, the Panel recommends that EPA take comment on how a design-based certification could be applied to small snowmobile manufacturers and that EPA work with the small entities in the design and implementation of this concept.

9.4.4.3 Broader Engine Families

Allowing manufacturers to certify broader engine families for certification has the potential to reduce cost while still meeting the intent of the certification requirement. The Panel recommends that EPA propose a provision for small snowmobile manufactures that would use relaxed criteria for what constitutes an engine or vehicle family. This approach would allow small snowmobile manufacturers 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.

9.4.4.4 Elimination of Production Line Testing Requirements

EPA is considering proposing that snowmobile manufacturers test a small percentage of production for emission purposes (“production line testing”). The Panel recommends that EPA propose that small snowmobile manufacturers not be subject to production line testing requirements. Not requiring production line testing (distinct from Selective Enforcement Auditing) for small snowmobile manufacturers would avoid adding to overall testing burden and costs. This flexibility could be limited to engine/vehicle families under a given production volume limit or applied broadly to small snowmobile manufacturers.

9.4.4.5 Use of Assigned DF During Certification

Manufacturers are required to certify their products using information to predict emission performance over its entire useful life. Developing information on emissions durability can potentially be costly and time consuming. Rather than performing a durability demonstration for each engine family as part of the certification testing requirement, small snowmobile manufacturers could elect to use deterioration factors determined by EPA to demonstrate end of useful life emission levels, thus reducing development/testing burden. The Panel recommends that EPA propose to allow this option for small snowmobile manufacturers.

9.4.4.6 Using Certification and Emission Standards from Other EPA Programs

Small displacement, low horsepower SI engines find many applications in nonroad vehicles and equipment. EPA has already implemented regulations for small SI engines and the pending proposal would cover essentially all other applications. Under this option, EPA would allow a small snowmobile manufacturer to use an engine certified to another EPA program without recertifying in its new application, provided the manufacturer does not alter the engine in such a way as to cause it to exceed the emission standards it was originally certified as meeting. For example, a certified small SI engine (lawn and garden) engine could be used in a specialized snowmobile without recertifying it as a recreational engine. The recreational vehicle application could not, however, be the primary intended application of the engine. Additionally, a certified snowmobile engine produced by a large snowmobile manufacturer could be used by a small snowmobile manufacturer provided the small manufacturer did not alter the engine in such a way as to cause it to exceed the snowmobile emission standards. This would provide a reasonable degree of emission control provided all other elements of the program were met. For example, if the only change a manufacturer were to make to the certified engine was to replace the stock Y-pipes and exhaust pipes with pipes of similar configuration or the stock muffler and air intake box with a muffler and air box of similar air flow, the engine could, subject to EPA review, still be eligible for this flexibility option. This manufacturer could also change the carburetor to have a leaner air/fuel ratio without losing eligibility. However, if the manufacturer were to change the bore or stroke of the engine, it is likely that the engine would no longer qualify as emissions could increase. The Panel recommends that EPA propose to allow this option for small snowmobile manufacturers.

9.4.4.7 Averaging, Banking and Trading

Averaging, banking and trading (ABT) programs allow a manufacturer to produce and sell engines and vehicles that exceed the applicable emission standards provided that the excess emissions are offset by the production of engines and vehicles which emit at levels below the standards. The sales, and power-weighted average of a manufacturer's total production for a given model year must meet the standards. ABT also allows a manufacturer to bank emission credits for use in future model years as well as buy credits from, or sell credits to, other manufacturers. Special provisions for small businesses could be created to increase flexibility. The panel recommends that EPA propose an averaging, banking and trading program for

snowmobiles, and seek comment on additional ABT flexibilities it should consider for small snowmobile manufacturers.

9.4.4.8 Hardship Provisions

The Panel recommends that EPA propose two types of hardship programs for small snowmobile manufacturers. The first type of hardship program would allow small snowmobile manufacturers to petition EPA for additional lead time to comply with the standards. A 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 put together a compliance plan explaining 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 hardship relief would be established during review of the application. EPA anticipates that normally this would be a period of 1-2 years. The second hardship program would allow small snowmobile manufacturers 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.

9.4.4.9 Unique Snowmobile Engines

Even with the broad flexibilities described above, there may be a situation where a small snowmobile manufacturer cannot comply. Therefore, the Panel recommends EPA seek comment on an additional provision, which would allow a small snowmobile manufacturer to petition EPA for relaxed standards for one or more engine families. The manufacturer would have to justify that the engine design, calibration, or operating characteristics which make it atypical and infeasible or highly impractical to meet the emission reduction requirements considering technology, cost, and other factors. At its discretion, EPA would then set an alternative standard at a level between the prescribed standard and the baseline level. Such a standard would be intended to apply until the engine family is retired, or modified in such a way as to increase emissions. These engines would be excluded from the averaging calculation. The Panel recommends that allowing this provision to be extended for up to 300 engines per year per manufacturer would assure it is sufficiently available for those manufacturers for whom the need is greatest.

