

**Summary and Analysis of Comments:
Control of Emissions of Air Pollution
from Locomotive Engines and Marine
Compression Ignition Engines Less than
30 Liters Per Cylinder**

**Chapter 11
Other**

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

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11 OTHER

What We Proposed:

The items raised in the following comments were not all specifically proposed in the Notice of Proposed Rulemaking (NPRM), therefore many of these comments do not have a corresponding NPRM section. For those that do, we have provided (in our responses) information on where the item can be located in the proposal. For the full text of comments summarized here, please refer to the public docket for this rulemaking (EPA-HQ-OAR-2003-0190).

11.1 Comments Outside Scope of the Proposal

11.1.1 Nonroad On-Board Diagnostics (OBD)

What Commenters Said:

The Engine Manufacturers Association (EMA) noted that it recently provided comments to EPA on the heavy-duty on-highway (HDOH) on-board diagnostics (OBD) proposal regarding the key considerations for implementing a nonroad OBD program at some point in the future (docket ID number OAR-2005-0047; also included in OAR-2003-0190-0575, pp. 63-65). The commenter noted that while the comments were specifically focused on the broader range of nonroad engines, the considerations are generally the same for marine and locomotive engines as well.

Letters:

Engine Manufacturers Association (EMA) OAR-2003-0190-0575.1

Our Response:

We did not propose, and are not finalizing, general OBD requirements in this rulemaking process. We have added these comments to the docket for the ongoing HD OBD rulemaking where they can be more appropriately addressed.

11.1.2 Greenhouse Gases/Fuel Economy

What Commenters Said:

Friends of the Earth commented that it would like EPA to consider the addition of

regulations for greenhouse gas (GHG) emissions from harbor craft. The commenter noted that several states including Washington and California have recently published maritime and GHG inventories; the commenter urged EPA to review the existing research and conduct analysis of the fuel use and GHG emissions from ferries and other harbor craft to better understand their contributions to global climate change and other effects. The commenter particularly stated that it would be beneficial to see a per passenger mile comparison between commuter ferries and landside commute modes for carbon dioxide and passengers carried per gallon of fuel, and suggested that EPA may also want to consider fuel economy standards for passenger ferries.

Electro-Motive Diesel, Inc (EMD) commented that, though a recent Supreme Court decision has found that EPA does have the power to regulate GHG emissions, it urged EPA not to regulate GHGs explicitly in this rulemaking. The commenter noted that, as EPA recognizes, the emissions of carbon dioxide (CO₂) – a greenhouse gas – are directly proportional to petroleum fuel consumption. The commenter further stated that marine transportation is the most fuel efficient method of moving freight, with the difficulty that barge tows do not climb mountains very well. EMD commented that rail transportation is the second most fuel efficient method of moving freight, with an approximate three-to-one overall advantage over truck transportation, and thus produce the lowest levels of CO₂ emissions per net ton-mile.

EMD commented that one of EPA's major goals in this rulemaking is the reduction of oxides of nitrogen (NO_x) emissions from rail and marine engines. The commenter noted the inverse relationship between NO_x emissions and fuel consumption (reduction of NO_x emissions places upward pressure on fuel consumption and GHG emissions). The commenter stated that, even if manufacturers are able to minimize fuel consumption increases through intelligent application of technology, a fuel consumption opportunity cost still exists; had the requirement to reduce NO_x emissions not been in place, the same or similar technology could have been used to improve fuel consumption. EPA should not impose any requirements that would complicate manufacturers' already difficult task of managing the fuel consumption/NO_x relationship, lest it jeopardize EPA's major NO_x emissions goal. EMD also recommended that EPA should not put in place, in service of GHG reduction, any measures that would increase the cost of rail or marine operation (such as the use of biodiesel fuel). The commenter stated that, despite the one dollar per gallon tax preference for biodiesel in the Energy Policy Act of 2005, it believes that biodiesel remains more expensive to the user than petroleum diesel. The commenter further stated that an increase in fuel cost to rail and marine transportation will have the effect of shifting freight to less fuel-efficient modes, likely increasing overall GHG emissions.

EMD also commented that selective catalytic reduction (SCR) for NO_x emission reduction – which is being used for demonstration of the feasibility of the Tier 4 NO_x standards – causes CO₂ emissions. (The commenter noted that the urea hydrolysis reaction yields one mole of CO₂ for every two moles of ammonia (NH₃) released; because of the approximately 1:1 NH₃:NO_x molar ratio required for optimal SCR operation, each mole of NO_x reduced emits one-half mole of CO₂.) The commenter requested that EPA not put in place any regulation that effectively prevents the use of SCR, which the commenter stated is currently the only aftertreatment technology that shows any promise of being durable in locomotive and marine

service.

AAR commented that GHG emissions are not addressed by the Notice of Proposed Rulemaking (NPRM), but noted that the proposed standards surely will affect GHG emissions. The commenter noted that carbon emissions are the major GHG byproduct of locomotives, and carbon emissions are directly related to fuel consumption. The commenter noted that the railroads' record with respect to fuel efficiency is outstanding: railroads are 80 percent more fuel efficient than they were in 1980; 27 percent more efficient than they were in 1990; and since 1998, the year the last locomotive emissions standards were issued, the railroads are 10 percent more efficient, even though some of the emissions reduction measures caused a loss of fuel efficiency. The commenter further noted that in 2006 alone, U.S. freight railroads consumed 3.3 billion gallons of fuel less than they would have if their fuel efficiency had remained constant since 1980 (i.e., they emitted 37 million fewer tons of CO₂); and, from 1980 through 2006, they consumed 45 billion fewer gallons of fuel and emitted 500 million fewer tons of CO₂ than they would have if fuel efficiency had not improved. The commenter stated that railroads now move a ton of freight 423 miles on one gallon of diesel fuel¹. (*Footnote 5: Statistics on fuel consumption and revenue ton-miles per gallon of fuel consumed are published by AAR in Railroad Facts: 2006 Edition, p. 40. The data in this publication are through 2005. AAR has preliminary data for 2006 and has used that data in these calculations. AAR used the Energy Information Administration's calculation of 22.384 pounds of carbon dioxide per gallon of diesel fuel to calculate tons of carbon dioxide released and saved. See <http://www.eia.doe.gov/oiaf/1605/coefficients.html>. Note that at the May 10 hearing, the American Waterways Operators badly underestimated the efficiency of railroad transportation.*)

AAR commented that it believes that EPA significantly understated the projected adverse fuel impacts from the proposed standards. The commenter further noted that, as a result of those adverse fuel impacts, GHG emissions will increase. AAR commented that, while the locomotive and marine rule does not specifically concern GHG emissions, EPA was directed by President Bush to take steps to reduce the emissions of GHGs. The commenter stated that it believes that EPA does not yet have a clear strategy on balancing the sometimes conflicting objectives of reducing GHGs, NO_x, and PM—the commenter stated that it would not make sense for EPA to adopt locomotive emissions regulations that will result in a significant increase in GHG emissions while elsewhere the agency is developing a strategy to reduce GHG emissions. AAR commented that it is particularly concerned that EPA did not adopt regulations requiring NO_x reductions that can only be accomplished by increasing fuel consumption and increasing the emissions of GHGs. The commenter noted that several groups called for further NO_x reductions prior to Tier 4 at the May hearings, without explaining how those reductions could be accomplished. The commenter stated that it believes that implicit in such requests is that EPA ignore GHG emissions and fuel consumption, which would not be in the public interest from both an environmental perspective or from the perspective of the country's efforts to attain energy independence.

Crowley Maritime Corporation (Crowley) commented that that marine transportation is the most energy efficient transportation mode for moving cargo. The commenter noted that, in

terms of emissions of sulfur oxides (SO_x) and particulate matter (PM) per ton of cargo moved, it is comparable to other modes and its greenhouse gas emissions are significantly less than other modes.

The Port of Seattle commented that it believes that the rule should be expanded to include GHG emissions limits. The commenter stated that there is an urgent need to effectively protect the earth's climate and success in doing so will depend on GHG emission reductions across the inventory, including emissions from locomotives and marine engines. The commenter further stated that it believes if GHG emission limits are added, the option of using credits for at least a fraction of the required reduction should be considered since climate is a global issue and emission reductions should be achieved in the most effective manner.

