

**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 9  
Marine Remanufacturing Concept**

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

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## 9. MARINE REMANUFACTURING CONCEPT

### *Background:*

The comments in this section correspond mainly to Section VII.A.2 of the preamble to the proposed rule, and are therefore targeted at the marine remanufacture concept. A summary of the comments received, as well as our response to those comments, are located below.

The proposal contained an alternative that would address emissions from marine diesel engines in the existing fleet of marine vessels. These engines are expected to remain in the fleet for a long time, and will not be subject to the standards for new (or freshly manufactured) engines. Therefore, their emissions will remain high absent standards that apply when they are remanufactured.

The programmatic alternative consisted of a two-part program that would apply to all commercial marine diesel engines above 600 kilowatts (kW) when they are remanufactured. In the first part, which could begin as early as 2008, vessel owners/operators and engine rebuilders who remanufacture engines would be required to use a certified remanufacture system when an engine is remanufactured (defined as replacement of all cylinder liners, either in one event or over a five-year period) if such a certified system is available. During this first phase of the program, manufacturers would not be required to make remanufacture systems available. However, it is expected that they would do so voluntarily. For Category 2 (C2) engines, systems are expected to be available for those marine diesel engines that are derived from locomotive engines, as manufacturers can certify locomotive remanufacture systems for use on marine diesel engines. It is also expected that manufacturers would also make systems available for Category 2 engines, with system availability tracking the relative share of models to the total population of engines so that systems for the most popular engine models would be certified first.

In the second part, which could begin in 2013, a marine diesel engine identified by EPA as a high-sales volume engine model would have to meet specified emission requirements when it is remanufactured. Specifically, the remanufacturer or owner of such an engine would be required to use a system certified to meet the standard; if no certified system is available, he or she would need to either retrofit an emission reduction technology for the engine that demonstrates at least a 25 percent reduction or replace the engine with a new one. If an engine is not a high-sales volume engine, the requirements of the first phase would continue to apply (use a certified remanufacture system if one is available; if not, there is no requirement). This second part is similar to the mandatory emission limits for existing locomotive engines in that if an engine has been identified by EPA as a high sales volume engine, action would be required to be taken when the engine is remanufactured. EPA would work with the engine manufacturers to determine what engine models should be included in the mandatory second phase of the program, and the second phase could be subject to a technology review. Remanufacture systems would be subject to a price cap of \$45,000 per ton of particulate matter (PM) reduced.

## 9.1 General Support for a Marine Remanufacture Program

### *What Commenters Said:*

We received comments from many state and local government representatives and environmental groups who expressed support for the marine remanufacture program. Some of these commenters noted that such a program would result in greater emission reductions for the program overall. They said that given the long years of service for most commercial marine diesel engines a remanufacture engine program will both ensure early emission reductions and provide more reductions than new Tier 3 and Tier 4 engine standards on their own. One commenter suggested a marine remanufacture would also enhance the effectiveness of retrofit programs, since a marine engine that is removed as part of a repower would be required to be remanufactured before it can be sold to a different user as a used engine; this is an improvement over the current situation in which these engines can simply be rebuilt to their original configuration.

A few industry groups also expressed support for the concept of a marine remanufacture program. Electro-Motive Diesel, Inc. (EMD) stated that it supports the proposal for such a program, and noted that it has received requests from marine vessel operators for certified remanufacture engines but have been unable to fill them because the present marine diesel engine program does not contain provisions that allow certifying other than freshly manufactured engines. American Waterways Operators (AWO) noted in its initial written comments that while it has opposed requiring existing engines to meet standards that were not in effect at the time of original manufacture, recent industry experience suggests it may be possible to develop a targeted marine remanufacture program that would achieve emission reductions without imposing undue hardship on owners. Kirby Corporation commented that it is committed to considering means to address emissions from existing vessels, but such a program should take into account the unique operating environment and technical challenges of developing such a program for marine diesel engines.

### Letters:

American Lung Association, et al. OAR-2003-0190-728  
American Waterway Operators (AWO) OAR-2003-0190-0519  
City of Houston (Texas) Bureau of Air Quality Control (BAQC) OAR-2003-0190-0561.1  
California Air Resources Board OAR-2003-0190-0596.1, 0719  
Clean Air Task Force (CATF) OAR-2003-0190-0499 (hearing)  
Clean Air Watch OAR-2003-0190-0500 (hearing)  
Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502, 0594, 0729  
Environmental Defense OAR-2003-0190-0592.1  
Kirby Corporation OAR-2003-0190-0563  
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495, 0732

Natural Resources Defense Council (NRDC) OAR-2003-0190-0489 (hearing)  
New Jersey Department of Environmental Protection, Air Quality Management (NJDEP)  
OAR-2003-0190-0562.2  
New York Department of Environmental Conservation, Office of Air Resources OAR-  
2003-0190-0583.1  
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia  
Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health  
and Environment Committee OAR-2003-0190-0593.1  
Oregon Department of Environmental Quality, Air Quality Division OAR-2003-  
0190-0506, 0652  
People for Puget Sound OAR-2003-0190-0649  
Private Citizens *various*  
Puget Sound Clean Air Agency OAR-2003-0190-0484 (hearing)  
Wisconsin Department of Natural Resources, Bureau of Air Management (WDNR)  
OAR-2003-0190-0552

*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 an 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.

## **9.2 Opposition to a Marine Remanufacture Program**

*What Commenters Said:*

A few commenters were opposed to a program for remanufactured marine engines, mainly as a result of their specific situations. The Makah Tribal Council indicated that while it supports the more stringent Tier 3 and Tier 4 marine diesel engine standards, they do not support standards for remanufactured commercial marine engines. The commenter noted that the Tribal Fleet is comprised of 45 to 50 privately owned long-line and troll fishing vessels, and that most of the engines are between 200 and 500 hp. The commenter was concerned about the burden this program would place on its members. Marathon Petroleum Company was also opposed. The commenter noted the diversity of engines used in the marine sector and stated that EPA cannot require a “one size fits all” provision and provide for cost effective emission reductions from existing engines.

In its initial written comments, the Engine Manufacturers Association (EMA) also indicated that it is not a proponent of a marine remanufacture program, due to the diversity of the

engines involved and the fact that there are no remanufacture systems that are currently approved or on the horizon. However, the commenter provided several suggested provisions that should be considered if EPA were to adopt such a program, and in a later set of comments the commenter expressed support for a program that requires the use of a certified remanufacture system only if one is available, along the lines of the program contained in the draft regulations that were made available September 10, 2007. Caterpillar recommended that a marine remanufacture program should not be adopted as part of this rule, but also offered some suggestions for a future program.

The Passenger Vessel Association (PVA) commented that instead of a regulatory program EPA should focus on incentive programs to bring about a similar result. The commenter noted that in making the decision to remanufacture or repower, vessel operators will decide based on economics. Existing engines will be replaced at an accelerating rate as the cost of maintaining the older engine increases, the cost of fuel increases, and the engine approaches the end of its economically useful life. The commenter suggested that EPA can reinforce these individual assessments through a public information program that would educate the marine industry on the benefits to the environment of repowering or rebuilding with emission reducing kits, promotional activities such as the National Marine Manufacturers Association (NMMA) “Grow Boating” program, participation in industry conferences and trade shows, and using the power of the media to publicize success stories.

Letters:

Caterpillar OAR-2003-0190-0591

Engine Manufacturers Association (EMA) OAR-2003-0910-0575, 0726

Makah Tribal Council OAR-2003-0190-0472 (hearing)

Marathon Petroleum Company LLC OAR-2003-0190-0595.1

Passenger Vessel Association (PVA) OAR-2003-0190-0576

*Our Response:*

EPA is sensitive to the concerns expressed by these commenters, and we took them into account when we developed the final program. The final program applies only to commercial marine diesel engines above 600 kW (800 hp) and applies only to those that are remanufactured (all cylinder liners replaced either all at once or within a 5-year period). The smaller engines operated by these groups will not be affected by the program. In addition, engines on vessels that are used only for low annual hours are unlikely to be affected since they are unlikely to be remanufactured on the schedule set out by the program, if at all.

While an incentive-based program along the lines suggested by PVA is theoretically possible, we believe it would not achieve the emission reduction goals achievable through this marine remanufacture program. This is because marine diesel engines used in commercial applications are often kept in service for extended periods of time, well over 25 or 30 years, both because they are durable and reliable and because it is difficult to remove them from a vessel. This makes replacing an engine a relatively expensive proposition, and it is not clear that an

incentive scheme could be designed to make the decision to replace an engine more attractive than retaining an existing engine, especially for engines in heavy-use commercial applications. We believe that a program based on the use of certified remanufacture systems is preferable both because the costs to the owners are smaller than retrofits and because systems can be designed that will not require significant modification of the base engine. Consequently, a systems-based program would encompass more engines and result in greater emission reductions.

EMA's and Caterpillar's comments are addressed in our response to section 9.3, below.

### **9.3 Support for Part 1 Program; Opposition to Mandatory Retrofit Program**

#### *What Commenters Said:*

Several commenters, while they did not oppose the concept of a marine remanufacture program, did not support the two-part program set out in the proposal.

General Electric Transportation (GE) commented that it believes that in general, the technology and opportunity to apply emissions improvements to marine engines at the time of remanufacture is equivalent to that for locomotives. The commenter noted that there are several upgrades that can be done without changing the footprint of the engine and without significantly affecting other systems on the vessel, such as vehicle control and cooling. GE also commented that, while there may be some engine families or engine models that are small in number or so unique that it may not be economical or practical to expect an emissions upgrade kit to be developed, it recommends that EPA make application of an upgrade kit mandatory at the time of remanufacture if a certified kit is available.

