MERCATUS CENTER
GEORGE MASON UNIVERSITY

December 19, 2001

SUBMITTED VIA E-MAIL: NRANPRM@epa.gov

Margaret Borushko
U. S. Environmental Protection Agency
National Vehicle and Fuels Emissions Laboratory
2000 Traverwood
Ann Arbor, MI 48105

Reference: Docket A-2000-01

Dear Ms. Borushko:

Please find enclosed comments on "*The U.S. Environmental Agency's Proposed Rule to Control Emissions From Nonroad Large Spark Ignition Engines and Recreational Engines (Marine and Land-Based)"* that we have prepared in response to the Environmental Protection Agency's request for comment dated October 5, 2001 (Federal Register: Volume 66, Number 194, p. 51098).

The Regulatory Studies Program (RSP) of the Mercatus Center at George Mason University is dedicated to advancing knowledge of regulations and their impacts on society. As part of its mission, RSP produces careful and independent analyses of agency rulemaking proposals from the perspective of the public interest. This comment on the U.S. Environmental Protection Agency's proposed emission standards for new nonroad engines does not represent the views of any particular affected party or special interest group, but is designed to evaluate the effect of the Agency's proposals on consumer welfare.

The Regulatory Studies Program appreciates the opportunity to comment on the proposed rule. We hope that consideration of these comments will enhance the quality and development of regulations and policy regarding air quality.

Wendy L. Gramm, Director
Regulatory Studies Program

Susan E. Dudley
Senior Research Fellow

MERCATUS CENTER
GEORGE MASON UNIVERSITY

REGULATORY STUDIES PROGRAM

Public Interest Comment on
The U.S. Environmental Agency's Proposed Rule to Control Emissions From Nonroad Large Spark Ignition Engines and Recreational Engines (Marine and Land-Based)[1]

The Regulatory Studies Program (RSP) of the Mercatus Center at George Mason University is dedicated to advancing knowledge of the impact of regulation on society. As part of its mission, RSP conducts careful and independent analyses employing contemporary economic scholarship to assess rulemaking proposals from the perspective of the public interest. Thus, this comment on the U.S. Environmental Protection Agency's proposed emission standards for new nonroad engines does not represent the views of any particular affected party or special interest group, but is designed to evaluate the effect of the Agency's proposals on overall consumer welfare.

The EPA is proposing emission standards for several groups of nonroad engines—not yet regulated by the Agency—that contribute to ozone, carbon monoxide (CO), air toxics and particulate matter (PM) but are not yet regulated by the Agency. These engines include large spark-ignition engines such as those used in forklifts and airport tugs; recreational vehicles using spark-ignition engines such as off-highway motorcycles, all-terrain vehicles (ATVs) and snowmobiles; and recreational marine diesel engines. The EPA claims that the proposed rule will help many parts of the nation meet air quality standards and confer health and environmental benefits.

Section I of this comment summarizes the proposed rule and its legal foundation. Section II reviews the analysis used by the EPA to justify the rule. Section III demonstrates that the Agency's own cost accounting methodology strongly suggests that major revisions in the proposed rule could deliver comparable health and environmental benefits at far less cost to consumers. Section IV provides a brief summary and set of recommendations.

I. Summary of proposal and statutory authority

A. Proposal Summary

The U.S. Environmental Protection Agency (EPA) is proposing new "standards for emissions of oxides of nitrogen (NO_x), hydrocarbons (HC), and carbon monoxide (CO) from several groups of previously unregulated non-road engines and vehicles that cause

[1] Prepared by Garrett A. Vaughn, Ph.D. economist. This comment is one in a series of Public Interest Comments from Mercatus Center's Regulatory Studies Program and does not represent an official position of George Mason University.

or contribute to air pollution."[2] EPA groups these engines into three principal categories with two of those categories divided into sub-categories. The three principal categories are:

- **Large Industrial Spark Ignition Engines.** Spark-ignition (SI) non-road engines rated over 25 horsepower (19 kilowatts or kW) used in commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of other construction, farm, and industrial equipment.

- **Recreational Vehicles.** Spark-ignition nonroad engines used in off-highway motorcycles, all-terrain-vehicles (ATVs), and snowmobiles.

- **Diesel Marine Engines.** Diesel engines rated at or above 50 horsepower (37kW) used in recreational boats.[3]

Tables 1, 2 and 3 summarize the proposed emission standards for the following engines/vehicles (now unregulated).[4]

Table 1. Proposed Emission Standards for Large SI Engines (g/kW-hr)

Model Year	Testing Type	Emission Standards		Alternate Emission Standards	
		$HC+NO_x$	CO	$HC+NO_x$	CO
2004 -2006	Duty-cycle testing (steady-state)	4.0	37	—	—
2007 and later	Duty-cycle testing (transient)	3.4	3.4	1.3	27
	Field-testing	4.7	5.0	1.8	41

According to the EPA, many large SI engines are modified automotive engines without, however, the automotive emission-control technologies that "allow for dramatic

[2] United States Environmental Protection Agency (EPA), "Emission Standards for New Nonroad Engines," Environmental Fact Sheet (EPA420-F-01-026), September 2001.
[3] United States Environmental Protection Agency, "Emission Standards for New Nonroad Engines," Environmental Fact Sheet (EPA420-F-01-026), September 2001.
[4] These tables reproduce those given by the EPA in "Emission Standards for New Nonroad Engines," Environmental Fact Sheet (EPA420-F-01-026), September 2001.

improvements to engine performance and fuel economy, while reducing CO, NO_x, and HC emissions by about 90 percent. The proposed near-term standards [for 2004 – 2006] are based on similar requirements adopted by the California Air Resources Board."[5] The EPA proposes the longer-term [2007 and later] standards based on its estimates of remaining emissions and the potential of new technologies to curb those emissions. Currently, according to the EPA, large SI engines account for approximately 3 percent of total mobile-source CO, NO_x and HC emissions nationwide.[6]

Table 2. Proposed Recreational Vehicle Exhaust Standards

Vehicle	Model Year	Emission Standards		Phase-in
		HC g/kW-hr	CO g/kW-hr	
Snowmobiles	2006	100	275	100%
	2010	75	200	100%
		$HC+NO_x$* g/km	CO* g/km	
Off-highway Motorcycles	2006	2.0	25.0	50%
	2007 and later	2.0	25.0	100%
ATVs	2006	2.0	25.0	50%
	2007 and 2008	2.0	25.0	100%
	2009	1.0	25.0	50%
	2010 and later	1.0	25.0	100%

*The motorcycle and ATV g/km standards relate to a vehicle test rather than an engine test. Thus the g/km standards cannot be compared directly to the g/kW-hr standards for the other sectors. For example, an ATV emitting 2.0 g/km $HC+NO_x$ could emit as much 16 g/kW-hr when tested on an engine-basis.

[5] United States Environmental Protection Agency, "Emission Standards for New Nonroad Engines," Environmental Fact Sheet (EPA420-F-01-026), September 2001, p. 3. Words in brackets are added.
[6] United States Environmental Protection Agency, "Emission Standards for New Nonroad Engines," Environmental Fact Sheet (EPA420-F-01-026), September 2001, p. 3.

According to the EPA, emissions from recreational vehicle engines account for approximately 10 percent of HC and 3 percent of CO total mobile-source emissions nationwide.[7]

Table 3. Proposed Recreational Marine Diesel Emission Limits and Implementation Dates

Subcategory	Implementation Date	$HC+NO_x$ g/kW-hr	PM g/kW-hr	CO g/kW-hr
power $\geq$37 kW 0.5 < disp < 0.9	2007	7.5	0.40	5.0
0.9 $\leq$ disp <1.2	2006	7.2	0.30	5.0
1.2 $\leq$ disp <2.5	2006	7.2	0.20	5.0
2.5 $\leq$ disp	2009	7.2	0.20	5.0

According to the EPA, recreational diesel marine engines "vary greatly in size, but are generally produced by modifying land-based engines." Emissions from these engines "account for approximately 0.5 percent of NO_x emissions and 0.2 percent of PM emissions relative to total nationwide mobile-source emissions."[8]

B. Legal Authority

According to the EPA:

> *The proposed standards are a continuation of the process of establishing standards for nonroad engines and vehicles, as required by Clean Air Act section213(a)(3). All the nonroad engines subject to this proposal are still unregulated emission sources.*
>
> *This proposal follows a final finding published on December 7, 2000 (65 FR76790). Under this finding, EPA found that industrial spark-ignition (SI) engines rated above 19 kilowatts (kW), as well as all land-based recreational nonroad spark-ignition engines, cause or contribute to air quality nonattainment in more than one ozone or carbon monoxide (CO) nonattainment area. We also*

[7] United States Environmental Protection Agency, "Emission Standards for New Nonroad Engines," Environmental Fact Sheet (EPA420-F-01-026), September 2001, p. 4.
[8] United States Environmental Protection Agency, "Emission Standards for New Nonroad Engines," Environmental Fact Sheet (EPA420-F-01-026), September 2001, p. 5.

found that particulate matter (PM) emissions from these engines cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare.