GE commented that the emission standards should take into account all pollutants, recognizing that reducing one pollutant may lead to increases in another (especially for the Tier 4 standards); the commenter stated that, in particular, EPA should consider the effects of the proposed standards on "emissions" of GHGs under Clean Air Act Section 213(a)(5). Moreover, the commenter stated, EPA is required to consider the energy impacts – particularly where such impacts would increase GHGs. GE commented that it believes that improving fuel efficiency should also be a priority. The commenter stated that, in light of the Supreme Court decision from *Massachusetts v. EPA*, it is critical for EPA to take steps that will ensure that the rule is neutral in terms of fuel and also allows for improved fuel efficiency and GHG emissions reductions – leading to a standard that balances reductions in NO_x and particulate with reductions in CO₂.

GE commented that, although the proposed revisions to the Tier 0, 1, and 2 NO_x limits may well be achievable, some of these revisions may have other negative effects such as increased GHG emissions. The commenter stated that the standards should be technologically achievable in the time frame allowed, but noted that the proposal did not take into account the significant fuel efficiency penalty associated with bringing these units to a Tier 1 level standard. GE commented that the new Tier 0 standard will both impact other pollutants and have a negative energy impact.

GE noted that there is concern about deterioration of the SCR performance over the useful life of the engine. As the system ages, the only way to reduce emissions would be through fuel injection timing retard to offset deterioration in the NO_x catalyst performance.

GE also commented that it agrees with EPA that the rule should encourage innovations that can help to meet the standards at lower costs with less fuel and less CO₂. The commenter further noted that a benefit of ensuring credit for technology innovations is that it focuses on environmental performance; manufacturers can reduce emissions through pollution prevention, which could, for example, reduce the load on aftertreatment devices. The commenter noted that for NO_x, this could reduce the amount of urea that a locomotive would need to carry for its SCR system, thus improving fuel economy and reducing GHG emissions. GE also suggested that EPA could also include an option for manufacturers to add other methods of reducing emissions

to their certificates, such as hybrids, which will also offer carbon reduction and reductions in fuel consumption compared to today's locomotives. Lastly, the commenter suggested that EPA included provision for manufacturers to take throttle/speed management systems into account when determining the certified emissions level, as these systems could (in principle) be applied to any engine and achieve fuels savings and reductions in CO₂ (and NO_x and PM) emissions.

MTU Detroit Diesel, Inc. (MTU) commented that the relatively short proposed phase-in of the Tier 3 standards (from 2012 until 2016) for other marine engines requires that interim emission reduction technologies and components be developed specifically for those other engines. The commenter stated that it believes that these provisions are not in the best interest of some manufacturers in terms of limited engineering resources and dollars, since an intermediate step from Tier 2 to Tier 3 is not necessary to reach the ultimate 1.8 g/kW-hr Tier 4 NO_x limit. The commenter stated that, to reach the proposed 5.4 g/kW-hr Tier 3 NO_x limit with internal engine measures would result in engines with higher fuel consumption, and thus higher fuel costs and increased CO₂ emissions. The commenter suggested that a direct step from the Tier 2 to the Tier 4 NO_x levels is technologically feasible for some engines (3.5-7.0 L/cyl), and could help to avoid the drawbacks of the "interim" Tier 3 standards for these marine engines. The commenter stated that Tier 2 engines would produce less CO₂ emissions due to the greater fuel efficiency, which would then be transferred to Tier 4 engines.

PVA commented that the NPRM seeks to reduce two classes of unfavorable emissions at a cost of increased fuel consumption, increased CO₂ generation, new or expanded fuel/urea distribution and production systems. The commenter stated that it believes that these (and other) factors may reduce the positive effects of this rulemaking through the detrimental impact on other environmental programs such as the reduction of GHGs.

Tidewater commented that the rule's proposed emissions reductions will partly be achieved by engine manufacturers tuning their engines to produce lower emissions at the expense of peak engine efficiency, thus increasing fuel consumption as much as 5% or more. The commenter asked if EPA has performed a cost-benefit analysis on this impact of the regulations.

Caterpillar commented that it believes that the requirement to use ultra-low sulfur diesel fuel (ULSD) will increase CO₂ emissions due to higher energy consumption at refineries to produce the ULSD for applications currently using heavy fuel.

Letters:

Association of American Railroads (AAR) OAR-2003-0190-0566.1

Caterpillar Inc. (Caterpillar) OAR-2003-0190-0485

Crowley Maritime Corporation OAR-2003-0190-0641

Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502

Friends of the Earth OAR-2003-0190-0609

General Electric Transportation (GE) OAR-2003-0190-0590.1

MTU Detroit Diesel, Inc. (MTU) OAR-2003-0190-0573.1

New Jersey Department of Environmental Protection, Air Quality Management (NJDEP)
OAR-2003-0190-0562.2
Passenger Vessel Association (PVA) OAR-2003-0190-0507
Port of Seattle OAR-2003-0190-0469.1
Tidewater Inc. OAR-2003-0190-0557

Our Response:

EPA agrees with the commenters who note that we should examine the possibility of directly addressing GHG emissions in the locomotive and marine diesel sector, as well as other sectors, as appropriate; however, we do not believe it is appropriate to do so in the context of this rulemaking. All gasoline and diesel powered engines produce GHG emissions. In 2003, passenger cars and light duty trucks produced 35 percent and 27 percent of total U.S. transportation-related GHG emissions, respectively. By comparison, in 2003, marine engines produced about 3 percent of U.S. transportation-related GHG emissions while rail produced 2 percent of total transportation-related GHG emissions.¹ The U.S. EPA is currently considering whether greenhouse gas emissions from on-highway vehicles and engines cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare.

While we agree that GHG emissions from locomotives and marine diesel engines are an issue worthy of review, EPA would need to delay any final action on this rule for several years if we decided to review the possibility of regulating GHG emissions, much less actually promulgating GHG regulations in this rulemaking. We would first need to determine whether it is appropriate to regulate GHG emissions from these engines. If so, we would then need to engage in research and development regarding the numerous issues related to GHG regulation prior to taking final action on such a regulation. None of that work has been done to date. In contrast, this rule has been the subject of several years of research and deliberation, and was proposed in March 2007 prior to the decision of the Supreme Court in Massachusetts v. EPA. It should be noted that the locomotive and marine diesel engines subject to this final rule were not the subject of the section 202 petition that occasioned the recent Supreme Court decision. Rather this rule has always been focused on completing an important step in EPA's ongoing National Clean Diesel Campaign (NCDC) by adding new programs that reduce locomotive and marine diesel engine emissions of PM and NOx to the clean diesel initiatives that EPA has already undertaken for highway, other nonroad, and stationary diesel engines. Absent this rulemaking, PM and NOx emission levels for locomotive and marine diesel engines would remain at much higher levels--comparable to the emissions for highway trucks in the early 1990s.

Given the substantial and pressing need for both the PM and NOx emission reductions that will be achieved as a result of this rule, we believe it would be counterproductive to delay final action on this rule in order to review the possibility of regulating GHG emissions. This rule significantly strengthens the locomotive and marine diesel emission standards for NOx and PM

¹ U.S. EPA, (2006) Greenhouse Gas Emissions from the U.S. Transportation Sector 1990-2003. Office of Transportation and Air Quality. EPA 420 R 06 003.

we proposed in March of 2007, especially in controlling emissions during the critical early years through the introduction of advanced technologies and the more complete coverage of existing locomotive and marine diesel engines. When fully implemented, this coordinated set of new programs will reduce harmful diesel engine emissions to a small fraction of their previous levels. Absent this final action, by 2030 the relative contributions of NO_x and PM_{2.5} from locomotive and marine diesel engines to the national transportation emissions inventory will grow to 35 and 65 percent, respectively.

Some industry commenters stated that the technology used to meet the standards in this rulemaking will increase fuel consumption and thereby GHG emissions from locomotives and marine diesel engines. We acknowledge that the locomotive and marine remanufacture and Tier 4 emissions standards being finalized will impact fuel economy, resulting in small fuel consumption and CO₂ increases of less than 1 percent overall. For individual Tier 4 locomotives and marine diesel engines the projected increase is about 1 percent. Our analysis (see section 5.4 of the Final RIA) does not agree with the unsubstantiated commenter claims of much larger fuel impacts, or of any fuel economy impact from the Tier 3 marine standards. In fact, technology improvements have historically eliminated these marginal fuel impacts projected for our mobile source programs, and it is our expectation that similar continuing technology improvement will eliminate the modest fuel and CO₂ impact estimated here. However, because we cannot project the time frame when these improvements would be realized, we have included these impacts in our cost estimates for the full period of the program to avoid underestimating costs. As noted in our analysis, required under Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use, we project this rule will result in an energy effect that exceeds the 4,000 barrel per day threshold noted in this executive order around the year 2022 and thereafter. Further, our cost, emissions inventory and economic impact analyses have all included this estimate of increased fuel consumption.