AWO and Kirby recommended a program that would apply only to Category 2 marine diesel engines. They noted that Category 2 engines are larger, burn more fuel, and are less frequently replaced than Category 1 engines. In addition, such a program could be designed similar to the locomotive remanufacture program. Specifically, the first phase of the program could begin 12 months after publication of the rule and could require the use of a certified remanufacture system that meets the locomotive Tier 0 standards; it would apply at the first remanufacture after the effective date. The second phase could also be based on the new locomotive Tier 0 and Tier 1 standards.

EMD also recommended a program based on the locomotive remanufacture program. However, the commenter suggested that the program be voluntary and that there should be no emission reduction requirement if a certified remanufacture system is unavailable. The commenter opposed a mandatory requirement because if the alternative is to retrofit a control device or repower, owners may choose to not rebuild their engines at all. EMD noted that an older engine that is simply rebuilt is preferable to one that is not rebuilt at all.

CIMAC commented that the program should not be applied to engines that do not have a

locomotive counterpart. The commenter's concern stems from the existence of many old marine engine types that have not been regulated and consequently have no emission data available. Manufacturers of these engines may not be in a position to test these engines or develop remanufacture systems as they are focusing on developing and testing engines to meet the new tiers of standards. In addition, the manufacturers of some old engines may not be in business anymore.

Kirby expanded on this concern about Category 1 engines. There is a great variety of engines installed on existing vessels, and there are currently no certified remanufacture systems or approved retrofit technologies for all of those engines. As a result, under Phase 2, owners could face a considerable expense if they are required to replace their engines. This could place them at a disadvantage compared to any competitors who do not remanufacture.

The Lake Carriers Association (LCA) expressed similar concerns. The commenter noted that some engines are no longer manufactured or are used so little that development of a kit is not economically warranted. Many older engines are unregulated and therefore there is no emission data available, and obtaining that data would be expensive. The commenter noted that the requirement in Phase 2 that an engine for which a remanufacture system is not available be retrofit or replaced would place an economic burden on their members, and steps would have to be taken (e.g., tax incentives and accelerated depreciation) to ease that burden.

As noted above, Caterpillar does not support adopting a marine remanufacture program in this rule. However, the commenter made several recommendations for such a program: it should be based on fully developed and certified retrofit kits, it should be voluntary, and it should begin no earlier than 2010. Also, kits should be required only at the time of a major overhaul of the engine.

EMA also did not support a remanufacture program in their initial written comments but made certain suggestions for such a program. The commenter recommended that the program apply only to engines that are at least 15 years old and are above 600 kW; Tier 2 and later engines should not be included in the program; the standards must not require aftertreatment; and the program should be subject to a technology review in 2011. The commenter further recommended the program should target a 25 percent reduction in PM emissions only; should require the use of rebuild kits only if they are commercially available, subject to a price cap, that the kits be verified, and that they not interfere with the durable and safe operation of the engine and vessel.

Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574, 725

Caterpillar OAR-2003-0190-0591

CIMAC Exhaust Emission Controls Working Group OAR-2003-0190-0548.1

Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502, 0594, 0729

Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575, 726

General Electric Transportation (GE) OAR-2003-0190-0590



*Our Response:*

EPA remains committed to reducing emissions from marine engines in the existing fleet. However, these comments compelled us to re-examine the 2-part program described in the proposal. We engaged in several one-on-one discussions with engine manufacturers and user groups to clarify the constraints outlined above, especially with respect to Category 1 (C1) engines and the concern that certified remanufacture systems would not be available for all existing engine models by the time the second phase of the program would begin, in 2013. Engine manufacturers explained that their current product lines are very diverse and it would be difficult for them to develop remanufacture systems for all types of engines. Furthermore, some models have very small annual sales and it may not be cost-effective for them to develop systems.

Owners, on the other hand, expressed their concerns about the expense of individual retrofits or repowers if remanufacture systems are not available. There was also concern that the mandatory Phase 2 would provide engine manufacturers with an economic incentive not to provide remanufacture systems as the repower alternative could be more attractive for them. In addition, as Kirby noted in its written comments, the price of remanufacture systems is hard to predict and may vary greatly among engine models and engine manufacturers depending on how many engines are in the existing fleet over which the costs of developing a remanufacture system can be spread.

The program we are finalizing addresses these comments by deferring Phase 2 of the program, covering only the larger commercial diesel marine engines, and requiring use of a remanufacture system only if one is available. We are adopting a market-oriented program according to which the owner of a covered engine would be required to use a certified remanufacture system when remanufacturing that engine if such a system is available. If there is no certified system available at that time, there is no requirement. Engine manufacturers are not required to make remanufacture systems available by a certain date for any engine. Instead, they would certify such systems on a voluntary basis. It is expected that they will respond to market signals, providing systems for those engines with the highest sales volumes first. We are also providing a streamlined certification process for locomotive remanufacture systems for use on marine engines. The program will begin June 1, 2008, although the requirements do not begin until marine remanufacture systems are certified and made available. The draft regulations that were made available to stakeholders on September 10, 2007, reflect these changes.<sup>1</sup>

We expect that the program we are finalizing, which relies on manufacturers to provide remanufacture systems and facilitates the use of locomotive remanufacture systems on marine engines derived from locomotives, will result in significant, early reductions from the large

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<sup>1</sup> EPA-HQ-OAR-2003-0190-0723

commercial marine diesel engines engine that are responsible for a significant share of the marine inventory while avoiding the higher compliance costs associated with one-off engine retrofits or repowers. If, as expected, locomotive remanufacture systems are made available for C2 engines, and if C1 engine manufacturers provide remanufacture systems for their largest sales volume engines (as measured by the number of engines in the existing fleet), we expect this program to yield emission benefits comparable to those estimated for the mandatory program.

Given the level of the marine remanufacture program standards and the technologies that will be used to achieve them we do not believe a technology review is necessary for this program. However, we are committed to the development and successful operation of a marine remanufacture program. We intend to assess the effectiveness of this program as early as 2012 to ascertain the extent to which engine manufacturers are providing certified remanufacture systems. If remanufacture systems are not available or are not in the process of being developed and certified at that time for a significant number of engines, we may consider changes to the program. In evaluating the effectiveness of the remanufacture program in the future, we may revisit the need for Part 2, or something similar, to ensure emission reductions from the large marine legacy fleet are occurring in a timely and effective manner. We may also evaluate other aspects of the program, including the criteria that trigger a remanufacturing event (including the 5-year period for incremental remanufactures), and whether the program should also apply to engines less than 600 kW. Revisions, if necessary, will be pursued in a separate rulemaking.

#### **9.4 Supplemental Comments – Support for Marine Remanufacture Program**

##### *What Commenters Said:*

In their supplemental comments, AWO expressed support for the voluntary program described in the proposed regulations made available on September 10, 2007, and noted that the program offers a reasonable way to achieve near-term emissions reductions from those marine diesel engines that account for the largest share of engine emissions from marine vessels. EMA noted its interest in trying to accommodate EPA's stated goal to implement some sort of voluntary marine engine rebuild program, and provided several additional suggestions.

##### Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574, 725

Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575, 726

##### *Our Response:*

EPA agrees that this program is an important step forward in controlling emissions from existing marine diesel engines.

#### **9.5 Legal Authority**

*What Commenters Said:*

EMA noted that Clean Air Act (CAA) sections 213(a)(3) (42 U.S.C. § 7547(a)(3)) and 213(c) (42 U.S.C. § 7547(c)) impose key constraints on EPA's authority to establish emission standards for new marine engines - specifically, technological feasibility, cost-effectiveness, and safety. The commenter noted that EPA does not have the legal authority to adopt or enforce requirements for nonroad engines (including marine engines) that are no longer "new," as CAA Section 213(a) (42 U.S.C. § 7547(a)) expressly limits EPA's standard-setting authority to "new nonroad engines and new nonroad vehicles." The commenter stated that, in that regard, CAA Section 216(3) (42 U.S.C. § 7550(3)) defines a "new" engine as one in which "the equitable or legal title to which has never been transferred to the ultimate purchaser" (i.e., the first person who in good faith purchases the engine for purposes other than resale). The commenter stated that EPA has vigorously defended this restrictive definition of "new" in the context of standard setting and federal preemption (*EMA v. EPA*, 88 F.3d 1075 (D.C. Cir. 1996)). EMA thus commented that it does not believe that EPA has the legal authority to establish emission control standards for marine engines that are no longer new, including marine engines that are being remanufactured after several years of in-use operation.

Environmental Defense, the Natural Resources Defense Council (NRDC), et al. commented that EPA is required to apply technology-forcing emission standards to remanufactured marine diesel engines, as section 213(a)(3) directs EPA to "promulgate (and from time to time revise) regulations containing standards applicable to emissions from those classes or categories of new nonroad engines and new nonroad vehicles (other than locomotives or engines used in locomotives) which in the Administrator's judgment cause, or contribute to," air pollution. The commenter stated that Congress took a comprehensive approach in delegating rulemaking responsibility to EPA, calling for the establishment of emission standards that apply to new vehicles and engines, and included language to ensure that remanufactured engines—engines that are functionally new—cannot elude protective emission standards. The commenters noted that such an approach follows inextricably from the statutory text and is essential to carry out the core statutory purpose of section 213—to address emissions from new engines, based on the natural and ordinary understanding of that term, that endanger public health and welfare—and stated that they believe that taking a different approach would be arbitrary and capricious, an abuse of discretion, and contrary to law.