Section 213(a)(2) further required us to determine whether emissions of CO, VOC, and NOX from all nonroad engines significantly contribute to ozone or CO emissions in more than one nonattainment area. If we determine that emissions from all nonroad engines were significant contributors, section 213(a)(3) then requires us to establish emission standards for classes or categories of new nonroad engines and vehicles that in our judgment cause or contribute to such pollution.[9]

II. Review of the analysis used to support the proposal

A. The EPA Has Not Conducted An Economic Benefit-Cost Analysis As Required

The EPA has estimated neither the economic benefits nor the economic costs of the proposed rule. Under Executive Order 12866 issued by President Clinton, regulatory agencies should "…select the approaches that maximize the net benefits…" (Section 1(a)). Maximizing net benefits requires an economic benefit-cost analysis.

Instead of estimating benefits (e.g., human health improvements) from its proposal, the EPA estimates the *nationwide* reduction in emissions—measured in tons—that would follow once the standards are fully phased in. Instead of economic costs, the Agency estimates the engineering costs that producers would face in modifying engine designs and developing new technologies needed to meet the proposed emission standards. The EPA then estimates the average cost per ton of prevented emissions. Since this statistic falls within the range of average costs per ton of prevented emissions established by previous regulations, the EPA concludes the proposed rule would be "cost effective." Yet, as Dr. John Graham, Administrator of the Office of Information and Regulatory Affairs in OMB, stated in his letter of 24 September: "while a measure of cost-effectiveness is useful, it is hardly sufficient because it cannot adequately capture the likely benefits of controlling emissions from these engines."[10]

"Cost effectiveness"—based on *nationwide* emission reductions—cannot capture likely benefits because most areas of the country now meet health-based air quality standards. Unless the estimated emission reductions happen to occur in the relatively few areas that fail to meet air quality standards, U.S. citizens will gain few health or environmental benefits. The EPA does not show that the proposed rule would target emission reductions

[9] *Federal Register,* October 5, 2001, p. 51099.
[10] John D. Graham, Administrator, Office of Management and Budget, letter to Jeffrey R. Holmstead, Assistant Administrator, U.S. Environmental Protection Agency, 24 September 2001.

where they are needed. Indeed, many of the reductions would appear to occur in areas of the country that already meet air quality standards, thereby promising few health benefits.

In place of making even a minimal effort to estimate the monetary value of the health and environmental benefits (that can be compared with a dollar value of costs), the EPA offers an extensive accounting of the proposed rule's savings on energy use and engine/vehicle maintenance. The estimated energy/maintenance savings—substantial enough to provide a net financial gain for customers—suggest that the proposed rule is economically justified even should the health and environmental benefits be trivial. However, as the Agency notes, the estimates of energy/maintenance savings presume a "market failure" of some kind. Without market failure, competition would ensure that over the long term all energy/maintenance savings—that do not require customers to sacrifice an equal or greater reduction in the value of other desired attributes (e.g., reliability, safety, acceleration, comfort, durability, and so forth)—would flow through to customers. As discussed in subsection IID, the EPA offers virtually no evidence to support its claim of market failure;[11] and therefore does not adequately support its claim that the proposed rule will provide consumers with a net financial gain.

Furthermore, as discussed in subsection IID, the energy/maintenance "savings" estimated by the EPA may actually represent money that consumers want to pay to obtain other desirable vehicle attributes such as safety, acceleration, durability and so forth. If so, the estimates of energy/maintenance "savings" improperly portray a loss in consumer welfare as a "benefit."

B. The EPA Does Not Demonstrate *Nationwide* Standards Are Needed

The nation's strategy for regulating similar air pollutants from automobiles recognizes that emission standards appropriate for densely-populated areas such as Los Angeles and Houston are needlessly expensive for more rural, less densely-populated areas. For instance, California's stricter automobile emission standards, coupled with tighter gasoline specifications, yield much higher health and environmental benefits than would those same regulations in such states as Montana, Kansas or Wyoming. By tailoring regulations to regions' air quality, the EPA could achieve similar or greater health benefits at lower costs.

Yet, the EPA makes no attempt to show why the same emission standards should apply to every forklift, recreational marine engine, offroad motorcycle or snowmobile regardless

[11] On this point, OMB's John Graham stated: "EPA estimates that the proposal will yield fuel cost savings of $430 million per year, an amount more than double the expected costs of the proposal. Much of the fuel economy savings will come from the adoption of different technological approaches (e.g., 4-stroke engines in the place of 2-stroke engines). Ordinarily, one might expect that market forces would operate to realize these fuel economy savings without regulatory intervention. EPA staff have explained to us, however, that they believe that the transition to different technologies will not occur in the absence of regulation because of the other attributes of 2-stroke engines—reliability, versatility, compactness—and because of the one-time costs of making the transition from a "tried and true" engine technology. We believe it is important to develop an estimate of the value of these attributes in order to understand the effect of this proposal on these various product categories."

of whether that vehicle is used in the wilderness of northern Minnesota, the outskirts of Boston, downtown Los Angeles or Hoboken, New Jersey.

While the regulatory deadlines differ somewhat among the various engines/vehicles covered by the proposed rule (e.g., the near-term standards for large SI engines take effect in 2004 but not until 2006 for snowmobiles, off-highway motorcycles and ATVs), the same general pattern applies to all: near-term standards take effect (less than[12]) two to four years after the rule becomes final but are soon replaced—within three to four years—by "long-term" standards. The EPA claims that manufacturers can meet the near-term (or Phase 1) standards by "converting" existing engines to accept known emission control technologies (such as those used on automobiles). The Agency predicts that the various manufacturers can perform the needed research and development (R&D) to "redesign" engines and related emission control technologies for meeting the long-term (Phase 2) standards within (less than) six to eight years after the rule becomes final.

The EPA's analysis of the proposed rule's technical (engineering) feasibility often conflicts with its cost estimates, market constraints or (and) the regulatory deadlines. For instance, the EPA expresses concern that the small annual production levels and modest R&D budgets of large SI engine manufacturers will require these companies "to apply a focused effort to meet the [Phase 2] standards we are proposing."[13] Yet, when the Agency discusses cost, these same companies appear capable of conducting the needed R&D at remarkably little expense. As discussed in section III of these comments, the EPA's cost methodology indicates that the Phase 2 R&D costs could be as little as $3.50 per engine for a "typical" engine manufacturer. Such modest per unit R&D costs are all the more remarkable since the Agency expects that manufacturers to complete the needed R&D in only four-and-a-third years[14] (a time span that the EPA describes as "several years"[15]).