As previously indicated, the percentage increase in GHG emissions resulting from this rule will be small, compared to the reductions in PM and NO_x. The particular costs associated with increases in GHG emissions are a matter that is under review currently, and we have not calculated such costs in this rule. Nonetheless, even if we had calculated the cost associated with increased GHG emissions, based on estimates used by other entities, this rule would still provide significant net benefits.

Furthermore we believe that the comprehensive program we are finalizing, including the performance-based standards with averaging, banking, and trading provisions, make it likely that our estimated energy, cost, and GHG impacts are all overstated because they do not reflect the potential fuel savings associated with these provisions. EPA agrees with commenters who have urged EPA to finalize innovative requirements which will encourage less fuel consumption from locomotives compared to today's locomotives. Innovative provisions we are finalizing include: requirements for automatic engine stop/start (AESS) systems, incentives to adopt other idle reduction technologies, the new cleaner switcher locomotive standards based on nonroad engines (which reduce fuel consumption by almost 20 percent compared to the locomotives they replace), and emissions credit for efficient consist management practices. Taken together these

technologies and practices can provide significant fuel savings to industry while also reducing GHG emissions.

Regarding the comment about fuel economy impacts from in-use injection timing retardation to offset SCR catalyst degradation, we have factored conservative projections of catalyst deterioration into our determination of appropriate full useful-life standards. These projections are based on experience with existing catalyst technologies and reasonable expectations for key operating parameters such as real-world high exhaust temperature excursions. We do not agree that additional engine-out NO_x reductions will be needed to compensate for even greater deterioration rates than our conservative projections.

Finally, regarding the comment that the requirement to use ULSD would increase GHG emissions due to high energy consumption at refineries to produce the ULSD for application currently using heavy fuel (residual) we recognize that distillate fuel will be needed in marine auxiliary engines currently using residual fuel; however, the number of residual fuel auxiliary engines in the U.S. fleet is much smaller than the number of engines that use distillate fuel. There are approximately 300 vessels above 10,000 deadweight tons (about 2 percent of the world fleet) flagged in the United States, and a small number of other vessels that use residual fuel. The incremental increase in distillate diesel demand from those applications switching from residual fuel to distillate in the future would be small in comparison to the total amount of distillate diesel fuel currently used in highway, nonroad, marine, and locomotive applications and the growth expected in fuel consumed in those engines. The additional consumption of distillate is not expected to require shifts that would significantly affect the market, or to noticeably higher GHG emissions from refineries producing that small increment of fuel. In any case, the ULSD requirements for both locomotive and marine diesel engines were promulgated in the 2004 Nonroad Tier 4 rulemaking and not as part of this current rulemaking. The costs and energy impacts associated with production of ULSD for the nonroad sector, including locomotives and marine diesel engines, have been accounted for in this earlier rulemaking.

11.1.3 World-wide Harmonization

What Commenters Said:

The Commission Centrale Pour La Navigation Du Rhin (CCNR) provided comments to update EPA on current developments in future emission regulations in Europe, and differences in the discussions on both sides of the Atlantic; to inform EPA when making final decisions on future emission regulations for inland navigation engines. The commenter noted that within the Expert Group on Exhaust Emissions from Inland Navigation Engines (now led by the Joint Research Centre of the European Commission) the representatives of the engine manufacturers presented proposals for future emission limits—proposals which were very similar to EPA's proposed standards, as the manufactures strive for full alignment with EPA regulations. The commenter noted however that representatives from the CCNR member states and some of the CCNR observer states, while also supporting world-wide harmonization, do not fully agree with

these proposals. Particularly suggested were: more ambitious limit values for carbon monoxide (CO), as current experience suggests that they are feasible and are currently appropriate in order to better protect the people who work and live on inland barges; separation of limit values for hydrocarbon (HC) and NO_x, as they have very different health and environmental effects and as MIX emissions should be as low as possible; and keeping the number of engine categories as low as possible and in the regulations as simple as possible, in line with current attempts in Europe and the CCNR for better and 'lighter' regulation.

CCNR provided the experts' proposals for stage IIIB and stage IV (and information on the reasoning behind them) within its comments. The commenter stated that with the aim of simplifying the future regulations and supporting possible alignment with the proposal of the EPA emission limits for NO_x using a continuous function, as currently applied by the CCNR and IMO, are no longer put forward. The commenter suggested that in 2012, the proposal for stage IV should be assessed in light of the actual developments of exhaust abatement systems; and for smaller engines, these developments (profiting from on highway applications) seem to be promising already today. The commenter noted that the German Federal Ministry for the Environment, the lead government agency in this case, does not judge the proposal of the engine manufacturers sufficient; the Federal Ministry suggested instead skipping stage IIIB and the respective technology development altogether, aiming for stage IV in 2012 instead. The commenter stated however, that there is hope that with the tightening of emission limits Germany will be able to support the induction of stage IIIB as an intermediate step towards stage IV.

CCNR commented that it would highly appreciate EPA considering CCNR's described proposals and concerns in finalizing the rule. The commenter noted that its member states would view such action by EPA as support for global harmonization of emission regulations and in line with EPA's strong commitment for the protection of the environment and the health of the people living on and near the water.

AABENRAA MOTORFABRIK recommended that the U.S. ratify MARPOL VI, and that EPA's regulations do not overrule MARPOL. The commenter stated that it strongly recommends that the U.S. ensure that the regulations in force in the U.S. are the same as in any other country of the world.

Markle Marine Safety Services noted that MARPOL Annex VI standards for engines are not very rigorous and only set standards for NO_x and fuel sulfur content. Markle commented that, now that Annex VI is in force, it believes EPA should work with the U.S. Coast Guard at the IMO Marine Environment Protection Committee to revise Annex VI to include appropriate PM, HC, and revised NO_x standards. The commenter also suggested that an attempt be made to revise the fuel sulfur content standard as well, so that ULSD will be available worldwide. Lastly, Markle commented that it believes that international shipping pollution standards should be addressed globally, and not attempted with unilateral national action.

Letters:

AABENRAA MOTORFABRIK OAR-2003-0190-0549
Commission Centrale Pour La Navigation Du Rhin OAR-2003-0190-0715
Markle Marine Safety Services OAR-2003-0190-0547.1

Our Response:

We appreciate the comments of the CCNR and the efforts that the various parties have made to help EPA consider the development of emissions regulations in other countries in setting the regulations we are finalizing today. We share a common goal with these parties to set where appropriate harmonized emissions test procedures and standards. We have given consideration to the potential to introduce the Tier 4 emissions standards as early as 2012 as recommended by the CCNR but have concluded that we can not at this time project with appropriate confidence that the technologies necessary can be developed and introduced by that time. We agree that in evaluating such an approach, one should consider skipping Tier 3 (stage IIIB in the CCNR comments) in order to more quickly achieve the Tier 4 standards. We have evaluated such an approach as Alternative 4 in section VII (Alternative Program Options) of the preamble to the final rule. Our analysis there shows that skipping the interim emissions standards would lead to increased emissions when compared to the program we have finalized. We intend to continue to work with all parties to seek harmonized emissions standards where appropriate.

We recognize the value of harmonizing emission standards, to the extent possible, with other nations, and we will continue to engage the international community. At the same time, we have an obligation under the Clean Air Act to set standards for new nonroad engines (including new marine diesel engines) that reflect the greatest degree of emission control achievable. These controls are necessary to protect human health and welfare and to reduce the impact of marine diesel engine emissions on air quality in the United States. As discussed elsewhere in this Summary and Analysis of Comments and in the preamble for this rule, these engines contribute significantly to air quality problems in coastal and port areas, and it is important to develop long-term standards that will help mitigate these efforts. We believe that C1 and C2 marine engines can substantially reduce emissions beyond Tier 2 levels and that the benefits associated with these standards far outweigh the costs.