Letters:

Engine Manufacturers Association (EMA)	OAR-2003-0190-0545 (hearing), 0575.1
Environmental Defense, NRDC, et al.	OAR-2003-0190-0592.1

*Our Response:*

Regarding the definition in section 216(3), that is the definition of "new motor vehicle," while EPA has generally followed that definition for determining "new" in the context of nonroad engines and nonroad vehicles, and believes it generally to be an appropriate guide, EPA

has made clear in the past, with regard to locomotives, and now, with regard to larger marine diesel engines, that the remanufacturing process for such engines, which stay in service much longer than typical motor vehicle engines, is so thorough as to return the engine to as-new condition, and thus should make the engine subject to section 213.

Our statutory authority to set standards for marine diesel engines is found in section 213(a) of the Clean Air Act. That section authorizes establishment of standards for “new” engines. EPA has previously determined that certain existing locomotive engines, when they are remanufactured, are returned to as-new condition and are expected to have the same performance, durability, and reliability as freshly-manufactured locomotive engines. Because these remanufactured engines are for all intents and purposes “new,” we consequently set emission standards for these engines that apply at the time of remanufacture (defined as “to replace, or inspect and qualify, each and every power assembly of a locomotive or locomotive engine, whether during a single maintenance event or cumulatively within a five-year period...” (see 61 FR 53102, October 4, 1996; 40 CFR 92.2). This rulemaking adopts new tiers of standards for both freshly manufactured and remanufactured locomotives.

We are extending this interpretation of “new” to marine diesel engines. This is appropriate because, like with locomotives, many marine diesel engines, particularly those above 600 kW, periodically undergo a maintenance process that returns them to as-new condition. A full rebuild that brings an engine back to as-new condition includes a complete overhaul of the engine, including piston, rings, liners, turbocharger, heads, bearings, and geartrain/camshaft removal and replacement. Engine manufacturers typically provide instructions for such a full rebuild, and describe engines that undergo such a rebuild as “as-new.”<sup>2</sup> Marine diesel engine owners complete this process to maintain engine reliability, durability, and performance over the life of their vessel, and to avoid the need to repower (replace the engine) before their vessel wears out. A commercial marine vessel can be in operation in excess of 40 years, which means that a marine diesel engine may be remanufactured to as-new condition three or more times before the vessel is scrapped.

Because these remanufactured engines are returned to as-new condition, sections 213(a)(3) and (4) give EPA the authority to set emission standards for those engines. We are adopting requirements for remanufactured marine diesel engines. For the purpose of this program, we are defining remanufacture as the replacement of all cylinder liners, either in one maintenance event or over the course of five years (for the purpose of this program, “replacement” includes the removing, inspecting and requalifying a liner). While replacement of cylinder liners is only one element of a full rebuild, it is common to all rebuilds. Marine diesel engines that do not have their cylinder liners replaced all at once or within a five-year period, or that do not perform cylinder liner replacement at all, are not considered to be returned to as-new condition and therefore are not considered to be remanufactured or new. Those engines would not be subject to the marine remanufacture requirements.

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<sup>2</sup> See Note from Amy Kopin, Mechanical Engineer, to Jean Marie Revelt, EPS, Re: Marine Remanufacture Program. A copy of this Note is available in Docket OAR-2003-0190.

With regard to the definition in section 216(3), that is the definition of “new motor vehicle,” while EPA has generally followed that definition for determining “new” in the context of nonroad engines and nonroad vehicles, and believes it generally to be an appropriate guide, EPA has made clear in the past, with regard to locomotives, and now, with regard to larger marine diesel engines, that the remanufacturing process for such engines, which stay in service much longer than typical motor vehicle engines, is so thorough as to return the engine to as-new condition, and thus should make the engine subject to section 213. As noted above, a full rebuild brings an engine back to as-new condition, and engine manufacturers describe remanufactured engines to be as good as new. While a full rebuild can vary by engine model and engine manufacturer, one element in common in all full rebuilds is replacement of cylinder liners. Therefore, we are defining a remanufactured engine to be an engine that is brought back to as-new condition as evidenced by the replacement of all cylinder liners within a five year period (see Section 9.8, below).

## **9.6 Separate Regulatory Action**

### *What Commenters Said:*

Several industry commenters said EPA should defer action on a marine remanufacture program to a separate rulemaking. These commenters noted that the marine market is very diverse in terms of number of engine manufacturers, engine models, and users, and deferring to a separate rule would allow more time for all stakeholders to consider the program. Some of the commenters wrote that more time is needed to assess the implications on the marine industry of a mandatory program patterned after the locomotive remanufacture program. One commenter said that all the “unknowns,” “maybes” and “hoped for” in the preamble suggests the need for a separate rule. Some commenters pointed out that the proposal did not include draft regulations for the program, and that stakeholders would need time to review the draft regulations when they became available.

PVA suggested that some applications may need a different program. For example, there are engines above 600 kW in passenger vessel service that approximate the use and maintenance practices of engines below 600 kW. These engines are used in low demand, intermittent, seasonal applications and do not have the operating characteristics of large commercial engines. The commenter suggested establishing separate criteria for these engines and supported a continued exploration of the remanufacture program through ongoing dialogue and a separate rulemaking, if needed.

After reviewing the proposed regulations made available in the docket on September 10, 2007, AWO expressed support for a voluntary program in supplemental comments and indicated that a supplemental notice of proposed rulemaking with a formal comment period would be required if EPA wanted to go beyond a voluntary program.

### Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574, 725  
Caterpillar Inc. (Caterpillar) OAR-2003-0190-0591.1  
Cummins Inc. OAR-2003-0190-0559, 731  
Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575.1  
Kirby Corporation OAR-2003-0190-0563.1  
Lake Carriers Association (LCA) OAR-2003-0190-0567.1  
Passenger Vessel Association (PVA) OAR-2003-0190-0576.1  
Port of Seattle OAR-2003-0190-0469.1

*Our Response:*

See response to section 9.3, above. The program we are finalizing does not include the mandatory Phase 2 described in our proposal. Because the final program is a market-based program that relies on the voluntary certification of remanufacture systems, we do not think it is necessary to postpone adoption to a separate rulemaking. With regard to the diversity of applications that use the covered engines, we disagree that differences among uses requires separate rules or provisions. The requirements are tied to how a vessel is maintained and whether or not it is remanufactured. Vessels in any application that are remanufactured to as-new condition through the replacement of cylinder liners are subject to the standards; those that have lower usage rates and are not remanufactured will not be affected by the program.

We intend to monitor implementation of the marine remanufacture program and will review the program as early as 2012 to determine if revisions are needed to obtain the emission reductions anticipated by this program. Revisions, if necessary, will be pursued in a separate rulemaking.

The final regulatory provisions are consistent with the concept EPA announced in the proposed rule. We also made draft regulations available to all stakeholders on September 10, 2007, by e-mailing them to all groups who commented on the rule (excluding private citizens), by inserting them in the docket for this rule, and by adding them to our website.

As is clear from the comments, the proposal fairly apprised commenters of the issues at stake in adopting a diesel marine remanufacturing program, EPA provided draft regulations to stakeholders in a timely manner, and EPA has met with the affected industry to address their concerns. A supplemental notice is not necessary to further develop the program.

## **9.7 Engines Covered**

*Background:*

The marine remanufacture program described in the proposal would apply to all remanufactured (defined as replacing all cylinder liners, either at once or in a five-year period) commercial marine diesel engines above 600 kW. We requested comment as to whether the

program should be expanded to include engines below 600 kW as well. We originally expected to apply the program to all marine diesel engines. Although we requested comment as to whether the program should be limited to engines built after 1973, the program described in our September 10, 2007 memo subsequently limited the program to engines built after 1973. We also requested comment on whether all engines onboard a vessel should be subject to the remanufacturing requirements if the main propulsion engine falls under the scope of the program.

*What Commenters Said:*

Many commenters from state and local governments and environmental groups argued for a broad-based program and recommended that EPA extend the coverage of the marine remanufacture program and include all existing C1 and C2 vessels. They also recommended that the second phase of the program not be restricted to just high-sales volume engines.

Manufacturers and user groups, on the other hand, advocated applying the program only to Category 2 marine diesel engines, with some specifying it should apply only to those Category 2 engines larger than 600 kW. Some of these commenters noted that this approach would make maximum possible use of components developed for rail engines for C2 engines (see section 9.3, above). According to these commenters, this approach is appropriate because Category 2 engines are larger, burn more fuel, produce more emissions, and are less frequently replaced. In addition, these engines are designed to be maintained on board the vessel and components are replaced or repaired as they wear, and that components such as heads, liners and pistons may be repaired or renewed on individual cylinders over a period.

Other commenters did not support a remanufacture program for Category 2 engines. These commenters noted that Category 2 engines are maintained onboard and are not remanufactured but instead are rebuilt onboard, and there may not be room for remanufacture systems. These commenters also noted that the remanufacture program should apply only to engines operated on distillate fuel. They stated that marine engines that operate on residual fuel have no counterpart among locomotive engines, and therefore the locomotive remanufacture systems would not be applicable. In addition, it would be necessary to specify a PM test measurement method for residual fuel engines.

With regard to the age of engines, EMA recommended in its initial comments that the requirements should apply only to engines above 600 kW that are at least fifteen years old, and that Tier 2 engines and later engines should be exempt. In its supplemental comments, EMA recommended that the program apply to Category 2 engines only. The commenter noted that many Category 1 engines are already being rebuilt to Tier 1 standards and that those emission benefits will continue to be realized even if the voluntary remanufacture program is limited to Category 2 engines. This would also limit issues associated with “will-fitters” (see section 9.11 below).