Snowmobiles provide an example of "feasible" regulatory requirements that may prove impossible for manufacturers to meet because of customer reaction. The EPA finds that the Phase 2 standards are feasible because a manufacturer will have "options available" to accomplish the proposed 50 percent reduction in HC and CO emissions averaged over its entire product line.[16] By "options," the Agency refers to three different subcategories of snowmobiles (defined by the specific technologies the EPA predicts that manufacturers will use in their engines to meet the emissions requirements). The EPA estimates that one of these three categories—dominated by relatively inexpensive two-stroke engines—will achieve only a 35 percent emission reduction, well below the 50 percent average needed. Hence, any manufacturer offering only snowmobiles in this

[12] The EPA, in the *Draft Regulatory Support Document* (p. 4-14),mentions September 2002 as its projected date for the rule to become final. Hence, for instance, the 2004 deadline for large SI engine Phase 1 standards provides only 15 to 16 months after the rule becomes final—not a full two years (24 months).
[13] EPA, *Draft Regulatory Support Document*, Chapter 4, p. 4-28.
[14] The EPA projects the proposed rule will become final by September 2002. Phase 1 standards will apply to large SI engines manufactured on or after January 1, 2007—four-and-a-third years later.
[15] EPA, *Draft Regulatory Support Document*, Chapter 4, p. 4-28.
[16] EPA, *Draft Regulatory Support Document*, Chapter 4, p. 4-43.

category will be forced to leave the industry unless it can also offer (and sell) sufficient numbers of snowmobiles with direct injection (which, estimates the EPA, would achieve a 70 percent reduction in emissions).[17] By averaging the two basic models together, this manufacturer could meet the 50 percent emissions reduction for its entire product line. Hence, to remain in business, diversifying its product line into relatively expensive models is the only "option" available to such a manufacturer. The Agency does not consider how profitable it would be for a manufacturer, now catering to the "low end" of the snowmobile market, to attempt offering models to "high end" (and quite different) customers.

C. EPA's Complex Cost Accounting Paints a Misleading Picture

With the exception of recreational marine engines, the EPA's cost accounting suggests that energy/maintenance savings over the long-term will more than offset the additional costs imposed by the proposed rule—by considerable margins for large SI engines. Table 4 summarizes the Agency's long-term cost accounting.

Table 4. Summary of EPA Long-Term Cost Estimates (7 Percent Discount Rate)

Vessel/Vehicle/Engine	Discounted Cost Per Vessel/Vehicle/Engine (NPV)	Lifetime Fuel/Maintenance Cost Savings Per Vessel/Vehicle/Engine (NPV)
CI Recreational Marine	$212[a]	$0
Large SI LPG Engine	$14[b]	($4,554)
Snowmobile	$125[c]	($509)
ATV	$28[d]	($102)
Off-Highway Motorcycle	$94[e]	($98)

[a]Composite long-term. Source: EPA, *Draft Regulatory Support Document*, Table 7.1.2.-1, p. 7-2. [b]Phase 2 long-term. Source: *Draft Regulatory Support Document*, Table 7.1.3.-2, p. 7-5. [c]Phase 2 long-term. Source: EPA, *Draft Regulatory Support Document*, Table 7.1.4.-1, p. 7-8. [d]Phase 2 long-term. Source: EPA, *Draft Regulatory Support Document*, Table 7.1.4.-2., p. 7-9. [e]Long-term. Source: EPA, *Draft Regulatory Support Document*, Table 7.1.4.-3., p. 7-9.

[17] EPA, *Draft Regulatory Support Document*, Chapter 4, Table 4.3-3, p. 4-43. The third category—"Four-Stroke"—would offer a 50 percent reduction in emissions. Hence, a manufacturer specializing in this model would be able—though, just barely—to meet the Phase 2 standards. However, a manufacturer of the first category snowmobiles (and their 35 percent reductions) could not reach an overall 50 percent reduction in emissions over its entire product line by offering "Four-Stroke" models. This manufacturer *must* also offer "Direct Injection" models to meet the overall 50 percent requirement.

However, a close examination of the Agency's cost accounting methodology raises a number of questions about the true magnitude and meaning of the energy/maintenance savings estimates. The large number of engines and vehicles that the proposed rule would cover make an exhaustive examination of each case impractical in this set of comments. Since the EPA follows the same accounting methodology for all of the engines/vehicles, a careful review of the Agency's treatment of one engine can illustrate the strengths and weaknesses of the cost accounting methodology.

To illustrate EPA's cost methodology, these comments closely review EPA's treatment of large LPG SI engines. These engines account for approximately 68 percent of all forklifts,[18] the dominant application of large SI engines (gasoline, diesel and CNG are the other major fuels used by these engines). Furthermore, forklifts provide the one and only instance where the EPA offers evidence—beyond its own "observations"—to support its claim of "market failure." (As discussed in IID, below, each instance of substantial energy/maintenance savings implies some form of market failure or else producers and consumers would have already taken advantage of such savings.) Finally, large SI engines represent three-fourths of EPA's estimated energy savings under the proposed rule.[19]

[18] EPA, *Draft Regulatory Support Document*, Chapter 5, Table 5.2.2-6, p. 5-17.
[19] Dr. John Graham of OMB, letter of 24 September 2001 to Jeffrey R. Holmstead, Assistant Administrator of the U.S. EPA.

Table 5: Estimated Costs for an LPG-fueled Large SI Engine

	Baseline	Controlled
Hardware Cost to Manufacturer		
Regulator/throttle body	$50	$65
Intake manifold	$37	$37
Fuel filter w/lock-off system	$15	$15
LPG vaporizor	$75	$75
Governor	$40	$60
Converter temperature control valve		$15
Oxygen sensor		$19
ECM		$100
Wiring/related hardware		$45
Fuel system total	$217	$431
Catalyst/muffler		$229
Muffler	$45	$0
Total Hardware Cost	$262	$660
Markup @ 29%	$76	$191
Warranty markup @ 5%		$20
Total component costs	$338	$871
Fixed Cost to Manufacturer		
R&D costs	$0	$175,000
Units/yr.	2,000	2,000
Amortization period (7% discounting)	5	5
Fixed cost/unit	$0	$26
Total Costs	$338	$897
Incremental Total Cost		$559

Table 6: Estimated Large SI LPG Engine >19 kW Cost Per Ton of HC+NO_X Reduced (7 percent discount rate)

Standard	Total Cost per Vehicle (NPV)	Lifetime Fuel/Maintenance Cost per Vehicle (NPV)	Lifetime Reductions (NPV tons)	Discounted Per Vehicle Cost Per Ton without Fuel/Maintenance Savings ($/ton)	Discounted Per Vehicle Cost Per Ton with Fuel/Maintenance Savings ($/ton)
Phase 1 near-term	$546	($4,554)	3.5	$156	($1,147)
Phase 1 long-term	$354			$101	($1,202)
Phase 2 near-term	$38		0.6	$61	$61
Phase 2 long-term	$14			$23	$23

To facilitate the discussion of EPA's accounting methodology, Tables 5 and 6 recreate Tables 5.2.2-1 and 7.1.3.-2 respectively from the Agency's *Draft Regulatory Support Document* and refer to large SI engines fueled by LPG.

Table 5 summarizes EPA's engineering cost estimates for large SI engines made by a manufacturer assumed to produce (and sell) 2,000 units a year. The "Controlled" and "Baseline" columns show relevant costs for the engine with and without the proposed rule respectively.

Table 6 applies to both the vehicle[20] (such as a forklift) and the engine (although the engine accounts for most of the change in costs that the rule will impose). This table summarizes EPA's net present value (NPV) estimates of: the additional costs incurred by the vehicle manufacturer (and paid by the purchaser) in meeting the standards; the reduction in fuel and maintenance costs that the vehicle's purchaser will receive over the vehicle's useful life; the reduced emissions over the vehicle's life (starting when the vehicle enters service); and the vehicle cost per ton of emissions reduction, with and without fuel/maintenance savings.

[20] The title of the EPA table replicated here by Table 6 – "Table 7.1.3.-2: Estimated Large SI LPG Engine >19kW Cost Per Ton of HC+NO_x Reduced (7 percent discount rate)"—does not include "vehicle." Yet, all of the column headings in the EPA table refer to "vehicle," not "engine."

1. Inconsistent Treatment of R&D Costs

The costs listed under "Hardware Cost to Manufacturer" in Table 5 appear associated with "upgrading" existing engines/vehicles to meet the Phase 1 standards.[21] The costs listed under "Fixed Cost to Manufacturer" are associated with the research and development (R&D) costs needed to "redesign" engines/vehicles for meeting the Phase 2 standards.[22] The EPA "amortizes" the Phase 2 R&D costs but *none* of the Phase 1 "upgrading" costs, even though firms would seem to incur a substantial portion of "upgrading" prior to 2004 if they are to meet that deadline. That portion should be amortized in the same way as Phase 2 R&D costs.