With respect to the comments regarding MARPOL Annex VI, we note that the U.S. is currently working toward ratification of IMO Annex VI for C3 marine engines. Further, EPA is currently working through the IMO Marine Environment Protection Committee (MEPC) to revise Annex VI international standards for C3 marine engines with respect to NO_x, PM, and fuel sulfur content. These standards would also apply to C1 and C2 engines onboard ships with C3 main propulsion engines.

MARPOL does not overrule EPA's legal requirement under the Clean Air Act to put out standards reflecting the "greatest degree of emission achievable." The current MARPOL NO_x standards are expected to extend to all vessels used in the marine environment; however, a special provision has been included in paragraph 1(b)(ii) (of "regulation 13" of Annex VI of

MARPOL 73/78) to allow Member States to set different standards for engines installed on ships used domestically. In this action, we are setting more stringent national requirements which fulfill EPA's obligation under the Clean Air Act.

11.1.4 Comments on Other Environmental Concerns

What Commenters Said:

The Environmental Club of Colorado State University-Pueblo commented that it is glad to see that new regulations are going to be implemented restricting air pollutants from lawn mowers and small boat engines, however the commenter believes that the dates which these regulations will go into effect are too far out. The commenter believes that it is possible to lessen the regulatory lead time, and requested that EPA consider enacting the regulations sooner, "as the Earth desperately needs clean air as do we all."

A private citizen commented that he believes EPA needs to gradually force all taxis in the U.S. to be hybrid gas/electric. The commenter noted that taxis in major cities spend a lot of time burning gasoline while stopped in traffic or at traffic lights; and that, with electric power, no power or pollution is expended while stopped at traffic lights. The commenter also requested that EPA eliminate incandescent lighting and require fluorescent lighting, as Europe is currently doing. Lastly, the commenter stated that conservation of energy will result in less pollution.

A private citizen commented that it is time to address all areas of pollution.

A private citizen commented that he hopes these regulations will extend to all transportation vehicles and continue on into the private sector as well. The citizen noted that, at one time, he did not place interest in public transportation but now feels (with new climate science) that public transportation should be more widely available, and thus that emissions needs to be addressed.

Letters:

Environmental Club of Colorado State University-Pueblo OAR-2003-0190-0466

Private Citizen OAR-2003-0190-0470

Private Citizen OAR-2003-0190-0532

Private Citizen OAR-2003-0190-0544

Our Response:

We appreciate all of the commenters concerns, however this rulemaking is solely focused on regulating the emissions from locomotive and marine diesel engines and vessels; thus, these comments are outside the scope of this rulemaking. We believe that the comment regarding emissions from lawnmowers and small boat engines was intended to be a comment on the proposed rule for nonroad spark-ignited engines, vessels, and equipment ("Control of Emissions

from Nonroad Spark-Ignition Engines and Equipment”, May 18, 2007), and we have placed this comment in the docket for that rulemaking (OAR-2004-0008); additional information on the rulemaking, as well as the regulatory documents, can be found at: www.epa.gov/otaq/equip-ld.htm#regs.

11.2 Comment Period

What Commenters Said:

Kirby Corporation requested that EPA approach the development of regulations in a measured, deliberate manner in which the regulatory community has an adequate opportunity to comment on proposed regulatory text. The commenter stated that it is imperative that entities affected under the rulemaking are given a forum for public comment on proposed regulations once they are in draft form. Kirby also requested that EPA allow adequate time to implement the regulations to accommodate education of the affected regulated community and ensure availability of materials to comply with the regulations.

National Maintenance & Repair, Inc. commented that the current proposed regulations were written without any input from the aftermarket suppliers. The commenter stated that it believes that EPA was remiss in not determining the extent of the aftermarket involvement in the rail and marine industries; and further, the commenter believes that EPA should extend the comment period to allow such entities time to prepare and present their comments.

Similarly Caterpillar, Inc. commented that it remains concerned that EPA has not engaged the full range of affected entities for the marine portion of the NPRM to the extent necessary for broad industry engagement. The commenter stated that, while the proposed Tier 3 emission standards have some nominal effect on vessel design and operation, the addition of Tier 4 aftertreatment standards will require significant vessel redesign and new methods of vessel operation and maintenance. The commenter noted that parties such as vessel architects, owners, operators, fuel suppliers, aftertreatment suppliers, and non-EPA regulators (such as the U.S. Coast Guard and the American Bureau of Shipping (ABS)), have a direct stake in the successful outcome of these standards. Caterpillar commented that it will participate in delivering certified configurations for the regulated markets it chooses to supply to, but believes that these and other affected entities must be consulted directly by EPA to be sure their input is considered. Caterpillar noted that, via the EMA and in personal conversations, it has worked with a few of these affected parties but believes that EPA has the broadest and most effective outreach mechanism available to complete this critical task. Caterpillar urged EPA to reach out to these parties prior to releasing final regulations that have the potential to significantly impact the operation and commercial viability of many marine businesses and supporting industries.

EMD commented that EPA has made an unusually large number of requests for comment on areas of substance in the NPRM. The commenter further stated that it believes the NPRM reads more like an Advance Notice of Proposed Rulemaking than like the preamble of a rule that

is to be made final in a few months. The commenter noted that the original locomotive emissions rule, 40 CFR Part 92, took nearly five years from the time of the first industry meetings in 1992 to the NPRM in 1997, while this rule – in many ways more complicated than Part 92 – has taken only just over three years from the first industry meetings in October of 2003 until the NPRM. EMD commented that it believes this tight schedule has left many issues unsettled that would have been resolved in a rulemaking spread over a longer time period. The commenter noted that this situation causes great concern for engine and locomotive manufacturers, as EPA will receive comment in many areas in which the thinking is not yet well crystallized. The commenter further stated that this could create, from the NPRM and from comments, a final rule that EPA, manufacturers, railroads, and marine vessel operators will have to live with and abide by for years to come (as the EPA Administrator has directed staff to finalize the rule by the end of the year 2007). EMD commented that industry's concern is that EPA will finalize provisions that are not well discussed and that will be unworkable in day-to-day operations. EMD thus urged EPA to solicit input from stakeholders in all aspects of the final rule so that a rule that meets EPA's objectives, while not being unduly onerous to manufacturers and users of locomotives and marine engines, can be developed. The commenter also suggested that EPA work closely with stakeholders in incorporating the information received as a result of the numerous requests for comment in the NPRM.

Letters:

Caterpillar Inc. (Caterpillar) OAR-2003-0190-0485
Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502
Kirby Corporation OAR-2003-0190-0563.1
National Maintenance & Repair, Inc. OAR-2003-0190-0655

Our Response:

We appreciate that commenters wanted as much time as possible to adequately review the proposal and be able to provide comments. We provided for a 90-day comment period for this proposal, as we believed that this would provide ample time for stakeholders to provide comments and for EPA to analyze those comments and finish the final rule in a timely manner. All of these commenters, and many others, provided robust, detailed, pointed, and helpful comments on the proposed rule. Further, EPA does not believe any commenter was prejudiced by the 90-day period for submitting public comment. We also note that while the rule was not published in the Federal Register until April 3, 2007, pre-publication versions of the proposed regulations and preamble were posted on EPA's website on March 1, 2007 (the day of the proposed rule's signing), providing commenters with more than 90 days to prepare comments on critical aspects of the proposed rule.

EPA has made every effort to reach out to potentially affected industries and stakeholders regarding the locomotive and marine regulations. Further, to ensure that we are able to reach a wide audience, we have worked with many industry organizations (such as EMA, AWO, and AAR) to help inform those in their respective industries that may not have been aware of the rulemaking initially. During the development of the final rule, we worked collaboratively with

regulated entities and other stakeholders to resolve questions and issues raised in the NPRM. We will continue to work with these parties (and others) following the publication of the final rule and throughout the locomotive and marine program implementation.

11.3 Other

11.3.1 ASTM Standards Referenced in NPRM

What Commenters Said:

ASTM International provided comments regarding standards referenced in the NRPM that have been updated and/or deleted. (The specific updates can be found in ASTM's comments at OAR-2003-0190-0464 and OAR-2003-0190-0465.)