With regard to the size threshold, at least two commenters, PVA and Kirby, indicated that

600 kW is the appropriate lower limit for the program, noting it is identical to the Tier 4 standards size threshold. PVA also recommended that a vessel be grandfathered if it can be shown that a certified remanufacture system won't fit a vessel.

Two commenters recommended that EPA not adopt a requirement to treat all engines onboard as a system and require all to be remanufactured if the main propulsion engine falls under the program. Kits may not be available for the smaller engines and the costs of retrofitting or replacing them would be prohibitive.

PVA also questioned the need for the marine remanufacture program, stating that existing engines will be replaced in an accelerating rate as the cost of maintaining older engines increases, the cost of fuel increases, and the engine approaches the end of its economically useful life. EPA can reinforce this turnover through initiatives and information programs. PVA also noted that there are engines above 600 kW in passenger vessel service that approximate the use and maintenance practices of engines below 600 kW. These engines are used in low demand, intermittent, seasonal applications and do not have the operating characteristics of large commercial engines.

The Makah Tribal Council noted that given that recreational boat owners do not depend on their vessels as a way to make a living, the Makah Tribe does support the application of these standards to the remanufacture of engines in non-commercial, or recreational vessels that fall into the 50 hp to 5 liter category.

The California Air Resources Board (CARB) expressed concern about the interface between this remanufacture program and existing state retrofit programs. Specifically, there may be a situation where a vessel owner has already applied a retrofit device achieving greater than a 25 percent PM reduction, in response to State and local agency direction. Then, when the engine needs a rebuild, the vessel owner who has already installed a retrofit would be required to rebuild with the certified EPA kit. This could result in the necessity of removing the retrofitted device. The commenter recommended that language be added to the effect that a certified EPA remanufactured (rebuild) engine emission control system must be used unless the vessel owner can demonstrate that an emission reduction system has already been applied that achieves equal or greater reductions than the required EPA-certified system.

Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574.1  
California Air Resources Board (CARB) OAR-2003-0190-0596.1  
CIMAC Exhaust Emission Controls Working Group OAR-2003-0190-0548.1  
Crowley Maritime Corporation (Crowley) OAR-2003-0190-0641, 659  
Cummins Inc. OAR-2003-0190-0559, 731  
Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502 (hearing), 0594, 0729  
Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575, 726  
Kirby Corporation OAR-2003-0190-0563.1  
Lake Carriers' Association (LCA) OAR-2003-0190-0567.1



Marathon Petroleum Company LLC OAR-2003-0190-0595.1  
Makah Tribal Council OAR-2003-0190-0472  
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0732  
Overseas Shipholding Group, Inc. (OSG) OAR-2003-0190-0589.1  
Passenger Vessel Association (PVA) OAR-2003-0190-0576.1  
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0483  
(hearing)

*Our Response:*

See response to 9.3, above. Because the final program is a market-based program that relies on the voluntary certification of remanufacture systems, we do not think it is necessary to limit the program to Category 2 engines only. Many of the emission control technologies that are being used to achieve the marine Tier 2 standards, and the technologies that are expected to be used to achieve the marine Tier 3 standards, can be applied to many existing marine diesel engines, particularly those that have the same basic engine platform as the Tier 2 or Tier 3 engines. However, engine manufacturers might not develop remanufacture systems for Category 1 engines unless owner/operators of those engines would be required to use those certified systems when they become available. EMA noted that it is unnecessary to include Category 1 engines in the program because many are already being rebuilt by engine manufacturers to Tier 1 (International Maritime Organization (IMO) Annex VI-compliant) standards. We disagree with such an approach. A certification requirement such as that adopted in the marine remanufacture program serves three important purposes. First, it ensures that a technologically-feasible PM emission reduction, 25 percent, can be achieved. Second, it requires the engine manufacturers to demonstrate that the emission reductions will actually occur over the useful life of the engine. Finally, it requires the vessel owner/operator to maintain the engine such that the emission reductions are achieved in-use. As a final note, the IMO Annex VI limits are for NO<sub>x</sub> only.

With regard to the comment that it is inappropriate to apply remanufacture requirements to Category 2 engines because they are maintained onboard, we don't agree that this should exempt them from the program. In our conversations with engine manufacturers, we learned that these engines are often designed to be a key component of the structure of the vessel. The location of the engine as well as its fuel and control systems is important both in terms of the stability of the vessel and in terms of vessel operation. These constraints make the engine difficult, if not impossible to remove. As a result, the engines are designed to last the life of the vessel, which can be upwards of 30 years. This also means that the engine must be designed to be serviced on the vessel, since removal of major components such as cylinder blocks or crankshafts would often mean cutting into the hull of the vessel. The engines are designed for easy in-situ repairs so that those parts subject to wear can be replaced without difficulty, to minimize the time that the unit is out of service for repair or rebuild. This includes power assemblies, which consists of the pistons, piston rings, cylinder liners, fuel injectors and controls, fuel injection pump(s) and controls, and valves. The power assemblies are generally rebuilt to bring them back to as-new specifications, or they can be upgraded to incorporate the latest design configuration for that engine. As part of the routine rebuilding process, many types

of power assemblies and key engine components can be disassembled and replaced or requalified (i.e., determined to be within original manufacturing tolerances). The ability of these engines to undergo a major rebuild without being removed makes them candidates for the marine remanufacture program. We acknowledge that there may be space constraints that could limit the types of technologies that can be applied to existing engines, although it is also the case that many commercial engines are located in engine rooms where space is not so constraining. In any case, the standards we are finalizing do not require the use of aftertreatment technologies, and can be achieved by using modified versions of the same parts that are currently replaced during a major engine rebuild.

While several commenters supported applying the program to smaller engines (those below 600 kW) as well, we did not receive any technical justifications for broadening the program. At this time, we do not have sufficient data to determine the extent that the rebuilding of engines below 600kW qualifies as remanufacturing to an as new condition. Therefore, we are defining “remanufacture” in §1042.901 to exclude engines below 600 kW from the program. There are also significant policy reasons to support this approach. Most significantly, these engines have shorter lives than those above 600 kW and are not designed to be rebuilt several times. Instead, they are more likely to be replaced with a new engine when they reach the end of their useful life. This is supported by the comments from PVA, who noted that owners will replace owners as it becomes economical to do so either due to decreased maintenance or increased fuel efficiency.

Similarly, we cannot conclude that rebuilding recreational engines qualifies as remanufacturing. Recreational engines also have shorter useful lives than commercial engines and are not subject to as much wear on an annual basis. This means it takes longer to acquire the hours between maintenance intervals. Engines on some recreational marine vessels may not be rebuilt at all but, instead, are replaced or the vessel is scrapped. There may also be other technological and cost issues with applying the remanufacture definition to smaller commercial or recreational engines. We may revisit this approach after implementing the program to evaluate whether other marine diesel engines should be included as remanufactured engines as well.

Because the program we are finalizing simply requires the use of a certified remanufacture system when an engine is remanufactured, if one is available, we are including all marine diesel engines above 600 kW, regardless of the type of fuel they use. While the technologies that can be used to reduce PM emissions from residual fuel engines may be different, there are steps that can be taken, such as changes in cylinder liners to reduce oil consumption. The marine remanufacture program would encourage manufacturers to consider such technologies since owners would be required to use a certified remanufacture for residual fuel engines if one is available. Note that while we are allowing someone to certify a remanufacture system for residual fuel engines that simply requires the use of distillate fuel in an engine, §1042.801 specifies that such systems would not trigger the availability requirements. We specify that any kit based on fuel or fuel additives would need to be certified in the same way as an engine-based system, in addition to being registered as a fuel or fuel additive under 40

CFR Part 79. It will be necessary to include emission testing data for the engine models included in the certificate, a description of any modifications that must be made to the engine to accommodate the fuel or fuel additive, a sampling method, and a compliance verification method.

We are not adopting a requirement that all engines on a vessel be remanufactured if the main propulsion engines falls under the program, for the reasons set out by the commenters (kits may not be available for these engines and the costs of retrofitting or replacing could be burdensome, depending on the number of engines on the vessel and the steps that are required to be taken to reduce the PM emissions).

With respect to PVA's comment on engines above 600 kW that have the same usage patterns as recreational engines, to the extent this is the case then those engines are unlikely to trigger the requirements as they are unlikely to be remanufactured. Specifically, the remanufacture event that triggers the requirements is defined as when all cylinder liners are replaced, either all at once or in a five-year period. Engines on passenger vessels that are used in lighter applications than most commercial vessels, and/or that aren't subject to as much wear on an annual basis, are unlikely to be remanufactured. Those that are used many hours are appropriately included in the program.

With respect to PVA's request that a vessel be grandfathered if a certified system won't fit a vessel, we expect that remanufacture systems are expected to be improved versions of the parts that are currently replaced in a thorough rebuild and that such a provision is not necessary. The remanufacture standard, a 25 percent reduction in PM emissions, is not expected to require the use of aftertreatment or any other additional components for the engine. Further, to certify a remanufacture system the manufacturer has to demonstrate that the cost of the system will not exceed \$45,000 per ton of PM reduced, and those costs must take into account any vessel modifications if they are necessary.