The EPA suggests that the proposed rule will impose no additional Phase 1 R&D costs because "even without EPA emission standards, manufacturers will conduct the research and development needed to meet California's [essentially identical] 2004 standards.[23] According to the Agency, "Manufacturers have been developing emission-control technologies to meet the proposed 2004 emission standards since October 1998, when [the] California ARB adopted the same standards."[24] However, the EPA's treatment of Phase 1 R&D costs assumes: (1) that all engine producers can meet the California standards; (2) all large SI engine firms serve the California market and none would withdraw from that market because of that state's 2004 emission standards;[25] and, (3) R&D costs would be unaffected if applied to 100 percent of a firm's engine production instead of only that (perhaps much smaller) percentage serving California.[26] The EPA offers little—if any—evidence to support any of these underlying assumptions.

[21] The *Draft Regulatory Support Document* states that the cost figures [shown here] in Table 4 "are in the form of retail-price equivalent for an individual engine" and "show the estimated costs of upgrading" an LPG engine. The table includes "individual cost estimates of the various components involved in converting a baseline engine to comply with emission standards." [*Draft Regulatory Support Document*, p. 5-9.] The terms "upgrading" and "converting a baseline engine"—in conjunction with the treatment of R&D costs (shown in the next footnote)—indicate that the costs under "Hardware Cost to Manufacturer" apply to the Phase I standard.

[22] The *Draft Regulatory Support Document* states: "Even without EPA emission standards, the manufacturers will conduct the research and development needed to meet the 2004 emission standards in California. The R&D impact of new EPA standards is therefore limited to the additional burden of complying with the proposed 2007 requirements. Estimated costs for research and development are $175,000 for each engine family [of which there are three: LPG, gasoline and CNG]….We would expect initial efforts to require greater efforts, but cumulative learning would reduce per-family development costs for subsequent models. These fixed costs are increased by 7 percent to account for forward discounting, since manufacturers incur these costs before the new standards apply." [*Draft Regulatory Support Document*, p. 5-9]

[23] EPA, *Draft Regulatory Support Document*, p. 5-9. Words in brackets are added.

[24] EPA, *Draft Regulatory Support Document*, p. 4-36. Words in brackets are added.

[25] Should an engine producer decide that it could not cover the costs of meeting California's 2004 standards, it could withdraw from that market while continuing to serve customers in one or more of the other 49 states. Hence, EPA's Phase 1 standards *would* impose R&D costs for such a firm.

[26] For instance, converting 100 percent of production to meet the Phase 1 standards would require that *all* factories, assembly lines and so forth would have to be "upgraded" Hence, the development portion of "research and development" costs could be substantially higher depending upon whether the standards apply only to California or to the entire nation.

2. The Agency's "Learning Curve" Treatment of Variable Costs is Flawed

By not recognizing any of the Phase 1 "upgrading" costs as legitimate R&D costs, the Agency subjects all (instead of some) of those costs to its two-step "learning curve" which substantially reduces the per unit cost estimates. According to the EPA:

> *As production starts, assemblers and production engineers will then be expected to find significant improvements in fine-tuning the designs and production processes. Consistent with analyses from other programs, we reduce estimated variable costs by 20 percent beginning with the third year of production and an additional 20 percent beginning with the sixth year of production. We believe it is appropriate to apply this factor here, given that the industries are facing emission regulations for the first time and it is reasonable to expect learning to occur with the experience of producing and improving emission-control technologies.*[27]

First, by extrapolating the experience of other industries in adapting to regulations, the EPA offers no direct empirical evidence obtained from the new industries it proposes to regulate. Next, several of the EPA's initial cost estimates are themselves based on the assumption that large SI engine companies will borrow emission control technologies developed by other, already-regulated industries. Presumably, these borrowed technologies *already* reflect EPA's two-step learning cost curve for the already-regulated industries. EPA does not explain why large SI engine companies should be expected to cut these costs in a second series of two-step 20 percent reductions.

Third, the "controlled" case—the standard against which energy/maintenance "savings" are measured—appears to assume that no technological improvements will occur during the next quarter century absent the proposed rule. The EPA offers no reasons why the rapid technological change that took place throughout the U.S. economy during the past quarter century should come to an abrupt halt during the next quarter century. If EPA's "controlled" case reflected continued technological change, the estimated energy/maintenance savings would be less than indicated in the *Draft Regulatory Support Document*.

Fourth, and finally, the short three-year duration of the Phase 1 standards—2004, 2005 and 2006—appears to severely limit the "Phase 1 long-term" as shown in Table 6. According to the EPA, "we reduce estimated variable costs by 20 percent beginning with the third year of production and an additional 20 percent beginning with the sixth year of production."[28] The Phase 1 standards would apply to large SI engines manufactured after January 1, 2004[29] and end when Phase 2 standards apply to large SI engines manufactured after January 1, 2007. Standards that apply for only three years do not provide enough time for a second 20 percent cost reduction that starts in the *sixth* year of

[27] EPA, *Draft Regulatory Impact Statement*, p. 5-1.
[28] EPA, *Draft Regulatory Support Document*, p. 5-1.
[29] EPA, "Frequently Asked Questions: Emission Standards for Industrial Spark-ignition Engines," *Environmental Fact Sheet*, September 2001, p. 2.

production. Yet, the reduction in total NPV cost per vehicle—from $546 in "Phase 1 near-term" to $354 in "Phase 1 long-term"—appears to require *both* 20 percent reductions,[30] an outcome not permitted by the short duration of the Phase 1 standards.

3. The Agency's 'Per Unit' Perspective Improperly Affects Fixed Cost Estimates

By expressing R&D costs on a per-unit basis, estimated average R&D costs largely depend on the firm's *assumed* size. In Tables 5 and 6 the Agency assumes an annual production of 2,000 units per facility, even though the EPA states elsewhere that "large SI engine manufacturers typically produce 10,000 to 15,000 units annually," a level that the EPA considers too low to support much R&D spending developing new, cleaner engines.[31] A facility producing 15,000 units annually, using EPA's methodology, would have a fixed cost/unit of $3.47 in Table 5, rather than the $26 shown. A per unit cost of only $3.47—approximately the price of a three-day video movie rental—strains credulity, especially for an industry that "will need to apply a focused [R&D] effort to meet the [Phase 2] standards we are proposing."[32] Even when accepted at face value, EPA's cost methodology indicates that the proposed rule will have a greater impact on small firms than large firms.

D. EPA's Analysis Does Not Adequately Support Its Claim of Market Failure

As summarized in Table 4, the EPA's analysis finds that—except for recreation marine engines – the net present value of lifetime fuel/maintenance savings exceed the net present value of the per unit vehicle cost (essentially, the price of the vehicle at time of purchase). The EPA offers these estimated dollar savings as a substitute for a dollar estimate of the proposed rule's health/environmental benefits. If the estimated fuel/maintenance savings are faulty, then the Agency provides no reliable benefit estimates of any kind.

The Agency recognizes that its savings estimates raise a fundamental question, particularly in the instance of large SI engines where the estimated fuel/maintenance savings exceeds the additional per unit vehicle purchase price (for Phase 1 near-term) by as much as eight-to-one ($4,554 to $546 for a large SI LPG engine). The EPA states:

[30] Reducing the "Phase 1 near-term" cost estimate of $533 by 20% and then by another 20% yields $341. Adding back the $13 that EPA estimates would be needed by the *vehicle* to accommodate the upgraded engine (for an upgraded fuel cap, etc.: see pp. 5-11 and 5-12 of the *Draft Regulatory Support Document*) yields precisely $354, EPA's per unit cost estimate for "Phase 1, long-term" in Table 6.

[31] *Draft Regulatory Support Document*, pp. 4-27, 4-28. Elsewhere, in the *Draft Regulatory Support Document* the EPA uses a different level of annual production to estimate per unit costs—3,000—than the 2,000 units shown in Table 6. This occurs where the EPA estimates compliance costs: "This cost is…amortized over five years of engine sales, with an assumed volume of 3,000 engines per year from each engine family." *Draft Regulatory Support Document*, p. 5-15.

[32] *Draft Regulatory Support Document*, p. 4-28.