Letters:

ASTM International OAR-2003-0190-0464, 0465

Our Response:

We appreciate the commenter's clarification on the referenced standards. We have made a comprehensive review of the various ASTM standards we reference in the regulations and made the necessary changes to ensure that we are relying on the most recently adopted standards.

11.3.2 Sulfur Limits and Diesel Pump Labeling

What Commenters Said:

Cummins, Inc commented that for marine vessels with Tier 4 engines, vessel operators must be assured that the fuel being delivered to the vessel is ULSD, however the commenter does not believe that the current labeling requirements are sufficient to meet this need. The commenter noted that the fuel specification at the pump must be ULSD, and the pump must be labeled accordingly; the commenter further stated that it believes that, absent a pump labeling requirement in the regulation, there will be no incentive for fuel suppliers to label pumps as ULSD. Cummins suggested that the responsibility needs to reside with the final supplying entity to deliver ULSD, not with the vessel operator to find a ULSD fuel supplier.

EMD noted that, per the final Nonroad Diesel Rule, the sulfur content of fuel produced for locomotives and marine engines is required to be reduced to 15 ppm maximum beginning June 1, 2012. The commenter stated that, at this fuel sulfur content, NOx reduction technologies such as NOx adsorbers are not durable due to passivation of the catalysts by sulfur, thus rendering SCR to be the only viable means of meeting the aftertreatment-forcing Tier 4 NOx emissions standards for locomotives and marine engines. EMD noted that manufacturers in

other industries have urged lowering of fuel sulfur content to 10 parts per million (ppm) maximum, believing that at that level NO_x adsorbers would be a viable technology. The commenter stated that, while such a reduction might cause a marginal increase in fuel cost, the benefits would be great if it enabled the use of NO_x adsorbers. The commenter further noted that: railroads and marine operators would not have to handle a reductant in addition to diesel fuel, separate tankage for such a reductant on board locomotives or marine vessels would not have to be provided, EPA's concern that engines might be operated without a reductant would be put to rest, and the requirements for diagnostics to monitor reductant level and quality would disappear. EMD urged EPA to evaluate a further reduction to in-use fuel sulfur content to allow more options for NO_x aftertreatment technology. Similarly, Markle Marine Safety Services (0547.1) also suggested that EPA consider revising the fuel sulfur content standard so that ULSD will be available worldwide.

EMA also commented that it believes that EPA must ensure that an adequate supply of ULSD is readily available at the U.S. ports that service and provide dockage to the marine vessels that will be equipped with Tier 4 engines. The commenter noted that Tier 4 engine systems cannot operate on 500 ppm sulfur fuel without emissions compliance issues and undue risks of damage or fouling, and requested that EPA ensure in the final rule that the marine diesel fuel that reaches U.S. ports as of 2014 will have a sulfur limit capped at 15 ppm. EMA thus recommended that EPA reduce the downstream sulfur limit for marine diesel fuel to 15 ppm to match the refinery gate standard, just as it did for the diesel fuel used in on-highway and nonroad applications. The commenter also requested that EPA require downstream providers and retailers of marine diesel fuel to label which fuel supplies are compliant with the 15 ppm sulfur cap.

Letters:

Cummins Inc. OAR-2003-0190-0501

Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0594.1

Engine Manufacturers Association (EMA) OAR-2003-0190-0545, 0575.1

Markle Marine Safety Services OAR-2003-0190-0547.1

Our Response:

The comments on labeling center around the concern that EPA did not set a strict downstream requirement on the use of 15 ppm locomotive and marine (LM) diesel fuel (while refiners are required to begin producing 15 ppm LM diesel fuel on June 1, 2012, we allow the downstream use of both 15 ppm LM and 500 ppm LM) and the commenter is concerned that this could lead to unavailability of 15 ppm LM diesel fuel at the pump. The commenters fear, for example, that while a port might receive deliveries of 15 ppm LM fuel, the port might keep its pump labeled as "500 ppm LM" to allow it to receive and dispense either 15 ppm or 500 ppm LM diesel fuel. (As part of the diesel fuel regulations, all pumps dispensing diesel fuel must be labeled with the type and maximum sulfur level of the diesel fuel being dispensed.) The commenters were concerned that if such practice were widespread, Tier 4 marine vessels that require ULSD could potentially have problems finding it.

As discussed further in section IV.A.(9) of the preamble to the final rule, we understand the commenters' concerns, and have discussed a few potential solutions to this problem. One possible option is to require large ports (i.e., ports over some certain size) to make 15 ppm LM diesel fuel available. This size requirement could be by volume of single sale, or above some other specified volume. Under this requirement, those ports with multiple tanks could continue to offer 500 ppm LM diesel fuel in addition to the 15 ppm LM diesel fuel. Or, if a port (regardless of size) continues to sell 500 ppm LM diesel fuel, it must also sell 15 ppm LM diesel fuel. Another potential option would be to limit the sale of 500 ppm LM diesel fuel to small ports and locomotives only. However, these potential solutions would need to be discussed thoroughly with all stakeholders (including those in the fuel distribution and marketing industry) and put out for notice and comment. Therefore, we merely note potential solutions in the preamble to the final rule, but we are committing to investigate this issue further and, if the facts warrant doing so, addressing it in a separate action.

We are finalizing engine labeling requirements in the final rule to ensure that vessel and equipment operators are aware of the fueling requirements for Tier 4 engines; these labeling requirements are located in the regulations at 40 CFR 1033.135 and 1042.135 for locomotive and marine diesel engines, respectively.

We appreciate the comments regarding the further reduction of the fuel sulfur level for LM diesel fuel, however we are not finalizing any additional fuel sulfur requirements in this rulemaking.

11.3.3 Certification Testing on Residual Fuel

What Commenters Said:

EMA commented that the proposed standards, like the current standards, would apply to all newly built marine diesel engines regardless of the fuel they are designed to use, including residual fuel. Thus, the commenter stated, if a Category 1 (C1) or Category 2 (C2) engine is designed to be capable of using residual fuel as well as distillate fuel, emission testing must be performed using a commercially available fuel of that type (§1042.101(d)(3), 72 FR 16005). The commenter stated that it believes that this requirement poses very significant problems for residual-fueled marine engines. The commenter noted that the PM measurement methodology for fuel oil with sulfur content below 0.8% (8000 ppm) is established based on ISO 8178; however, PM measurement methodology for fuel oil with sulfur content above 0.8%, such as residual fuel, is not specifically defined in the NPRM, which could create a situation where there is no accuracy or consistency in certification testing. EMA stated that it is concerned that certification testing on residual fuel may not represent in-use application. The commenter further stated that, when combined with the variability of the residual fuels that could be obtained for operation or testing, certification of engines using residual fuel likely will result in the generation of certification data that are not reflective of the operation of vessels in-use.

EMA also commented that, more importantly, the requirement for certification testing on residual fuel will amount to a de facto ban on the deployment of any residual-fueled marine engines, even auxiliary engines, in any U.S.-flagged vessels. The commenter stated that even EPA's proposal to allow some flexibility for auxiliary engines installed on vessels that utilize residual fuel (72 FR 16005) does not avoid the de facto ban on such engines. The commenter noted that the fact remains that a marine auxiliary engine cannot meet the proposed flexibility standards (1.8 g/kW-hr for NO_x, and 0.5 g/kW-hr for PM) if certification testing is required on residual fuel. EMA thus stated that, if it is EPA's intent to implement a ban on all residual fuel marine engines in new U.S.-flagged vessels, that intent should be clearly expressed so that all affected stakeholders can fully understand the impacts of the proposed regulations.

CIMAC Exhaust Emission Controls Working Group and LCA noted the proposed provision that engines designed for operating on residual fuel must also show compliance with the standards and requirements in Part 1042 Subpart B (§1042.101) when operating on the actual fuel used—basically, that engines operating on residual fuel and installed not only on ships in coastal waters (auxiliary and main engines), but also on ocean-going vessels (auxiliary engines), must comply using that fuel. The commenters stated that they are concerned that residual fuel does not represent a well-defined product in terms of fuel properties (the properties vary depending on bunkering port and refinery), and thus certification of engines for a representative residual fuel quality is impractical if not impossible (the commenters questioned what kind of residual fuel quality would be used for compliance testing). CIMAC and LCA recommended that the procedure used by the International Maritime Organization (IMO) be used: certification testing on distillate fuel only, even though the actual used fuel would be residual fuel.