With respect to EMA's recommendation about the scope of the program, we are not revising the program to include only those marine engines above 600 kW that are at least 15 years old, nor are we exempting Tier 2 engines. Instead, the program will apply to engines manufactured from 1973 through Tier 2. The beginning date of 1973 is based on our existing locomotive program; many of the techniques used to achieve those standards are expected to be applicable to marine diesel engines over 600 kW. Similarly, Tier 2 remanufacture systems will be available for the locomotive counterparts of these engines and those technologies should be transferable to marine engines. To the extent there are technological difficulties in achieving the emission reductions for any particular engine model, the program does not require that a system be made available. It only requires the use of a certified remanufacture system when remanufacturing a marine engine if such a system is available. With regard to EMA's comment on will-fitters, see response to comment 9.11, below.

With respect to the concerns about possible inconsistency between EPA's marine remanufacture program and existing state or local retrofit programs, we don't want to negatively

impact the positive benefits that arise from state and local retrofit programs, especially in those cases in which the retrofit achieves a greater reduction (e.g., retrofit of a selective catalytic reduction (SCR) system) than a certified marine remanufacture system. We also don't want to discourage these programs especially in early years where state and local programs may achieve reductions before certified remanufacture systems become available. Therefore, we are adopting a provision that will allow an owner/operator of an engine that is fit with a retrofit device prior to 2017 pursuant to a state or local retrofit program to request a qualified exemption from the marine remanufacture requirements for that engine. This qualified exemption will be available only to engines equipped with retrofit devices under a state or local program before 2017. The owner/operator must request the exemption prior to a remanufacturing event that would otherwise trigger the requirement to use a certified remanufacture system. The request must include documentation that the vessel has been retrofit pursuant to a state or local retrofit program and a signed statement declaring that to be true. Except for the initial request for a specific vessel and a specific retrofit, a request would be considered to be approved unless we notify the requestor otherwise within 30 days of the date that we receive the request. Note that the exemption does not apply where the sponsoring government specifies that inclusion in the retrofit program is not intended to provide an exemption from the requirements of this subpart. Owner/operators would be required to continue the use and maintenance of the retrofit kit that provides the basis for the exemption. Owner/operators that fail to operate or maintain the retrofit would be subject to the same penalties as would apply for malmaintenance of a certified engine's emission controls.

Beginning in 2017, this exemption will no longer be available for new retrofits. Engines included in state or local retrofit programs will be required to use a certified remanufacture system if one is available when the engine is remanufactured. In this case either the certified remanufacture system would be part of the retrofit or the vessel owner would use a certified remanufacture system at the next remanufacture event.

## **9.8 Definition of Remanufacture**

### *Background:*

As explained in the proposal, we designed the marine remanufacture program based on the locomotive remanufacture program. In the locomotive program, remanufactured was defined as meaning (i) to replace, or inspect and qualify each and every power assembly of a locomotive or locomotive engine, whether during a single maintenance event or cumulatively within a five-year period; or (ii) to upgrade a locomotive or locomotive engine; or (iii) to convert a locomotive or locomotive engine to enable it to operate using a fuel other than it was originally manufactured to use; or (iv) to install a remanufactured engine or a freshly manufactured engine into a previously used locomotive. Any of these events would result in a locomotive that is essentially new. Because large marine diesel engines installed on certain types of commercial marine vessels, including tugs, towboats, ferries, crewboats, and supply boats often undergo similar procedures, we indicated that it is appropriate to apply remanufacture requirements to

those engines.

*What Commenters Said:*

AWO and Crowley called EPA's attention to the difference between "remanufacturing," as it is commonly understood in the industry, and "overhauling." AWO noted that engines on tugboats and towboats are not routinely "remanufactured"; instead, these engines undergo routine overhauls according to the manufacturer's recommendations. An overhaul is generally performed while the engine is still in the vessel and includes a complete engine teardown, thorough inspection and qualification of components, and reinstallation of new or requalified components. Overhauls are meant to restore an engine to the performance level it had when new; they are not meant to change the characteristics of an engine. "Remanufacturing," on the other hand, is a more comprehensive process that is typically conducted at a remanufacturing facility, and involves removing the engine from the vessel, reboring the engine block, and replacing all major components with the latest technology appropriate. This is performed when the engine is 25 to 30 years old, and has not been common in the tugboat, towboat, and barge industry.

The Port of Seattle recommended that the definition of remanufacture be stringent enough to assure older engines are addressed in a reasonable time frame.

Industry groups recommended that the definition of remanufacture should exclude repairs made to respond to emergencies as well as routine maintenance and minor overhauls.

Some commenters noted that EPA did not provide a regulatory definition of remanufacture for marine engines.

Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574, 725  
Caterpillar OAR-2003-0190-0591  
Crowley Maritime Corporation (Crowley) OAR-2003-0190-0641, 659  
Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575.1  
Kirby Corporation OAR-2003-0190-0563.1  
Lake Carriers Association (LCA) OAR-2003-0190-0567.1  
Marathon Petroleum Company LLC OAR-2003-0190-0595.1  
Port of Seattle OAR-2003-0190-0469.1

*Our Response:*

In the regulations we made available in the docket on September 10, 2007, we proposed that "remanufacture" means to replace every cylinder liner in an engine, whether during a single maintenance event or cumulatively within a five-year period. That is the approach we are finalizing for commercial engines over 600 kW. As described in section 9.7, definition of "remanufacture" excludes engines less than 600 kW and recreational engines from the program.

A remanufacture event is intended to cover rebuilding the engine in such a way as to make it like-new, and an engine that has undergone this process is intended to last as long as and operate in the same manner as a new engine. Therefore, it is necessary to identify a characteristic of a major rebuild that could be used to categorize the action as remanufacturing and that would exclude routine maintenance or other actions that do less than make the engine like-new.

In discussions with manufacturers and user groups, we determined that it was inappropriate to use the identical locomotive definition for “remanufacture” since although the concept is the same for both locomotive and marine with thorough rebuilds periodically performed on the engines, the specific parts that may be removed and replaced or requalified may be different. Specifically, replacement of power assemblies is an inappropriate trigger for some marine engines since power assemblies may not always be replaced as a complete unit. Instead, different components may be replaced. We also determined that it was inappropriate to use the common industry understanding of the term “remanufacture,” which involves removing the engine and having the work done at a remanufacturing facility.

The approach we are adopting draws on certain features of large marine diesel engines used in commercial engines. As noted by AWO, it is difficult to remove the main propulsion engines from most commercial vessels, and therefore they are not removed from the vessel for maintenance. Further, the location of the main propulsion engines as well as their fuel and control systems is important both in terms of the stability of the vessel and in terms of vessel operation. As a result, the engines are designed to last the life of the vessel, which can be upwards of 30 years. This also means that the engine must be designed to be serviced on the vessel, since removal of major components such as cylinder blocks or crankshafts would often mean cutting into the hull of the vessel. The engines are designed for easy in-situ repairs so that those parts subject to wear can be replaced without difficulty, to minimize the time that the unit is out of service for repair or rebuild. This includes power assemblies, which consists of the pistons, piston rings, cylinder liners, fuel injectors and controls, fuel injection pump(s) and controls, and valves. The power assemblies are generally rebuilt to bring them back to as-new specifications, or they can be upgraded to incorporate the latest design configuration for that engine. As part of the routine rebuilding process, many types of power assemblies and key engine components can be disassembled and replaced or requalified (i.e., determined to be within original manufacturing tolerances).

Because there are differences among manufacturers with respect to instructions for replacing power assembly components, we determined that the replacement of cylinder liners, either all at once or over a period of five years, would indicate that the engine had undergone a rebuild intended to return it to as-new condition. Engine manufacturers indicated that replacement of cylinder liners is something common to what AWO described in its comments as a major overhaul and would therefore be a key component of returning an engine to as-new condition. This also avoids having routine maintenance or emergency repairs triggering the requirements.

The five-year period is identical to the approach in the locomotive remanufacture program. This has two effects. First, it allows owners to continue constant maintenance practices (also called “rolling rebuilds”) whereby a fraction of an engine’s cylinders are replaced every year. Some operators prefer this practice because it ensures constant power availability over the entire life of the engine instead of declining power over the period between overhauls. These owners can either use a certified remanufacture system as the cylinders are remanufactured, or replace all cylinders with certified remanufactured systems all at once at the end of the cycle, in the case of incompatibility between certified systems and the pre-existing cylinders. Second, it is a disincentive for owners to try to evade the requirements by avoiding replacing all cylinders at once.

This approach answers AWO’s comment about the difference between overhauling and remanufacturing, in that we have defined the requirement in terms of what is being replaced and not where (i.e., on board or at a remanufacturing facility) or how much. An engine that has all cylinders liners replaced, either on the vessel or at a remanufacturing facility, would fall under the program. It will also ensure coverage of the affected vessels in a minimal amount of time, since most vessels replace all liners at once to avoid downtime.

## **9.9 Effective Date and Availability of Remanufacture Systems**

### *Background:*

Our proposal discussed a two-part program, with a first phase to begin as early as 2008 and a second, mandatory phase to begin as early as 2013. In the first phase of the program, a vessel owner/operator would be required to use a certified remanufacture system when remanufacturing a covered marine diesel engine if such a system has been certified. If no system has been certified, there is no requirement. In the second phase of the program, an owner/operator would be required to achieve a 25 percent reduction in PM emissions, either through the use of a certified remanufacture system or, if such a system is not available, by retrofitting a control device or by repowering.

### *What Commenters Said:*

Many of the comments we received from state and local governments and environmental groups recommended earlier start dates for the mandatory program, ranging from 2008 to 2010.