> *The cost of applying the anticipated emission-control technology to these engines is offset by much greater cost savings from reduced fuel consumption over the engines' operating lifetime. The large estimated fuel and maintenance savings relative to the estimated incremental cost of producing low emitting engines raise the question why normal market forces have failed to induce manufacturers to design and sell engines with emission-control technologies on the basis of the expected performance improvements.* [33]

The EPA answers this question on the basis of its own observations of forklift purchasers, supplemented by a single engineering study referenced in a trade journal article:

> *We have observed that forklift users generally see their purchase as an expense that doesn't add value to a companies* [sic] *product, whether that applies to manufacturing, warehouse, or retail facilities. While operating expenses require no internal justification or decision-making process, purchasing new equipment involves extensive review and oversight by managers who are very sensitive to capital expenditures. This is reinforced by an April 2000 article in a trade publication, which quotes an engineering estimate of 20- to 40-percent improvement in fuel economy while stating that it is unclear whether purchasers will tolerate any increase in the cost of the product.*[34]

Unspecified "observations" of forklift user behavior, supplemented by a single outside engineering estimate, provide insufficient evidence for a *general* market failure. First, the alleged market failure covers only a portion of the firms and consumers who purchase engines/vehicles covered by the proposed rule. While not as dramatic as for large SI engines, the EPA's cost estimates imply similar market failures with snowmobiles, ATVs and off-highway motorcycles. The Agency offers no evidence at all to support its implied claims of "market failure" with any of these other engines/vehicles.

Second, although forklifts may be the single most important application of large SI engines, numerous other firms—from "Generators" to "Crushing/processing equipment"—together accounted for nearly 48 percent of the 2000 population of large SI engines.[35] The EPA provides no evidence of a similar market failure with any of these other firms.

Next, EPA does not explain why no manufacturer of large SI engines attempts to increase its market share by demonstrating to potential customers the money-saving qualities of an energy-saving model. Surely, in light of the EPA's cost estimates, this would be a relative easy case for a manufacturer's salesperson to make. According to EPA, a more efficient engine would extend the average operating life of a forklift by 15 percent from

---

[33] *Federal Register*, October 5, 2001, p. 51120.
[34] EPA, *Draft Regulatory Support Document*, Chapter 5, p. 5-14.
[35] Based on data provided by the *Draft Regulatory Support Document*, Chapter 6, Table 6.2.2-1 ("Operating Parameters and Population Estimates for Various Large SI Applications"), pp. 6-12, 6-13.

8.3 years[36] to approximately 9.5 years.[37] A net present value of $4,554, as estimated by the EPA, over a useful life of 9.5 years means annual fuel/maintenance savings of $627. Hence, the "payback" period for the additional cost of a more efficient large SI LPG engine would be less than a year—even using the "Phase 1 near-term" cost estimate of $546 (the largest of the four per unit cost estimates shown in Table 6). Surely, even if such a short payback period cannot overcome the (alleged) myopia of forklift users, each forklift producer—seeking greater profits—would have ample incentives to educate users about the overwhelming cost advantages of its more efficient large SI LPG engine.

Furthermore, the successful education of even a single forklift user would put competitive pressure on all other users to overcome their energy/maintenance myopia. The educated forklift customer would enjoy lower costs—enabling it to seek greater market share by lowering prices—a development that surely would not escape the notice of at least some other competing firms and trade journals that report on the latest developments.

Fourth, the EPA's analysis is inconsistent about the behavior of forklift users. The Agency's "market failure" hypothesis—that forklift users "are very sensitive to capital expenditures" and that "it is unclear whether purchasers will tolerate any increase in the cost of the product"—suggests the demand for forklifts is highly price elastic. Yet, as Table 5 illustrates, the Agency's *Draft Regulatory Support Document* assumes that this demand is highly price *inelastic*. In Table 5, EPA assumes that the large SI engine producer will sell the same number of engines—2,000 annually—at the higher price that the proposed rule would trigger as at the lower price under the "baseline" (no new rule) scenario; *i.e.,* the cost estimates shown in Table 5 assume zero price elasticity.[38]

If the EPA truly believes that forklift users are highly resistant to any price increases, the Agency would anticipate that its proposed rule would cause these users to reduce their purchase of new forklifts, slowing down the turnover of the existing fleet. Yet, the Agency's analysis does not consider the potential impact of higher vehicle prices on fleet turnover (and thereby slowing the delivery of health/environmental benefits).

At the same time that forklift users are allegedly "very sensitive to capital expenditures," they also appear willing to spend additional money to obtain forklifts that possess desired characteristics. For instance, the *Draft Regulatory Support Document* states that

[36] EPA, *Draft Regulatory Support Document*, Table 6.2.2-1, p. 1-12. However, EPA uses a 12 year lifetime when estimating fuel savings from large SI engines. [See p. 5-13, Table 5.2.2-3] EPA's selection of a 12-year lifetime in that instance apparently reflects the wide range of lifetimes for various applications—from 0.8 years for "gas compressor" to 25.0 years for "generator" and several other applications. [See pp. 6-12 and 6-13, Table 6.2.2-1] EPA's use of a 12-year lifetime to estimate fuel savings is somewhat misleading, in light of the (proper) emphasis the Agency gives forklifts, the dominant single use of large SI engines.

[37] EPA estimates that under the proposed rule, "engines will last percent longer before needing overhaul." *Draft Regulatory Support Document*, p. 513. Increasing 8.3 years by 15 percent yields 9.5 years.

[38] The EPA also refers to projections of future large SI engine populations that appear to be totally insensitive to forklift price. See, for example, Table 6.2.2-2 ("Projected Large SI Population by Year) at p. 6-14 of the *Draft Regulatory Support Document*.

> *…a large subset of these [large SI] engines are operated indoors or in other areas with restricted airflow much of the time. For these indoor engines, customers have generally wanted engines with lower CO emissions. Thus most indoor engines are fueled with LPG or CNG. In some cases, where the customer wants even lower emissions, they will purchase engines equipped with exhaust catalysts.*[39]

If forklift users care only about incurring the least possible capital expenditure, they would not spend money on engines offering lower emissions. Furthermore, forklift users capable of recognizing that different large SI engines vary in emissions performance, should also be capable of recognizing that these engines may differ in energy efficiency, reliability and in other important ways as well.

While the EPA's treatment of market failure is inadequate in the instance of large SI engines, it is nonexistent with respect to snowmobiles, ATVs and off-highway motorcycles. Consumers, rather than profit-making firms, dominate the demands for these vehicles.[40]

The Agency suggests that consumers of these products value several attributes that require use of energy, especially when choosing vehicles with 2-stroke engines (an engine design that the EPA expects largely to disappear from the marketplace under Phase 2 standards):

> *Because the fuel savings can outweigh up front costs, one might question why manufacturers continue to use 2-stroke engines. Manufacturers have not made these changes in the absence of emissions standards for several likely reasons. Many customers generally do not place a high value on fuel economy compared to initial cost and engine simplicity…production costs are relatively low…To capture the fuel economy benefits, manufacturers would have to invest substantially in R&D…in the face of uncertainty with regard to market acceptance of the new product. Such a move could also lower profits per vehicle. Considering all these factors, manufacturers choose to focus improvements in such areas as increasing horsepower and overall vehicle design.*[41]

Providing consumers with attributes such as more horsepower and more attractive vehicle design at the expense of "energy savings" does *not* indicate a "market failure"—any more than the purchase of SUVs instead of smaller, higher-mileage cars indicates a market failure in the automobile industry. Indeed, the EPA's observation that manufacturers of recreational vehicles could "lower profits" by offering "fuel savings" (and higher up-front costs) indicates that these manufacturers offer consumers the mix of performance and fuel economy that they desire, given the tradeoffs that exist between those attributes.

[39] *Draft Regulatory Support Document*, p. 2-10.
[40] However, some snowmobiles are operated by profit-making firms, e.g., tour companies.
[41] EPA, *Draft Regulatory Support Document,* p. 5-20.