CIMAC and LCA commented that they are also concerned about the proposed PM measurement method, which is similar to ISO 8178 part 1; the commenters noted that the applicability of ISO 8178 part 1 is limited by the fuel sulfur content. The commenters noted that experience with the ISO 8178 method has shown low repeatability. (CIMAC also noted that the recommendation in the ISO 8178 standard is that the sulfur level when using this method should not exceed 0.8% (8000 ppm), and commented that its upper recommended limit for this method is 0.05%, (500 ppm) and, based on experience within the CIMAC EEC WG, the ISO 8178-1 method for particulates shows low repeatability together with typical marine fuel qualities. CIMAC also commented that the root cause for the low repeatability is the sulfur in the fuel.) The commenters recommended that EPA define a proper PM measurement procedure for typical marine fuel qualities before proposing (and finalizing) requirements. The commenters also recommended the use of ISO 9096 for marine engines operating on any fuel quality in order to achieve consistent measurement results and also enabling comparison to other land-based sources, because ISO 9096 is the predominant method used for measuring particulates on land-based stationary sources.

CIMAC and LCA commented that the emission standards for Category 3 (C3) propulsion engines are based on the use of residual fuel; however, auxiliary engines designed and operated on residual fuels must comply with emission standards based on the use of distillate fuel. The

commenters stated that the design principle of a residual fuel-operated engine (C2 and C3) is different from that of one designed for distillate fuel use only. The commenters noted that residual fuel-designed (and operated) engines inherently emit higher PM and NO_x emissions than those using distillate. CIMAC and LCA commented that the regulations must reflect these facts by employing standards tailored to those realities. The commenters stated that they believe the problem could be avoided by expanding the IMO MARPOL Annex 6 approach to Category 2 engines.

CIMAC also commented that it believes EPA should be aware of the fact that likely no engine type belonging to C2 will be certified for operation on residual fuel with the proposed conditions (“tight PM and NO_x levels with Tier 2, 3 and 4 and inadequate PM measurement method”), the commenter believes that the use of residual fuel is not possible. The commenter further stated that, as a consequence U.S.-flagged ocean-going ships operating in international traffic will be excluded to operate the auxiliary engines on residual fuel - as the foreign-flagged ships will do. The commenter suggested that a better approach would be to introduce geographically-based emission standards, such as the type of regulation that California has introduced for auxiliary engines and diesel electric propulsion within California waters to regulate the fuel quality in coastal waters. CIMAC provided the following recommendations for the compliance test procedure: compliance testing on distillate fuel only, although the engine will be operated in use on any fuel quality (e.g., residual fuel); use an approach similar to that used by IMO Annex 6 to MARPOL; if compliance tests are required on the actual fuel that will be used, a proper practicable PM measurement method should be defined and ISO 9096 should be used in place of ISO 8178.

LCA also commented that it believes EPA must consider whether the cost of switching from residual to distillate fuel will encourage modal shifts. LCA commented that the nation's railroads do not have a great deal of excess capacity right now, but noted that freight rates can reach a point where at least some cargo could change modes. The commenter stated that moving cargo from the water to land produces significant increases in fuel consumption and emissions, and also has some societal impacts. The commenter stated that it believes that if more trains move through population centers, it could result in more accidents at rail crossings, and possibly even more green space covered with rail beds. The commenter suggested that EPA carefully weight the concerns.

Crowley noted that marine transportation is the most energy efficient transportation mode for moving cargo. In terms of emissions of SO_x and PM per ton of cargo moved, it is comparable to other modes and its GHG emissions are significantly less than other modes. Fuel costs represent a significant portion of marine vessel operating costs. For this reason, residual fuel is the chosen fuel when operating on voyages between ports. As the cost of fuel increases, there will be a shift of tonnage from marine vessels to less energy efficient highway or rail transportation modes resulting in a higher level of emissions over land versus at sea.

The Puget Sound Clean Air Agency commented that it believes auxiliary engines should be certified distillate engines and that EPA should not relax its standards for these engines to

accommodate the use of residual fuel. The commenter noted that there is a growing practice of using distillate fuel in these engines while vessels are in port; and stated that, given that auxiliary engines are used extensively while vessels are in port, often near sensitive populations, it is essential to reduce their emissions as rapidly as possible.

The Northeast States for Coordinated Air Usage Management (NESCAUM) noted the claim by shipbuilders that they are unable to obtain certified C1 or C2 residual fuel auxiliary engines for installation on newly built vessels with C3 propulsion engines and that they have requested relief from the certification requirements in this circumstance. NESCAUM commented that it supports the solution presented by EPA of requiring installation of certified auxiliary engines that operate on distillate fuel, notwithstanding the requirement for a separate fueling system on the vessel.

Letters:

Crowley Maritime Corporation	OAR-2003-0190-0641
CIMAC Exhaust Emission Controls Working Group	OAR-2003-0190-0548.1
Engine Manufacturers Association (EMA)	OAR-2003-0190-0545
Lake Carriers' Association (LCA)	OAR-2003-0190-0567.1
Northeast States for Coordinated Air Use Management (NESCAUM)	OAR-2003-0190-0512
Puget Sound Clean Air Agency	OAR-2003-0190-0484

Our Response:

Please see the response to section 3.2.9 regarding residual fuel engines and certification testing on residual fuels.

11.3.4 Additives and Clean Fuels

What Commenters Said:

A private citizen provided comments regarding Syntroleum's (SYNM) ultra-clean diesel fuel for test and evaluation. The commenter noted that the fuel was a synthetic fuel made from the Fischer-Tropsch process combined with Syntroleum's proprietary processes. The commenter noted that the feedstock was natural gas, but that the same fuel can be developed from coal, natural gas, or bio-mass. The commenter further stated that the coal-to-liquid is the cheapest and most abundant feedstock source in the United States because of coal reserves that could last 250 to 300 years. The commenter stated that the production of this fuel is competitive with crude oil when the crude oil is \$45 to \$50 per barrel, according to Syntroleum and others; and the commenter stated that his first impression has always been that this synthetic fuel can be used in existing diesel engines without any need for modifying the engine. The commenter also noted that this fuel differs from ethanol as there is currently no existing infrastructure to provide higher amounts of ethanol, and ethanol requires a special hybrid vehicle design. The commenter

provided information on the characteristics and properties of Syntroleum's fuel in his comments, and noted that it meets or exceeds all CARB, EPA, and EU current and future requirements.

The commenter also provided information about the Silverado Green Fuels, Inc. (a subsidiary of Silverado Gold Mines Ltd), "Green Fuel" product that will be demonstrated in Choctaw County, Mississippi. The commenter stated that the fuel is a cleaner and safer form of fuel derived from lignite, and should be in operation within 24 months at a price of about \$15/barrel.

Pure Power EcoFuel LLC and Marine Propulsion Technology, Inc. jointly announced two new fuel savings alternatives that reduce marine fuel consumption, thus dramatically reducing marine fuel emissions. The commenters noted their new "EcoFuel™ Mach 3 Gasoline & Diesel Additive." The commenters noted properties and results from independent testing. The commenters stated that the additive is affordable (only one ounce is needed for every 15 gallons of fuel), efficient (it does not produce any new/foreign material that could cause any adverse emissions), and works on all marine gas or diesel engines (and even better on the fuels used by deep-water vessels). The commenters also provided information on their new Thrustor™ and Schultz Nozzle™ Marine Propulsion Systems. The commenters stated that this marine propulsion and guidance system reduces fuel consumption, while increasing overall vessel performance. The commenters noted that prototypes have been proven out and are ready for production. The Thrustor™ marine propulsion system is designed to perform on all high speed propellers on both out-board motors and stern drive boats with planning hulls at virtually any speed; test results showed a fuel savings of 5-15% depending on motor size and speeds. The Schultz Nozzle™ marine propulsion system is designed to perform on all in board motor vessels with either displacement or planning hulls and any size propeller, and has projected fuels savings of 10-20% depending on vessel size and speed. The commenters stated that the systems are affordable and could (conservatively) provide an expected combined fuel savings of 20-40%. Pure Power EcoFuel LLC and Marine Propulsion Technology, Inc. commented that they welcome EPA's rigorous independent testing.