The Panel recommends that EPA seek comment on initial and deadline dates for the submission of such petitions. While any relief would be enacted for the first year standards apply, there may be value to getting feedback early. It would seem reasonable that the first date for submittals would be during the first year requirements apply to any snowmobile manufacturer. The deadline for submittals might be at sometime during the last year of the small business delay. The Panel understands that EPA intends to respond in a timely manner.

9.4.5 Highway Motorcycles

While the highway motorcycle market is dominated by large entities, there are over 30 small entities which manufacture 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. The Panel has developed its recommendations in part in response to the technology, timing, and scope of the requirements applicable to the small entities in California's program. The provision discussed below would reduce the economic burden on small entities, allowing harmonization with California requirements in a phased, but timely manner.

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. These provisions are appropriate because of the significant research and development resources that could be required to meet the proposed emission standards. These provisions would reduce the economic burden while ensuring the vast majority of the program is implemented ensuring timely emission reductions. The Panel also understands that many small highway motorcycle manufacturers market "classic" and "custom" motorcycles, often with a "retro" appearance. This tends to make the addition of new technologies a uniquely resource-intensive prospect for these manufacturers.

9.4.5.1 Delay of Proposed Standards

The Panel recommends that EPA propose to delay compliance with the Tier 1 standard of 1.4 g/km HC+NO_x until the 2008 model year for small volume manufacturers. EPA is considering proposing a Tier 1 standard beginning as soon as the 2006 model year for 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, the Panel recommends that EPA seek comment on whether additional time is needed for small businesses to comply with the Federal program.

The current California regulations do not require that small manufacturers comply with the Tier 2 standard of 0.8 g/km HC+NO_x. 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. And, as noted above, many of these manufacturers market a specialty product with a "retro" simplicity that often may not easily lend itself to the addition of advanced technologies like catalysts. However, CARB has acknowledged that, in the course of the progress review that they plan to undertake in 2006, they will revisit their small manufacturer provisions. Therefore, we recommend 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 section 3.6.4.2.

9.4.5.2 Broader Engine Families

Small entities have met EPA certification requirements since 1978. Nonetheless, it has cost and has lead time implications as well. Relaxing the criteria for what constitutes an engine or vehicle family would 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. The Panel recommends that these provisions remain in place.

9.4.5.3 Exemption from Production Line Testing

There is currently no mandatory production line testing requirement for highway motorcycles. The current regulations allow the EPA to request production vehicles from any certifying manufacturer for testing. The Panel recommends no changes to these existing provisions.

9.4.5.4 Averaging, Banking, and Trading (ABT)

ABT allows a manufacturer to produce and sell engines and vehicles that exceed the applicable emission standards provided that the excess emissions are offset by the production of engines and vehicles which emit 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 ABT program typically also allows a manufacturer to bank emission credits for use in future model years as well as buy credits from, or sell credits to, other manufacturers. ABT programs are generally made available to all manufacturers, although special provisions for small businesses could be created to increase flexibility.

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

9.4.5.5 Hardship Provisions

The Panel recommends that EPA propose two types of hardship programs for highway motorcycles. The first type of hardship program would allow small businesses to petition EPA for additional lead time to comply with the standards. These businesses would have to make the case that they have 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. Hardship relief could include requirements for interim emission reductions and/or purchase and use of emission credits. A manufacturer would be required to provide a compliance plan defining when and how it would achieve compliance with the standard. The length of the hardship relief would be determined during review of the hardship application. EPA anticipates that one to two years would normally be sufficient. The second hardship program would 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. In light of the California requirements, which do not include hardship provisions, the Panel recommends that EPA request comment on this alternative.

9.4.5.6 Reduced Certification Data Submittal and Testing Requirements

The 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. The Panel believes that it would be appropriate to provide these flexible approaches to manufacturers with annual sales up to 3000 units, as this would provide relief where it is likely to be needed most. The Panel also notes that this threshold is consistent with the 500 employee SBA definition and the California provision for these vehicles. This lower threshold would accommodate the more substantial provisions for small entities recommended in this report. In general, qualifying manufacturers also have reduced testing and data submittal requirements. For example, a qualifying manufacturer is required to 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. A manufacturer is required to retain adequate emission test data, for example, but need not submit it. Qualifying manufacturers are not required to complete the detailed durability testing required in the regulations. The Panel recommends no changes to these existing provisions.

10. APPENDICES

Appendix A - EPA Summaries of SBAR Panel's Outreach Meeting with SERs on May 30 and May 31, 2001

Appendix B - Written Comments Submitted by SERs

Appendix C - List of Materials SBAR Panel Sent to SERs