For all three categories of recreational vehicles, the *Draft Regulatory Support Document* notes that both vehicle price and "performance" matter to consumers:

- **Snowmobiles:** *The performance snowmobile segment is driven by a constant demand for more power and less weight. In the touring segment of the market performance in terms of power and weight is somewhat less important, but still significant…. Snowmobiles are for the most part a recreational product and are thus a discretionary purchase. Cost is an important factor for snowmobilers, and signficiant cost increases could cause people to spend their discretionary income on other recreational opportunities.*[42]

- **ATVs:** *Performance can be important for some of the higher-end adult models, but handling is also an important consideration, particularly when riding in dense areas. Durability and reliability are also important to the customer, but perhaps not as important as price…ATVs, like other recreational vehicles, are basically discretionary purchases…Cost is an important factor, particularly in the youth or entry-level segments of the market, and signficant cost increases could cause people to spend their discretionary funds in other areas.*[43]

- **Off-highway motorcycles:** *There seems to be a certain amount of status involved in owning a really high-performance machine…Except for a few dual-purpose machines, off-highway motorcycles are purely recreational in nature…Unless the purchaser is an all-out competition model customer, price can therefore be an important consideration to an off-highway motorcycle purchaser…Significant cost increases could therefore result in decreased sales of these motorcycles, as potential customers turned to other recreational opportunities for spending their discretionary income.*[44]

By raising production costs—and, ultimately, vehicle prices—the proposed rule will reduce consumer welfare. The Agency implies that this welfare loss will be more than offset by the fuel/maintenance savings estimated in Table 4. However, "peformance" attributes (power, quick acceleration and so forth) generally involve using more fuel and often require more frequent maintenance. By choosing more peformance, consumers willingly accept paying for more fuel and maintenance. The EPA does not account for these tradeoffs—willingly made by consumers—when estimating the fuel/maintenance "savings" shown in Table 4. As a consequence, instead of offsetting the higher vehicle prices that the proposed rule will cause, the estimated fuel/maintenance "savings" may actually reflect a *further* loss of welfare: a restriction on their ability to get better performance by accepting fewer miles-per-gallon and more frequent maintenance.

Mr. Thomas C. Wyld of the Motorcyle Riders Foundation referred to this loss of welfare in a 14 September 2001 letter to Dr. John Graham of the OMB:

[42] EPA, *Draft Regulatory Support Document*, p. 2-12.
[43] EPA, *Draft Regulatory Support Document*, p. 2-16.
[44] EPA, *Draft Regulatory Support Document*, pp. 2-22, 2-23.

> *Emission restrictions on the order EPA is contemplating will hinder motorcycle performance, impact safety and limit our freedom to personalize this most personal of motor vehicles…To comply, many manufacturers will have to add a catalyst or make other changes which will render performance unacceptable and make modification of the machine complicated and expensive…Millions of motorcyclists modify street bikes for performance, safety, and show…Unlike the drivers of cars, safe riders of motorcycles must be fully integrated with their machines; all aspects of operation (braking, acceleration, turning, etc.) must flow smoothly and naturally. It must 'fit' the rider* and *the rider's style and use. Because manufacturers design models to fit a broad cross-section of riders, almost all individual riders will, at some time after delivery, personalize their machines to suit their style, riding environment and unique needs…if coupled with inflexibility regarding 'tampering' (read: improvements), Tier Two will hike substantially the costs to consumers of machines with* more *performance problems when viewed from the motorcyclist's perspective, yet radically reduce if not eliminate the choices available to the community of American motorcyclists to improve them.*[45]

A true benefit-cost analysis would estimate the loss in consumer welfare described by Mr. Wyld—at least in qualitative terms (if quantitative measures are impractical). Such an analysis would also avoid misinterpreting a loss in consumer welfare as a "benefit."

E. No Alternatives to the Proposed Rule Have Been Assessed

The EPA does not discuss any alternatives to the proposed rule; nor does the EPA demonstrate that the proposed rule delivers health/environmental benefits at the least cost to society. The EPA does not address such basic questions as:

- How would a regional approach compare with the nationwide approach of the proposed rule?
- How would varying the stringency of emission standards affect cost and benefits?
- How would lengthening or shortening the regulatory deadlines affect costs and benefits?
- How would eliminating Phase 1 standards—with their tight deadlines and limited duration—help affected firms meet Phase 2 standards?

By not evaluating alternative regulatory approaches, the EPA has not met its obligation under Executive Order 12866 that agencies should "... select the approaches that maximize the net benefits ..." (Section 1(a)).

[45] Thomas C. Wyld, Vice President for Government Relations, Motorcycle Riders Foundation, letter to Dr. John Graham of OMB, 14 September 2001.

III. Adjustments to estimated costs and benefits

The Agency's own cost methodology—flawed though it may be—strongly suggests that the EPA should substantially revise the proposed rule. By doing so, the Agency can provide health/environmental benefits to consumers at substantially less cost to their pocketbooks. We examine EPA's analysis of two engines to illustrate the major improvements that a carefully revised rule could provide. The first illustration covers large SI LPG engines; the second covers snowmobiles.

A. EPA Data for Large SI LPG Engines Do Not Support Phase 1 Standards

The EPA bases its Phase 1 cost estimates for large SI LPG engines on the assumption that all engine manufacturers will meet California's 2004 standards (which the EPA would essentially apply nationwide) whether or not the Agency's proposal actually becomes final. Under this assumption, the Agency is able to claim that its Phase 1 standards would impose no additional R&D costs. However, as discussed in subsection IIC, there are several reasons why applying California's 2004 standards nationwide could impose higher per-unit costs—including R&D costs—than the Agency assumes.

Indeed, California's adoption of emission standards for ATVs and motorcycles illustrates that actual results may differ from regulators' expectations. The EPA notes that, because of the difficulty manufacturers had in meeting those emission standards, California "ultimately allowed manufacturers to sell uncertified engines as long as those ATVs and motorcycles equipped with these engines were operated exclusively on restricted public lands and at specified times of the year. This allowed manufacturers to continue to manufacture and sell two-stroke ATVs in California."[46]

Fortunately, the EPA can guard against the risk of substantial Phase 1 cost overruns while actually hastening its schedule for replacing the nation's current fleet of large SI engines with the cleaner-burning Phase 2 models. By eliminating the Phase 1 standards and making the Phase 2 standards contingent on a satisfactory outcome in California for that State's Phase 1 standards, the EPA can offer the other 49 states faster delivery of health/environmental benefits at less cost. Forklift users in the other 49 states would be spared paying the higher average component costs involved in the first three years of production. By the time that Phase 2 standards would apply—2007—large SI engine manufacturers will have cut their variable costs by the first of two 20 percent reductions by serving the California market (assuming, as we do in this section for purposes of discussion, that the "learning curve" is valid). And, all states except California will enjoy 100 percent saturation of the even-cleaner Phase 2 forklifts more than a year earlier than they would under the Agency's two-phase approach. [Since Phase 1 forklifts will also last 15 percent longer, California will not achieve 100 percent saturation of Phase 2 forklifts until all of the Phase 1 forklifts turn over completely. The other 49 states will not have any Phase 1 forklifts to turnover.]

[46] EPA, *Draft Regulatory Support Document*, pp. 4-45, 4-46.

Of course, should California's experience with its Phase 1 standards prove more costly than estimated by the EPA, then the Agency's Phase 2 cost estimates would also be affected (since the component costs of Phase 1 also apply to Phase 2, as indicated in Table 5). In that case, the substance and schedule for the Phase 2 standards should be revisited.

However, if California's experience confirms the accuracy of the Agency's cost estimates, the way would be clear for faster delivery of clean air benefits at lower cost. Furthermore, if California's experience demonstrates the accuracy of EPA's estimated fuel/maintenance cost savings (that these savings recover the extra cost of a Phase 1 large SI LPG engines in less than a year), then profit-making firms using forklifts will eagerly embrace these machines. Since Phase 2 forklifts would offer similar fuel/maintenance savings, profit-making firms nationwide should eagerly embrace them when the January 1, 2007 deadline arrives—a reaction that could "turn over" the entire forklift fleet more quickly in the other 49 states than would otherwise occur.

To demonstrate the feasibility of this option, we have re-estimated some of the costs shown in Tables 5 and 6 under the assumption that producers of large SI LPG engines would have to meet the Phase 2 standards in 2007 but not the Phase 1 standards in 2004 (assuming actual experience in California during 2004-2006 confirms expectations). This analysis accepts EPA's technique of applying a "learning curve" to the "total component cost" shown in Table 5 since the purpose in this section of the comments is to trace out a key implication of the Agency's own accounting methodology (even though we believe that the "learning curve" is flawed).