Letters:

Association of American Railroads (AAR) OAR-2003-0190-0566.1

Kirby Corporation OAR-2003-0190-0563.1

Marine Propulsion Technology, Inc. OAR-2003-0190-0720

Private Citizen OAR-2003-0190-0348

Pure Power EcoFuel, LLC OAR-2003-0190-0720

Our Response:

Our regulations are intended to be fuel neutral and would not preclude the use of these fuels or additives. However, anyone wishing to obtain a certificate of conformity that relies on the use of an additive or a fuel that is not widely available would be required to demonstrate that such additives or fuels would be used.

11.4 Alternatives

11.4.1 Alternative 1: Exclusion of Locomotive Remanufacturing Standards

What Commenters Said:

The North Kingston Community Association) and the South Coast Air Quality Management District (SCAQMD) commented that they oppose Alternative 1 (the exclusion of additional controls on older locomotive engines). SCAQMD further commented that it agrees with EPA that locomotive remanufacturing programs are needed since existing locomotives represent a significant portion of the emissions inventory.

Letters:

North Kingston Community Association OAR-2003-0190-0496

South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1

Our Response:

We did not chose to finalize this alternative because these remanufactured locomotive standards represent PM reductions of about 50 percent, and (for Tier 0+ locomotives with separate loop intake air cooling) NO_x reductions of about 20 percent. Significantly, these reductions will be substantial in the early years. This will be important to State Implementation Plans (SIPs) being developed to achieve attainment with the NAAQS, owing to the 2008 start date and relatively rapid remanufacture schedule (roughly every 7 years, though it varies by locomotive model and age). Therefore, we agree with the North Kingston Community Association and as proposed, we are setting new standards for the existing fleet of Tier 0, Tier 1, and Tier 2 locomotives, to apply at the time of remanufacture. These standards will also apply at the first remanufacture of Tier 2 locomotives added to the fleet between now and the start of Tier 3.

11.4.2 Alternative 2: Tier 4 Advanced One Year

What Commenters Said:

The Passenger Vessel Association (PVA) commented that, with regard to Alternative 2 (Tier 4 advanced one year), it does not believe that the advancement of Tier 4 standards by one year is achievable or desirable given the unknowns introduced by current marine experience in aftertreatment utilization. However, SCAQMD commented that it does not agree with EPA that advancing Tier 4 standards is not feasible. The commenter further stated that it believes that Tier 4 standards are achievable as early as 2010 (and the commenter proposed that the Tier 4 standards be implemented by June 2012).

Letters:

Our Response:

We have considered the many comments we received supporting our proposed marine engine standards and timing, or arguing for different standards/timing. Many state and local air quality agencies and environmental organizations argued that earlier implementation of Tier 4 technologies is feasible and emphatically needed to address the nation's air quality problems. Some pointed to advanced technology demonstrations already being made on marine vessels. We have reviewed the available information provided in comments and elsewhere and have concluded that the standards and timing we are adopting in the final rule, which include some modifications from the proposal, are feasible and appropriate under the Clean Air Act. We note that some of the modifications from the proposal, such as a pull-ahead of Tier 4 NO_x for 2000-3700 kW engines, involve an increase in stringency. In these cases our own feasibility analysis is supported by manufacturer comments. See section 3.2.1 "Timing and Standards for the Overall Program," section 10.3.1 "Lead Time for Marine" of this document, and section III.B.(2)(a) of the preamble to the final rule for further information on our finalized provision to pull Tier 4 NO_x standards for 2,000-3,700 kW engines ahead by two years.

11.4.3 Alternative 3: Tier 4 Exclusively in 2013

What Commenters Said:

SCAQMD commented that it has reviewed the alternatives analyzed in the NPRM and it does not concur with EPA's presumption that under Alternative 3 (setting Tier 4 standards by 2013), concurrent efforts cannot be made to have a remanufactured and a new engine program. The commenter noted that there are efforts currently underway to field demonstrate particulate filter devices on switch locomotives and diesel oxidation catalysts on line-haul locomotives. The commenter further noted that, as described in EPA's own documents, these technologies are commercially available in Europe for new switch locomotives and a particulate filter device has been integrated into a 3500 hp line-haul locomotive. Additionally, SCAQMD commented that its understanding is that there are currently two locomotives that meet the proposed Tier 3 standard.

SCAQMD noted that, relative to NO_x control technologies, it is sponsoring two field demonstrations of SCR/DPF technologies on passenger trains; and the commenter strongly believes that these demonstrations will be applicable to switch and line-haul locomotives. The commenter noted that its understanding is that there are about 60 locomotive configurations that the manufacturers must ultimately develop remanufacture kits to meet the proposed remanufacture standards; many of these configurations are similar in design and manufacturers could develop kits for a family of engine configurations. SCAQMD commented that locomotive engine manufacturers have been working on parallel efforts to produce remanufacture kits and

bringing new Tier 2 engines to the market. The commenter stated that it believes that the challenge facing manufacturers in having both programs is not one of technology but rather, simply a matter of applying additional engineering resources.

SCAQMD commented that it would support alternative proposals as long as it is demonstrated that the alternative proposal achieves emission reductions equivalent to the SCAQMD staff proposal. The commenter urged EPA to, at a minimum, consider its proposed Tier 4 deadlines to apply only to California; the commenter believes that a regional rule can serve as a 'push ahead' demonstration of Tier 4 locomotives that will benefit the rest of the nation.

SCAQMD commented that it understands that proposals have been made to EPA to accelerate EPA's proposed Tier 4 NO_x standards by two years (from 2017 to 2015) and require a 50 percent reduction in NO_x under the proposed Tier 3 standard. The commenter stated that it believes that, while this would provide some additional emission reduction benefits, it would not be sufficient to meet the needs of the South Coast Basin and other areas where significant locomotive activities occur. The commenter noted that under this proposal, Tier 4 locomotives would still not be available prior to the year that the South Coast Basin must demonstrate attainment of the federal PM_{2.5} standard. The commenter additionally stated that this proposal does not achieve the emission reductions that the California Air Resources Board targeted in the California SIP (which calls for 30 percent penetration of Tier 4 locomotives by 2014). SCAQMD noted that in the past, the Class 1 railroads have agreed to accelerate penetration of new Tier 2 locomotives in the South Coast Basin, a mechanism which could help achieve the reductions proposed by CARB and needed to timely attain the federal standards if EPA requires manufacture of Tier 4 locomotives at an early enough date.

SCAQMD commented that while it recommends advancing Tier 4 standards to June 2012, it believes that this alternative is the closest alternative to the SCAQMD staff comment. However, the commenter stated, if EPA decides to advance Tier 4 standards to 2013, the remanufacture locomotive programs must remain in place—as remanufacture locomotive programs are critical to expeditious emission reductions. SCAQMD reiterated that its recommendation is to implement new Tier 3 standards by the end of 2010 and require remanufacturing of Tier 2 locomotives by 2010.

The North Kingston Community Association commented that it opposes Alternative 3 (eliminating immediate (Tier 3) controls on large new engines). The commenter stated that the technology for these already exists and these alternatives considerably weaken EPA's proposal. The commenter stated that it forgoes the opportunity of considerable air quality improvement with minimal additional cost.

Letters:

North Kingston Community Association OAR-2003-0190-0496
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0483
(hearing), 0558.1

Our Response:

The proposed Alternative 3 evaluated eliminating the Tier 3 standards along with the locomotive remanufacturing standards, while pulling the Tier 4 standards ahead to 2013 for all portions of the Tier 4 program.² We agree with the commenters that the elimination of Tier 3 and the locomotive remanufacturing program as this alternative describes would substantially reduce essential near-term benefits, and would provide significantly fewer PM reductions. We believe our Final Rule, which pulls ahead Tier 4 NOx standards two years combined with our new locomotive and marine remanufacturing standards is a superior program to this alternative.

Regarding the comment that we could pull the Tier 4 standards forward while maintaining the proposed new remanufacturing standards, as we stated in the NPRM, we still do not believe that it is reasonable to project that such an approach is feasible. The remanufacturing program is extensive and will demand a substantial amount of resources from locomotive manufacturers in 2008 and 2009 in order for them to meet the standards on over sixty different engine configurations subject to this program that will all require testing and certification in order to meet the 2010 requirement for Tier 0 and Tier 1 and the 2013 requirement for Tier 2. We do not believe that manufacturers would have enough available engineering staff, engine test cells, and engineering facilities to introduce Tier 4 as early as this Alternative proposed while simultaneously upgrading their remanufacturing systems. SCAQMD suggests that it is “simply a matter of applying engineering resources” to accomplish this. However, unlike the situation for smaller diesel engines, where manufacturers can leverage their own resources by contracting with independent testing labs, locomotive manufacturers must perform nearly all development testing in their own facilities. There is limited additional testing capability available. The situation is similar for large marine engines. Moreover, introducing fundamentally new technologies into either rail or marine service requires substantial field testing before they can be introduced more broadly. To require widespread use of Tier 4 technologies by locomotives and large marine engines in 2012 would have required that manufacturers had prototypes ready for testing several years prior to 2012, which would be infeasible at this point.