Industry commenters opposed the mandatory program (see 9.3, above). They also requested a later effective date for the voluntary program, and noted that the effective date should provide ample opportunity for implementation to ensure the technology is available to meet the regulatory obligation, to ensure the availability of remanufacture systems, and to ensure that industry members are aware of the requirements. Many recommended that the program start

no earlier than 12 months after publication of the final rule, and the requirements be triggered at the first remanufacture after that date. At least one manufacturer noted that the Phase 1 program should begin no earlier than 2010 to allow manufacturers time to prepare remanufacture systems; if an earlier effective date is chosen, kits may not be robust.

With regard to owners who do not replace all cylinder liners at once, one commenter suggested that the requirements be triggered at the time the last power assembly is renewed after the effective date of the rulemaking.

At least one commenter requested that we add a provision that would allow a vessel owner to use non-certified parts if a certified remanufacture system is not available. This commenter noted that a vessel owner should not be required to tie up a vessel to wait for parts that are not available in a timely manner.

Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574, 0725  
California Air Resources Board (CARB) OAR-2003-0190-0596.1, 0719  
Caterpillar OAR-2003-0190-0591  
City of Houston (Texas) Bureau of Air Quality Control (BAQC) OAR-2003-0190-0561.1  
Clean Air Task Force (CATF) OAR-2003-0190-0499 (hearing)  
Clean Air Watch OAR-2003-0190-0500 (hearing)  
Cummins Inc. OAR-2003-0190-0559, 731  
Environmental Defense OAR-2003-0190-0592.1  
Kirby Corporation OAR-2003-0190-0563.1  
Lake Carriers' Association (LCA) OAR-2003-0190-0567.1  
Marathon Petroleum Company LLC (Marathon) OAR-2003-0190-0595  
Missouri Department of Natural Resources, Air Pollution Control Program (MDNR) OAR-2003-0190-0658  
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)  
Natural Resources Defense Council (NRDC) OAR-2003-0190-0489 (hearing)  
Northeast States for Coordinated Air Use Management (NESCAUM) OAR-2003-0190-0551.1  
Ozone Transport Commission (OTC) OAR-2003-0190-0633  
People for Puget Sound OAR-2003-0190-0649  
Port of Seattle OAR-2003-0190-0469.1  
Private Citizens (*various*)  
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1

*Our Response:*

See response to 9.3. The program we are finalizing consists only of the Phase 1 program that will begin as soon as the rule goes into effect; we are not pulling ahead the Phase 2 program.



As explained in our response to 9.3, this decision is in response to industry concerns over the costs of retrofitting emission control systems or repowering if a remanufacture system is not available. We intend to monitor implementation of the marine remanufacture program and will review the program as early as 2012 to determine if revisions are needed to obtain the emission reductions anticipated by this program. As part of that assessment, we will revise the program if remanufacture systems are not made available. Any change to the program will be the subject of a full rulemaking.

The marine remanufacture program could begin as soon as this rule goes into effect in the spring of 2008, when manufacturers may begin certifying marine remanufacture systems. It should be noted that the remanufacture requirement is not triggered until an engine is remanufactured and a certified remanufacture system is available for that engine. A remanufacture system will be considered to be available 120 days after we issue a certificate of conformity for it or 90 days after it has been included on EPA's list of certified systems, whichever is later. The earliest time by which a system could be certified and be considered to be "available" is in the fall of 2008, assuming that a manufacturer certifies a system in the spring. In addition, availability means not only that a system has been certified, but also that it can be obtained and installed in a timely manner consistent with normal business practices. For example, a system would generally not be considered to be available if it required that the engine be removed from the vessel and shipped to a factory to be remanufactured unless that is the normal rebuild process for that engine. Similarly, a system would not be considered to be available if the component parts are not available for purchase in the period normally associated with a scheduled rebuild. If a certified system is not available there is no requirement to comply with this program until the next remanufacture, at which time this availability determination will again be made.

The above provisions make it unnecessary to postpone the beginning of the program to 2009, 2010, or later.

An owner may use non-certified parts if a certified remanufacture system is not available, since no remanufacture requirement is triggered if there is no certified system or if the component parts of a certified system are unavailable. It should be noted that owners should keep a record of their efforts to obtain a certified system after one has been certified, in the case of a compliance action, to demonstrate an effort was made to locate the necessary certified system components.

For those cases in which cylinder liners are not replaced all at once (rolling rebuilds), the remanufacture requirement is triggered at the time the remanufacture system becomes available. Any remanufacturing that occurs after the system is available needs to use the certified system. However, if the components of a certified remanufacture system are not compatible with the engine's current configuration (i.e., if the engine cannot operate with a mix of new and old components), the program allows the owner to postpone the installation of the remanufacture system until the replacement of the last set of cylinder-liners, which would occur no later than five years after the availability of the system. At that time, the entire engine must be

remanufactured using a certified remanufacture system or systems.

## **9.10 Remanufacture Standards**

### *Background:*

The standards described in the proposal would require certified marine remanufacture systems to meet at least a 25 percent reduction in PM emissions compared to the baseline engine emissions. This would be established based on emissions testing.

### *What Commenters Said:*

Many of the comments we received from state and local governments and environmental groups urged us to adopt tighter standards, ranging from the new locomotive remanufacture standards to standards that reflect modern pollution control equipment that can achieve 40 to 50 percent reductions, for both NO<sub>x</sub> and PM. Some commenters noted that SCR and DOC systems have been successfully retrofit on existing engines, and one commented that emission reduction technologies such as emulsified fuel, water injection, and exhaust gas recirculation are individually capable of achieving at least 25 percent reduction. In addition, based on a number of Carl Moyer projects, repowering can also achieve about 50 percent reduction. Another commenter suggested that the standard require best available technology at the time of the rebuild, since new and cleaner options will develop through time. Other commenters said that emissions from remanufactured marine engines should be reduced so as to be similar to those expected from new engines under the proposed standards. These commenters noted that tighter standards would permit additional emission reductions to be realized in a much shorter time frame than waiting for older engines to be retired from use.

Industry commenters supportive of a program applicable to Category 2 engines only supported applying the new locomotive remanufacture standards to Category 2 engines when they are remanufactured. Other industry commenters were supportive of a 25 percent reduction described in the Notice of Proposed Rulemaking (NPRM). At least one commenter was opposed to applying the Tier 4 standards to rebuild, retrofit, or repower engines, and recommended that the rebuild requirements be limited to the best available technology that will fit in the current engine room. In its supplemental comments, EMA suggested that the program apply only to Category 2 engines and not require the use of a remanufacture system if an engine is within 135 percent of the Tier 2 PM standard.

EMD recommended that a provision be added allowing certification of remanufactured engines upgraded to meet specific freshly manufactured engine standards, regardless of the emissions reduction to be gained by the installation of the remanufacture system. Such a provision should allow the certification of a remanufactured engine simply by making its hardware and, where applicable, control software identical to those of the freshly manufactured configuration.

AWO and Kirby recommended a 2-part program similar to the locomotive remanufacture program. The first phase of the program could begin 12 months after publication of the rule and could require the use of a certified remanufacture system that meets the locomotive Tier 0 standards; the second phase could be based on the new locomotive Tier 0 and Tier 1 standards. EMA recommended that the program apply only to engines that are at least 15 years old and are above 600 kW, and the standards should not require aftertreatment. EMD said the standards should reflect reductions that can reasonably be expected for older engines, such that deep reductions would not be required of older engines due to the limits of applying more recent emission control technologies to those engines. In its supplemental comments, EMD also requested that EPA take into account the NOx reductions associated with the locomotive Tier 0 standards when considering the final marine remanufacture standards. The commenter noted that it has been certifying remanufacture systems for locomotives for many years based on a requirement that required reducing NOx with no PM increase. The commenter recommended that these systems be permitted until an alternative system is certified that achieves a PM reduction

PVA indicated that it opposes a stepped approach that would entail standards based on reductions of 60 percent, 40 percent, and 20 percent, and requiring that a rebuild use the certified kit meeting the most stringent of these three standards if available.

Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574.1  
California Air Resources Board (CARB) OAR-2003-0190-0596.1  
Caterpillar Inc. (Caterpillar) OAR-2003-0190-0591.1  
City of Houston (Texas) Bureau of Air Quality Control (BAQC) OAR-2003-0190-0561.1  
Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502 (hearing), 0594, 729  
Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575.1  
Kirby Corporation OAR-2003-0190-0563.1  
Marathon Petroleum Company LLC OAR-2003-0190-0595.1  
Missouri Department of Natural Resources, Air Pollution Control Program (MDNR) OAR-2003-0190-0658  
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)  
Oregon Department of Environmental Quality, Air Quality Division OAR-2003-0190-0506, 0652  
Passenger Vessel Association (PVA) OAR-2003-0190-0576.1  
Port of Seattle OAR-2003-0190-0469.1  
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1

*Our Response:*

The standard we are adopting for marine remanufacture systems is a 25 percent reduction

in measured PM emissions and no increase in NO<sub>x</sub> emissions (within 5 percent). This standard is similar to the PM emission reduction that was achieved from our Tier 2 marine diesel standards for new engines. This standard reflects reductions that can be achieved through improvements to piston ring-pack designs, as well as turbocharger, fuel system, and closed crankcase ventilation system improvements, and will not require the use of exhaust aftertreatment devices. While there may be technologies that can reduce PM further, it is not clear that such technologies can be applied to all existing engines built in 1973 and later. By adopting a more stringent standard, the program may exclude engines that could achieve emission reductions if a less stringent standard were adopted. In addition, the technologies that were used to achieve the Tier 2 standards can be applied to engines with similar platforms as the Tier 2 engines and may be more readily adaptable to older engines.