Like the EPA, our calculations consider only those R&D costs that the Phase 2 standards would impose upon engine producers above and beyond what they would face meeting California's emission standards—standards these producers face with or without EPA's proposed rule. Like EPA in preparing the estimates shown in Tables 5 and 6, we assume that the forklift population grows over time at a rate that is independent of vehicle price. And, we accept EPA's estimate that under both the Phase 1 and Phase 2 standards, engines will have an average useful life of about 9.5 years—15 percent longer than the current 8.3 years average useful life. We assume that at the year of purchase, a Phase 2 LPG forklift offers lifetime emission reductions of 4.1 tons (NPV)—equal to the 3.5 tons (NPV) shown in Table 6 for a Phase 1 vehicle plus the (additional) 0.6 tons (NPV) for a Phase 2 forklift.

We, assume too, that the EPA's cost estimates accurately reflect the Agency's analysis and are not marred by typographical errors. However, we cannot help but notice that when the Agency applies a 3 percent discount rate, it arrives at the same estimates under the "Total Cost per Vehicle (NPV)" column for all four time periods as it does when the 7 percent discount rate is used in Table 6. Indeed, the Agency arrives at those same per unit cost estimates using both a 7 and a 3 percent discount rate for large *CNG* (rather than

LPG) engines.[47] Even if LPG and CNG engines happen to have the same costs for all four time period—a remarkable coincidence in itself—using a 3 percent discount rate should certainly result in different NPV estimates than when using a 7 percent discount rate. Indeed, the estimates in all of the other columns of these tables *do* differ. Hence, it appears possible—even probable—that at least two tables in the *Draft Regulatory Support Document* contain typographical errors.

We assume that the cost estimates shown here in Table 6 accurately reflect the EPA's analysis, since applying both 20 percent reductions to the cost data in Table 5 (estimates not affected by the discount rate chosen) yields an estimate for "Phase 1, long-term" within one dollar of the EPA's estimate shown here in Table 6 (disregarding, of course, the timing conflict between the short duration of the Phase 1 standards and the longer time requirements of the EPA's learning curve). Since there will be no Phase 1 forklifts (which would also have an average useful life of 9.5 years) to "turnover" through the fleet, Phase 2 forklifts will reach 100 percent saturation of the fleet over a year earlier than under the EPA's two-phase approach. When 100 percent saturation of Phase 2 vehicles occurs, the discounted per vehicle cost per ton (without fuel/maintenance savings) would be $131, compared to $142 for EPA's two-phase approach (which would still be more than a year away from fully phasing in Phase 2 vehicles).[48]

Hence, the Agency—if truly confident that its cost estimates are realistic—can reach its ultimate health/environmental goals at less cost, allow American consumers to avoid any risk of unanticipated higher costs and actually hasten 100 percent saturation of Phase 2 large SI engines. The EPA can do this by dropping its own Phase 1 standards, monitor the actual experience under California's Phase 1 standards and proceed with the Agency's Phase 2 standards nationwide if California's experience confirms the Agency's cost estimates.

Indeed, if California's experience validates the EPA's estimates of fuel/maintenance cost savings, nationwide acceptance of the Phase 2 standards would tend to occur more rapidly than otherwise. Demonstrated "payback periods" from these savings of less than a year would encourage firms to accelerate their purchase of the new, ultra-clean Phase 2 forklifts rather than attempt to postpone paying the higher up-front costs of these machines through extending repair schedules for their current, dirtier forklifts. Since the

[47] See the EPA's estimates in Table 7.1.3.-2, Table 7.1.3.-3 and Table 7.1.3.-6 (*Draft Regulatory Support Document*, pp. 7-5, 7-7).

[48] It should be noted that both the $131 and $142 estimates are not comparable to the EPA's per ton cost estimates shown in Table 6. The EPA's estimates appear to apply to a forklift manufacturer in 2004 looking into the future. These estimates do not consider how long it will take for the fleet to turnover fully, taking into account the fact that only a fraction of existing forklifts will be replaced in 2004. The EPA does not reveal in its estimates shown here in Table 6 precisely when "Phase 2, long-term"—and its $14 per unit cost—begins. Presumably, this period does not arrive until both 20 percent reductions in component costs (*via* the learning curve) have occurred and the R&D costs have been fully amortized. The two 20 percent reductions in component costs would occur in 2010—the sixth year of production after Phase 1 begins in 2004. Phase 2 R&D costs would be fully amortized by 2012—five years after the standards begin in 2007. However, our analysis shows that from a manufacturer's perspective in 2004, the per unit cost would be about $30 in 2012 (using EPA's learning curve and full amortization of R&D costs.

EPA believes that firms that use forklifts greatly resist higher prices, the Agency should find this an important advantage.

B. EPA Data for Snowmobile Engines Do Not Support Phase 2 Standards

Snowmobiles serve as our second illustration of why reconsideration of the proposed rule could provide substantial improvement in the regulatory outcome.

The EPA's cost estimates for snowmobiles display similar flaws as the Agency's treatment of large SI engines. For instance, the time periods used to estimate costs do not always mesh with the regulatory deadlines. The EPA does recognize that snowmobile manufacturers would face R&D costs in meeting Phase 1 standards (since California has no standards for snowmobiles that the EPA can apply as a nationwide standard, unlike the situation with large SI engines). However, the Agency amortizes these costs over five years[49] when the snowmobile Phase 1 standards would apply for only four years. Amortizing these costs over four years would, of course, result in higher per unit cost estimates. The lack of coordination between the cost estimates and the regulatory schedules raise obvious questions about the estimates' accuracy and, therefore, about the feasibility of the Phase 1 standards themselves.

Nevertheless, in this section of the comments we accept the EPA's cost estimates in the same way that we accept its estimates for large SI LPG engines shown in Table 5 and Table 6. According to the Agency, the Phase 1 standards for snowmobiles would provide no energy/maintenance savings but accomplish most of the emission reductions[50] at a fraction of the cost that the Phase 2 standards would impose.[51] The Phase 2 standards would provide comparatively little additional environmental benefits (on top of the benefits the Phase 1 standards already provide) but provide substantial fuel savings. Indeed, at the time of vehicle purchase, the net present value of the estimated fuel savings ($509 over the average 9-year life of a snowmobile) exceeds the additional cost of a Phase 2 machine ($216 for "Phase 2, near-term").

If the Agency's estimates of fuel savings represent a true net economic benefit—that consumers would actually prefer these savings to the lower initial purchase price, better styling, faster acceleration of lower-mileage machines—then the EPA can consider other less coercive and less risky ways of getting comparable results. For instance, genuine fuel savings—certified by EPA mileage labeling—could enable consumers easily to identify the models that offer them the most satisfaction per dollar spent (counting dollars spent on both the snowmobile and the fuel it uses).

[49] See the row, "years to recover," in Tables 5.2.3.-1 and 5.2.3-2 in the *Draft Regulatory Support Document* on pp. 5-21 and 5-21. According to the EPA, these tables "provide estimates of variable and fixed costs associated with the technologies that form the basis of our cost analysis for Phase 1." [p. 5-20]

[50] The EPA estimates that "Phase 1, near-term" cost per vehicle would be $55 but $216 for "Phase 2, near-term." See: EPA, *Draft Regulatory Support Document*, Table 7.1.4.-1, p. 7-8.

[51] The EPA estimates that the lifetime net present value of emission reductions for the Phase 1 standards at 1.18 tons but only 0.32 (additional) tons for the Phase 2 standards. See: EPA, *Draft Regulatory Support Document*, Table 7.1.4.-1, p. 7-8.