11.4.4 Alternative 4: Elimination of Tier 4

What Commenters Said:

The North Kingston Community Association commented that it opposes Alternative 4 (the elimination of advanced (Tier 4) technology on large new engines). The commenter stated that it believes that Alternative 4 denies the public the advantages of new technology; the commenter believes that new emission technologies have almost always ultimately benefited American Industry, as well as provided the public with the best air quality benefits possible. SCAQMD commented that it agrees with EPA that Tier 4 standards are necessary, and stated

² Note that the equivalent alternative for the Final Rule is Alternative 4, which evaluates this scenario without new remanufacturing standards for either marine or locomotives.

that it does not support the elimination of the proposed Tier 4 standards. (Also, as noted in previous chapters of this Summary and Analysis of Comments document, SCAQMD stated that it believes that the timing for implementation of the proposed Tier 4 standards could be advanced to the 2012 timeframe and would provide greater emission reductions required for PM_{2.5} attainment.)

Letters:

North Kingston Community Association OAR-2003-0190-0496

South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1

Our Response:

We agree with the commenter that the elimination of Tier 4 would produce a program that falls well short of the total benefits that our comprehensive proposed program was expected to realize. Elimination of Tier 4 would result in a substantial loss of PM emission reductions, and well over half of the NOx reductions expected. Therefore, our final program includes Tier 4 standards.

11.4.5 Alternative 5: Standards for Engines on Existing Marine Vessels

What Commenters Said:

The North Kingston Community Association and Friends of the Earth commented that they support the overall structure of Alternative 5 (setting Tiers 3 and 4 standards for most large commercial marine engines and cleaning up existing marine engines when they are remanufactured). The North Kingston Community Association also commented that it favors Alternative 5 because, to a large extent, it uses existing technology and provides major air quality benefits.

Clean Air Task Force (CATF) noted that Alternative 5 would require a 'minimal' 25% PM reduction for remanufactured marine engines above 800 hp. The commenter stated, however, that EPA indicated an expectation that the simple application of locomotive remanufacturing kits to similar marine engines could reduce PM emissions by up to 60% and NOx emissions by 25%. CATF commented that it believes EPA should require remanufactured marine engines to meet these tighter limits and consider the application of these standards to all marine propulsion engines (the vast majority of which are below 800 hp).

The Passenger Vessel Association (PVA) commented that it believes that this discussion is fraught with reference to other programs - locomotives and buses, alternative sources - locomotive kits, eventual development of kits by manufacturers, directed kit development based on engine populations, speculative reductions of 60%, 40% and 20%, multiple certification responsibilities -engine manufacturers, aftermarket manufacturers, a fleet owner. The commenter further stated that the 'unknowns,' 'maybes,' and 'hoped for's' in the preamble

discussion supports the need for a separate development effort both in continued public/private discussion and in the rulemaking process.

The Washington State Department of Transportation (WSDOT) and the Washington State Ferry System (WSF) commented that they believe it is essential (for WSF) that the EMD 710 and 645 series and GE 7FDM series propulsion engines are included in the high volume marine diesels list noted in Alternative 5. The commenters noted that these are the large propulsion engines that power the majority of WSF's fleet. The commenters stated that they anticipate that the extensive work being accomplished in the locomotive sector will carry over into viable solutions for marine sector propulsion engines. The commenters also stated that, to assess the impact of addressing all engines as an onboard system (as discussed in Marine Diesel Engines to Be Included in the Program), WSF estimates a high implementation cost. The commenters noted that most of the WSF ferries have multiple auxiliary generators that fall below the 800 hp cut off normal operations, and that WSF has proactively replaced many of these diesels with Tier 1 compliant Detroit Diesel Corporation Series 60 diesels during 2002-2004 as both fuel conservation and emissions reduction initiatives. WSDOT and WSF commented that, in order to meet the proposed regulations, further engine upgrades and exhaust aftertreatment will be needed (and the commenters stated that costs for such upgrades have not been factored into their estimate as it is focused on meeting the proposed requirements of Alternative 5).

SCAQMD commented that its staff fully supports setting remanufacturing requirements for marine engines similar to the locomotive remanufacturing standards, per Alternative 5. The commenter stated that it believes that the proposed remanufacturing program should apply to pre-1973 model engines and to all Category 1 and 2 marine engines, and (as acknowledged in the preamble) the pre-1973 marine engines account for over one-third of the population of marine engines which are not systematically retired. The commenter further noted that marine engines less than 600 kW contribute nearly 40 percent of the emissions to the South Coast Air Basin harbor craft sector. The commenter stated that, for these reasons—and to develop an effective reduction strategy for existing marine engines—it recommends the applicability of the remanufacturing requirements to all engine sizes and model years.

The Texas Commission on Environmental Quality (TCEQ) commented that, in response to EPA's request for comment on whether to set emission standards for existing large marine diesel engines when they are remanufactured, it supports establishing emission standards for remanufactured compression ignition marine engines with per-cylinder displacement below 30.0 liters per cylinder that would be similar to the emission standards proposed for remanufactured and/or refurbished locomotive engines.

Letters:

Clean Air Task Force OAR-2003-0190-0499

North Kingston Community Association OAR-2003-0190-0496

Passenger Vessel Association (PVA) OAR-2003-0190-0507

South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0483

Texas Commission on Environmental Quality OAR-2003-0190-0612.1

Our Response:

EPA agrees with these commenters about the need to address emissions from engines in the existing fleet of marine vessels that will not be subject to the new Tier 3 and Tier 4 standards. We also agree that such a program should take into account the special operating and technical challenges associated with marine diesel engines, and we consulted with engine manufacturers and users to obtain their feedback on key elements of the program. The remanufacture program we are finalizing is important step toward reducing emissions from the engines that are in the marine fleet the longest and that are the largest contributors to diesel marine air pollution.

In response to comments by CATF suggesting that our program should require greater emissions reductions, section 9.10 of this document discusses why the standard we are adopting for marine remanufacture systems is a 25 percent reduction in measured PM emissions and no increase in NOx emissions (within 5 percent) which is similar to the PM emission reduction that was achieved from our Tier 2 marine diesel engine standards for new engines. PVA noted that this program relies heavily on other existing engine programs and as such, continued discussion and/or a separate rulemaking process may be necessary to develop a marine remanufacture program. We do not think it is necessary to postpone adoption of these standards to a separate rulemaking because the program we are finalizing is a market-based program that relies on the voluntary certification of remanufacture systems, see section 9.6 for more details on this subject. WSDOT commented that certain engine models must be included on our high volume engine list of engines which would be required to have remanufacture kits available as described in part 2 of Alternative 5. Part 2 of Alternative 5 included a set of mandatory standard, however, we are not finalizing part 2 of Alternative 5, see section 9.3 for more information on why we are only finalizing part 1 of Alternative 5 at this time. WSDOT also commented on the high implementation cost of addressing all engines as an onboard system. The NPRM discussed the idea of the 600 kW cutoff point including vessels with total power of 600 kW or greater and was listed as a potential modification to Alternative 5, however, it was not part of the proposed Alternative, and is not part of our final rulemaking, see section 9.7 for more discussion about which engines are covered by our final rulemaking and why. SCAQMD commented that all marine engines should be covered by this program regardless of size or age, section 9.7 of this document also discusses why our final rulemaking only covers engines greater than 600 kW that were built after 1972. Finally, TCEQ commented that it supports establishing standards that are similar to those for remanufactured locomotives. We expect that the program we are finalizing will utilize locomotive remanufacture systems on marine engines derived from locomotive engines and have included provisions in our final rule to streamline the certification process for locomotive remanufacture kits to be used on marine engines, see sections 9.3 and 9.11 for more details.