We do not agree with the suggestion that the program not apply to engines that are already within 135 percent of the Tier 2 PM standard. The technologies that can be applied to control PM emissions from marine diesel engines, including improvements to piston ring-pack designs, as well as turbocharger, fuel system, and closed crankcase ventilation system improvements. These engine-based technologies can achieve the 25 percent PM reduction required in this program without the use of exhaust aftertreatment devices. If it is not possible to achieve a 25 percent reduction in PM from an existing model of engines, then a system will not be certified; it is not necessary to exempt these engines from a voluntary program such as the one we are finalizing. In addition, this type of exemption would be complicated to administer, since it would be necessary to provide emission testing to show that the engine's PM emissions fall within that 135 percent range. Finally, we are concerned that the PM emission reduction for at least some existing engines will already be within 135 percent of the Tier 2 PM standard due to the new controls on marine diesel fuel that reduces the sulfur content from the 2,000 ppm limit on which the engines were originally certified to 500 ppm in 2007 and 15 ppm in 2012.

We intend to monitor implementation of the marine remanufacture program and will review the program as early as 2012 to determine if revisions are needed to obtain the emission reductions anticipated by this program. As part of that assessment, we will consider if it is appropriate to set additional more stringent standards, similar to the tightening of the locomotive marine standards included in the final rule. Any change to the program will be the subject of a full rulemaking.

With regard to EMD's comment about allowing existing locomotive Tier 0 kits to be used in this program, we agree with EMD's assertion that those systems, while not providing a PM benefit, will provide important NO<sub>x</sub> reductions. Therefore, the final program allows locomotive Tier 0 systems to be certified as marine remanufacture systems. However, those systems can be used only on pre-Tier 1 (uncertified) Category 2 engines, and the use of these existing Tier 0 systems will not be permitted after systems certified to the new Tier 0 locomotive standards are made available.

With regard to the stepped approach, we are not adopting that requirement. In conversations with manufacturers, many expressed concern that such a requirement would

discourage the development of remanufacture systems since they could rapidly become obsolete. In addition, owners were concerned that they would be subject to a moving requirement that would complicate their engine maintenance and overhaul schedules and could result in identical engine models being required to use different remanufacture systems. They also wondered whether such an approach would mean they would have to use a different system every time they remanufacture, and the impacts on engines that are remanufactured over several maintenance events. For these reasons, instead of adopting the multi-step approach, we are adopting a single emission reduction requirement. If several certified systems are available, we will allow any of them to be used. However, states may develop incentive programs to encourage the use of the certified remanufacture system with the greatest reduction. Also, we may revisit the emission level in the future to determine if it should be modified to reflect advances in applying new PM reduction technologies to existing marine diesel engines.

Finally, with regard to EMD's suggestion that manufacturers be allowed to certify remanufacture systems based solely on applying the same hardware and control systems that are being used to achieve the freshly-manufactured engine standards, we are not adopting such a provision. While such a program could result in greater emission reductions, we are concerned that shortcutting the certification process risks certifying remanufacture systems that are too burdensome to vessel owner/operators. Specifically, these greater emission reductions could come at much greater costs, and this will not be well known absent complying with the certification requirements and demonstrating that the remanufacture system costs less than \$45,000 per ton of PM reduced. Also, because the requirement to use a remanufacture system is triggered once such a system is certified, it is important to ensure that the systems are reliable and durable. It should be noted, however, that engine manufacturers who wish to provide these retrofit systems can do so through EPA's diesel retrofit program.

## **9.11 Certification of Remanufacture Systems**

### *What Commenters Said:*

Several commenters asked for more information about how remanufacture systems would be certified. EMA and Cummins expressed concerns about third-party companies certifying remanufacture systems and the impacts of those systems on engine durability and reliability. EMD requested simplified certification for locomotive remanufacture systems that can be used on marine diesel.

In supplemental comments in response to the proposed regulations that were made available on September 10, 2007, EMA expressed concern about "will-fitters" who may enter the rebuilt market with potentially substandard rebuild kits (not made from the original engine manufacturer's approved parts) that could negatively impact the durability and performance of the underlying marine engine. EMA also suggested that remanufacture systems be subject to a notice and comment period similar to that for the urban bus rebuild program. Cummins also noted in supplemental comments that it has spent millions of dollars designing engines with high

levels of reliability and durability, and that it is unlikely that any third party would be able to adequately demonstrate the existence of no adverse effects on an engine's reliability or durability. The commenter noted that issues could be something as simple as increased exhaust back pressure or as complex as incompatibility between an engine's electronic calibration and aftertreatment regeneration. Cummins was also concerned about the investment it would take to either issue disclaimers about third-party kits or disprove the kit developer's claims.

EMA also suggested streamlined certification for Tier 1 upgrade kits if it can be shown that such kits yield PM reductions of 25 percent or more from a measured baseline.

EMD noted that in addition to achieving a 25 percent PM reduction, NOx emissions for remanufacture systems must be equivalent or less than the baseline NOx levels for the engine. The commenter recommended that NOx emissions five percent greater than those of the baseline configuration be accepted as equivalent.

#### Letters

American Waterways Operators (AWO) OAR-2003-0190-0574, 725

Cummins Inc. OAR-2003-0190-0559, 731

Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502, 0594, 0729

Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575, 726

#### *Our Response:*

In general, the normal certification requirements for new marine diesel engines would apply, with minor variations as needed to accommodate the characteristics of remanufactured engines. For example, engine families are based on the same criteria as freshly manufactured engines, and testing, reporting, the application for certification, and warranty requirements closely follow the provisions that apply for freshly manufactured engines. To certify a remanufacture system, a manufacturer must measure baseline emissions and emissions from an engine remanufactured using its system. A baseline emission rate would be established by remanufacturing an engine following normal procedures. That engine, or a second engine of the same configuration, is then tested for emissions after remanufacturing with the expected emission controls. The remanufacturing system meets the emission standards of the program by demonstrating a minimum 25 percent reduction in PM emissions and no increase in NOx emissions (within 5 percent). The remanufacturer must also demonstrate that the remanufacturing system does not adversely affect engine reliability or power.

The regulations allow for simplified certification requirements for remanufacture systems that are already certified under the locomotive program. This would require only an engineering analysis demonstrating that the system would achieve emission reductions from marine engines similar to those from locomotives. Because the marine remanufacture program requires only a PM reduction, locomotive remanufacture system manufacturers may modify those locomotive systems with respect to NOx emissions. In that case, the system will have to be recertified as a marine remanufacture system based on measured values and subject to all of the other

certification requirements of the marine remanufacture program

We are not providing a similar streamlined certification for Tier 1 upgrade kits. The locomotive streamlined certification is reasonable because the underlying system, the existing locomotive Tier 0 system or the future Tier 0, 1, or 2 systems, are certified under the locomotive program. Tier 1 upgrade kits, on the other hand, are not pre-certified under another program.

Some engine manufacturers expressed concern about the potential for unintended adverse effects on engine performance, reliability, or durability that could occur if another entity develops a remanufacture system for their engines. They were particularly concerned about being held responsible for an emission failure if the remanufacture system does not perform as intended, or for an engine failure if the system causes other engine components to fail. While we agree that engine manufacturers need to be made aware if a third party certifies a remanufacture system for one of its engines, we do not agree that the way to do this is through a public notice and comment approach. Such an approach would be burdensome, both for the industry and engine manufacturers, given the large number of engine models that could potentially be affected by the program. Instead, to address this concern about third-party “will-fitters,” the program we are finalizing requires any person who wishes to certify a remanufacture system for an engine not produced by that person to notify the original engine manufacturer and request their comments on the remanufacture system. Any comments received by the certifier are required to be included in the certification application, as well as a description of how those comments were addressed.

With regard to EMD’s comment about NOx emission limits, we have adopted their suggestion. The remanufacturing system meets the emission standards of the program by demonstrating a minimum 25 percent reduction in measured PM emissions and no increase in NOx emissions (within 5 percent).

## **9.12 Technology Review**

### *Background:*

We asked for comment on the need for a technology review for the marine remanufacture program prior to implementation of the mandatory second phase of the program. This review could take place in 2011.

### *What Commenters Said:*

Industry commenters were supportive of a technology review in 2011. Such a comprehensive technology review would be useful to take stock of what rebuild kits are available for which marine engines, and to assess the overall cost-effectiveness of any mandatory marine engine rebuilds. This would also ensure that the standards are attainable with current technology.

Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574.1

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

Lake Carriers' Association (LCA) OAR-2003-0190-0567.1

*Our Response:*

Since we are not adopting a mandatory second phase, a technology review for that program is unnecessary. In addition, given the level of the marine remanufacture program standards and the technologies that will be used to achieve them we do not believe a technology review is necessary for this program. However, we are committed to the development and successful operation of a marine remanufacture program. We intend to assess the effectiveness of this program as early as 2012 to ascertain the extent to which engine manufacturers are providing certified remanufacture systems. If remanufacture systems are not available or are not in the process of being developed and certified at that time for a significant number of engines, we may consider changes to the program. In evaluating the effectiveness of the remanufacture program in the future, we may revisit the need for Part 2, or something similar, to ensure emission reductions from the large marine legacy fleet are occurring in a timely and effective manner. We may also evaluate other aspects of the program, including the criteria that trigger a remanufacturing event (including the 5-year period for incremental remanufactures), and whether the program should also apply to engines less than 600 kW. Revisions, if necessary, will be pursued in a separate rulemaking.