Such an approach would avoid the risk that the Agency's fuel "savings" estimates it counts as a benefit would actually harm consumers because of the loss in other, more highly-valued attributes. And, the EPA would avoid the risk of bankrupting those firms unable to diversify into offering more expensive, "high end" machines. As discussed later in this subsection, the Phase 2 snowmobile standards virtually require manufacturers that serve the cheaper "low end" models also to offer (and sell) more expensive "high end" models in order to stay in business. By eliminating Phase 2, firms would not be forced to diversify into a more diverse array of model offerings than they can handle efficiently. The rule would prompt fewer bankruptcies among firms and thereby encourage greater supply. Greater supply, in turn, would help dampen price increases that would harm consumers and also encourage them to hold on to existing, dirtier snowmobiles for a longer length of time.

Eliminating the Phase 2 standards for snowmobiles would also eliminate one of the most expensive options proposed by the EPA to cut CO emissions. The Agency estimates the net present value Phase 2, near-term cost per CO ton at $670 (without fuel savings)—more than four times the comparable Agency cost estimate for large SI LPG engines.

However, even the $670/ton estimate itself may be too low. The $216 total cost per vehicle estimate (for Phase 2, near-term) is not consistent with the Agency's "incremental total cost" estimates that range from $262 to $770 for the various two-stroke models.[52] The EPA's $216 estimate is based on the mix of two-stroke and four-stroke models that the Agency assumes will be sold during the Phase 2, near-term period. The $216 estimate appears to assume that a large number of four-stroke models will be in the mix bought by consumers, since the EPA estimates that adding electronic fuel injection to four-stroke models would have a total incremental cost ranging between $119 and $174 per unit.[53] However, in discussing the feasibility of the proposed standards, the EPA depicts how a manufacturer could meet the Phase 2 standards by offering a product mix in which four-stroke models—the most expensive—comprise but 10 percent of the units produced.[54] That hypothetical manufacturer would have "direct injection" models account for 40 percent—the largest single share—of its production. Direct injection systems would have incremental total costs ranging between $262 and $342 per unit. In light of these costs, it is not clear how a firm can offer a product mix that will simultaneously: (1) meet the 50 percent reduction in average emissions required by Phase 2; (2) win customer acceptance for that product mix; and (3) keep average per unit cost down to $216. Should manufacturers not be able to keep per unit cost down to EPA's estimate of $216, the cost per ton of CO would be higher—perhaps much higher—than the Agency's estimate of $670.

If the EPA is truly confident in its estimates of fuel savings under the Phase 2 standards, then there is little need for mandatory standards. Genuine savings, endorsed and publicized by the Agency, should be sufficient to "sell" cleaner, more efficient machines

[52] EPA, *Draft Regulatory Support Document*, Tables 5.2.3.-3 through 5.2.3.-6, pp. 5-22 – 5-25.
[53] EPA, *Draft Regulatory Support Document*, Table 5.2.3-6, p. 5-26.
[54] EPA, *Draft Regulatory Support Document*, p. 4-43.

to those consumers who would truly benefit. The public should not be made to run the risks—however small (or large) they may be—that the Agency has seriously underestimated Phase 2 costs or (and) seriously overestimated Phase 2 fuel savings.

IV. Conclusions and Recommendations

Without conducting either a true benefit-cost analysis of its proposed rule, or a comparison of alternative regulatory approaches, the EPA has not met the requirements of E.O. 12866. As a consequence, policymakers—including those in the Agency—cannot properly assess how the proposed rule will affect the health and welfare of U.S. citizens.

To address localized violations of air quality standards, EPA proposes to issue nationwide standards for certain nonroad utility and recreational vehicles. It has not shown that such nationwide standards will be effective at meeting air quality in the urban regions that are out of attainment, and instead justifies the rule on cost-per-emitted-ton measures that do not inform policy makers as to whether the restrictions will actually contribute to air quality goals. EPA also justifies the stricter emission standards on alleged fuel cost savings to purchasers of these vehicles without recognizing that purchasers value other qualities that would have to be forfeited in these machines.

EPA's proposal includes both a brief interim "Phase 1" standard followed by a permanent "Phase 2" standard. Yet EPA's own data reveal that this one-size-fits-all approach does not serve either consumers or air quality well. With forklifts, meeting the interim Phase 1 standard will actually cost purchasers more, distract manufacturers from achieving Phase 2, and delay air quality benefits.

Assuming EPA's analysis is correct (and this comment raises several problems with it) EPA could reach its ultimate health/environmental goals at less cost, allow American consumers to avoid any risk of unanticipated higher costs and actually hasten 100 percent saturation of Phase 2 large SI engines by dropping its own Phase 1 standards, monitoring the actual experience under California's Phase 1 standards and proceeding with the Agency's Phase 2 standards nationwide *if* California's experience confirms the Agency's cost estimates.

For snowmobiles, the situation is reversed. According to the Agency, the Phase 2 standards will deliver few environmental benefits at several times the cost of the Phase 1 standards.

While EPA's data cast doubt on the cost-effectiveness of the two-phased approach, it is not sufficient to support a single-phased approach at the emission levels proposed. EPA should postpone going forward with the proposed rule until it has conducted a true benefit-cost analysis, coupled with a comparison of alternative regulatory approaches. Primary among these alternatives should be approaches that target controls in urban areas where air quality does not meet standards, rather than targeting recreational vehicles, like snowmobiles, that are not used in urban areas.

In estimating benefits, the Agency should drop the estimates of "fuel/maintenance savings" and replace them with dollar estimates of the health/environmental benefits based on a regional modeling of the proposed rule's clean air impacts. In preparing the cost impacts on consumers, the Agency should rely less on engineering cost estimates (that implicitly bias the analysis against smaller firms) and consider both price and vehicle "performance" impacts on consumer welfare.

Appendix I

RSP Checklist

Nonroad Large Spark Engines

Element	Agency Approach	RSP Comments
1. Has the agency identified a significant market failure?	EPA uses its own observations of forklift users, supplemented by a single engineering study, to suggest nonroad vehicle users suffer from **"**energy myopia" and do not recognize tradeoffs between capital costs and operating costs. Grade D	"Energy myopia" does not reflect a market failure, but that users of this equipment have different values than government analysts. Furthermore, the EPA's evidence for a market failure applies to only a fraction of the vehicles/engines covered by the proposed rule. Other portions of the record assembled by the EPA, along with basic economic reasoning, contradicts the hypothesis of "energy myopia" among forklift users.
2. Has the agency identified an appropriate federal role?	The EPA has a role in enforcing the Clean Air Act under which the rule is proposed. However, the Agency has not met the requirements of E.O. 12866. Grade D	Under the Clean Air Act, states are responsible for implementing National Ambient Air Quality Standards. National emission standards are inappropriate for addressing localized attainment problems.
3. Has the agency examined alternative approaches?	EPA has not examined any alternative approaches. Grade F	Alternative approaches should be examined. EPA's own cost accounting methodology—flawed as it is—strongly suggests that the Phase 1 should be abandoned, at a minimum.
4. Does the agency attempt to maximize net benefits?	The EPA attempts to show only that the proposed rule would prevent emissions at a cost per ton that falls within the range of established regulatory programs. However, the estimates appear marred by several inconsistencies. Grade D+	The Agency must conduct a true benefit-cost analysis, and consider alternative regulatory approaches, to formulate an action that can maximize consumer net benefits.

Element	Agency Approach	RSP Comments
5. Does the proposal have a strong scientific or technical basis?	The EPA relies on an engineering cost analysis. The Agency does not model regional air quality impacts nor attempt to quantify the health/environmental benefits from those impacts. Grade C	The Agency should substitute the estimates of fuel/maintenance dollar cost savings with health/environmental dollar benefits.
6. Are distributional effects clearly understood?	The EPA recognizes that price impacts may harm disproportionately first-time, youthful buyers of snowmobiles, etc. but does not adjust its analysis to consider such effects. Areas of the country that already meet air quality standards will bear needless expense for trivial benefits Grade D	Conducting a true benefit-cost analysis would do much to correct this shortcoming of EPA's analysis. EPA should also consider permitting state and local solutions to address local air quality problems, rather than setting a one-size-fits-all emission standard for all vehicles nationwide, regardless of regional air quality needs.
7. Are individual choices and property impacts understood?	EPA recognizes that price and performance matter to many consumers but its analysis presumes that consumers value energy efficiency above all else—implicitly denying that any other choices deserve regulatory consideration. Grade F	Rather than assuming irrationality on the part of consumers, EPA should respect diversity in individual preferences.