### **9.13 Costs**

*What Commenters Said:*

We received comments from industry groups who were concerned about the costs of a mandatory marine remanufacture requirement such as the one contained in Phase 2. For example, the Washington State Department of Transportation (WSDOT) and Washington State Ferry System (WSF) noted that the initial estimate of the cost to meet Tier 2, 3, and 4 standards throughout the WSF ferry fleet is \$35-\$55M (in 2007 dollars). The commenters noted that it is very costly to remove propulsion engines from vessels for remanufacture, and removal and reinstallation processes will also significantly impact the availability of ferries for operational service. The commenters stated that they believe that a concept of a certified retrofit kit approach for achieving the PM and NOx targets would be more cost efficient. The WSDOT/WSF comments also contained extensive details of their preliminary research into the impacts to WSDOT/WSF resulting from the proposed rule.

The Makah Tribal Council commented that there is no definitive information or projections on what it would cost to retrofit older remanufactured or rebuild engines. The commenter noted that increased costs could put an unfair economic burden on commercial



fisherman with smaller boats (both tribal and nontribal) in an economic environment that is already hostile to the small commercial fisherman. The commenter requested that more information and data be provided on the possible costs for this type of retrofit.

The Lake Carriers' Association stated that it believes that if the cost of a new or rebuilt power plant is so high that it cannot be justified by freight rates and long-term market projections, a modal shift is inevitable. The commenter noted that its members have relayed that current freight rates are at best equal to the early 1990s in terms of real dollars (thus, the commenter stated, this is not an industry awash in spare cash). The commenter stated that it does recognize the need to protect the environment, and noted that LCA members do take steps to enhance the performance of their vessels. However, the commenter noted, decisions to upgrade or repower have to be based on economic realities—the commenter noted that the costs of replacing an engine are significant and difficult to justify in the current market.

Letters:

Lake Carriers' Association (LCA) OAR-2003-0190-0567.1

Makah Tribal Council OAR-2003-0190-0472

Washington State Department of Transportation (WSDOT)/Washington State Ferry System (WSF) OAR-2003-0190-0555.2

*Our Response:*

See answer to 9.3. We are not finalizing the mandatory Phase 2 program. We expect the costs associated with certified remanufacture systems that achieve a 25 percent reduction in PM will be reasonable given that manufacturers already have experience with the applicable technologies that were applied to meet the Tier 2 PM limits. In addition, we have put a cost cap of \$45,000 per ton PM reduced to discourage certification of kits that would require aftertreatment or other costly solutions.

With regard to the WSDOT/WSF comments regarding the costs associated with the possible marine remanufacturing program, we do not believe that the costs developed by the commenter are applicable to the program being finalized. Those costs appear to consider the costs associated with both phases one and two that were presented in the proposed rule, and appear to assume that vessel owners will be required to comply with the new engine Tier 3 and Tier 4 standards. The marine remanufacture program we are finalizing for existing engines only requires that, at the time of remanufacture, the owner use a certified remanufacture system that achieves at least a 25 percent reduction in PM emissions compared to baseline if such a system has been certified for the relevant engine; if no system has been certified, there is no requirement. Remanufacture systems are expected to be made up of improved versions of the same parts that are replaced in a thorough overhaul of the engine, and there would be no need to take a vessel out-of-service any earlier than would be done under current operating plans (i.e., when the engine would normally be remanufactured, defined as replacing all of the cylinder liners either all at once or over a 5-year period). While it is true that the final requirement would require that vessels be out-of-service for the time required to undergo the remanufacturing

process, that out-of-service time period is not expected to be any longer than under current practices since the replacement of engine parts is expected to be the same.<sup>3</sup> Therefore, we are not requiring any incremental increase in the amount of out-of-service time. Note that the new certified remanufacture kits are expected to be more costly than kits that could be used absent this requirement and we have accounted for that incremental cost in our marine remanufacturing cost estimate. Finally, remanufacture systems are not expected to require the use of aftertreatment control technology, since the 25 percent PM reduction can be achieved with engine based controls such as changes to piston ring-pack designs, as well as turbocharger, fuel system, and closed crankcase ventilation system improvements.

## 9.14 Technology Constraints

### *What Commenters Said:*

Several commenters raised questions about the ability of existing engines to use PM emission reduction technologies. Many of these commenters requested that, in considering a marine remanufacture program, EPA take into account the unique operational environment as well as technological availability and feasibility of implementing land based emission reduction technologies within the marine environment. These commenters noted that there are significant challenges in developing a remanufacture provision for the existing marine diesel engine market. Other commenters expressed concern about the wide variety of existing engine manufacturers within the Category 1 fleet of engines and that there is no retrofit technology or approved emission reduction certified kit in production for Category 1 engines. In addition, there is little or no emissions data (especially for PM) available for most of the existing marine engines, and in some cases the original engine manufacturer may not be in business anymore. For all of these reasons, a program like Phase 2 that mandates an emission reduction from existing engines by a given date may not be feasible.

GE commented that it believes that, in general, the technology and opportunity to apply emissions improvements to marine engines at the time of remanufacture is equivalent to that for locomotives. The commenter noted that there are several upgrades that can be done without changing the footprint of the engine and without significantly affecting other systems on the vessel, such as vehicle control and cooling. The commenter further stated that some of the available technologies that could be applied are turbo optimization, combustion optimization, fuel system upgrades, and injection timing optimization. GE commented that it believes that the application of these technologies would result in exhaust emissions reductions equivalent to what is specified for remanufactured locomotive engines in Part 1033 of the proposed rule. GE also commented that, while there may be some engine families or engine models that are small in number or so unique that it may not be economical or practical to expect an emissions upgrade kit to be developed, it recommends that EPA make application of an upgrade kit mandatory at

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<sup>3</sup> An exception would be if an owner who normally does a rolling rebuild elects to replace all cylinder liners at once, in which case the engine may be out of service somewhat longer; this would be offset by not taking the engine out of service annually for partial rebuild events.

the time of remanufacture if a certified kit is available.

Letters:

Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502 (hearing), 0594.1, 0729  
Engine Manufacturers Association (EMA) OAR-2003-0190-0545 (hearing), 0575.1  
General Electric Transportation (GE) OAR-2003-0190-0590  
Kirby Corporation OAR-2003-0190-0563.1  
Lake Carriers' Association (LCA) OAR-2003-0190-0567.1  
Marathon Petroleum Company LLC OAR-2003-0190-0595.1  
Offshore Marine Service Association (OMSA) OAR-2003-0190-0490 (hearing)

*Our Response:*

We recognize the concern that several commenters expressed about a mandatory engine remanufacturing program for engines with power ratings greater than 600 kW. However, as expressed by GE in its comments, many of the control approaches that are used in locomotive remanufacture systems are expected to be applicable to marine applications. Concern about the ability to transfer these technologies is addressed by our adoption of only the first phase of the program described in the NPRM. Participation in the program is mandatory only when a verified rebuild system is available – if no system is available, there is no requirement for the vessel owners to deviate from their traditional rebuild practice. We expect that there will be a small number of engine models where it is not economically feasible to develop, test, and certify a PM-reducing technology. However, we expect that engine manufacturers and/or rebuilders will develop, certify, and distribute the technologies needed to achieve a 25% PM reduction on high-sales volume engines.

In the case of 2-stroke marine engines which are based on locomotive designs, a PM solution already exists in the form of low-oil-consumption power assemblies. Once the PM levels for these power assemblies have been tested and verified on the marine test cycles, they will be eligible for use in this program.

## **9.15 Flexibilities**

*What Commenters Said:*

We received several suggestions for flexibility provisions to include in the final marine remanufacture program. These include: an alternative compliance mechanism that would allow greater PM reductions to compensate for lower NO<sub>x</sub> reductions; allowing fuel additives to be certified as remanufacture systems; allowing a fleet averaging approach, that would allow fleet owners to develop an efficient and more cost-effective method of managing emissions; including a small business exemption; providing financial incentives or tax credits to encourage owners to replace older engines; and including an exemption or waiver process for vessels that will be scrapped or permanently removed from service in the U.S. market within a specified period of

time.

Letters:

American Waterways Operators (AWO) OAR-2003-0190-0574.1

Electro-Motive Diesel, Inc. (EMD) OAR-2003-0190-0502 (hearing), 0594.1, 0729

Lake Carriers' Association (LCA) OAR-2003-0190-0567.1

Marathon Petroleum Company LLC OAR-2003-0190-0595.1

*Our Response:*

We have included several flexibility provisions to reduce the burden of the marine remanufacture program. The final program will allow fuel and fuel additives to be certified as remanufacture systems as long as they meet certain requirements. We also included a small business exemption (see Chapter 7 of this Summary and Analysis of Comments document).

With regard to the comment about including a waiver process for vessels that are expected to be scrapped or permanently removed from service we do not think such a waiver is necessary. If an owner intends to scrap a vessel, it is unlikely that the owner will remanufacture the engines on that vessel. If the engines are remanufactured, then the owner obviously intends to use it in the meantime, in which case it is appropriate for the engines to comply with the remanufacture program if they are remanufactured.

We have not included a provision that would allow greater PM emissions to compensate for lower NOx reductions. This provision is not necessary since the standard is for PM only. We have also not included a provision for fleet averaging. This is not necessary because we are not adopting the mandatory Phase 2 program. Since the requirement is linked to the existence of a certified remanufacture system for a particular engine, it is not clear how an averaging program could be applied. Finally, the Clean Air Act does not allow EPA to extend financial incentives or tax credits as methods to encourage compliance with the program.