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July 2, 2007

U.S. Environmental Protection Agency
Air Docket, Mailcode 6102T
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
Attn: Docket EPA-HQ-OAR-2003-0190

This letter provides the comments of the Air Resources Board (ARB) staff on the U.S. Environmental Protection Agency's (U.S. EPA) Proposed Rule "Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder" (published April 3, 2007, Docket ID No. EPA-HQ-OAR-2003-0190).

As discussed in detail in these comments, California needs the most effect and timely locomotive and marine engine controls possible. We believe the Clean Air Act requires U.S. EPA to establish stringent, aftertreatment based emission standards and encourage the agency to set and implement such standards as soon as feasible.

We are supportive of most elements included in the April 3, 2007 proposal. However, we believe that several portions of the proposal should be strengthened, expanded or accelerated. Our comments below expand upon the testimony provided by ARB staff at the May 8 hearing in Seattle on this proposal.

Summary of Elements Supported as Proposed

Major elements of the proposal that we support include the following:

- Setting Tier 4 locomotive and marine requirements based on the best possible emissions aftertreatment control technologies at emission reduction levels similar to those required on diesel engines in on-road trucks and off-road sources.

- Applying the most effective Tier 3 locomotive and marine standards possible while the Tier 4 technologies are being developed.

- Establishing rebuild requirements to ensure that the emissions performance of in-use engines is significantly improved at the time that rebuild occurs. The proposal to significantly reduce diesel particulate matter (PM) from Tier 0 through Tier 2 locomotives is particularly important to reduce community risk due to locomotive emissions.

- Ensuring that both new and in-use requirements are applied as soon as the technologies are available.

Summary of Suggestions to Strengthen the Proposal

The following summarizes ARB staff recommendations for strengthening the proposal:

1. Locomotive Engines

- Tier 4 oxides of nitrogen (NOx) standards for freight line haul locomotives should be applied concurrently with the introduction of the Tier 4 PM standards. Based on the time frame over which industry developed Tier 2 Standards and the research and experience gained from the application of diesel particulate filters (DPF) and selective catalytic reduction (SCR) to trucks and off-road engines, we believe that full compliance with Tier 4 levels will be feasible for locomotives produced in 2015, if not sooner.

- Tier 3 standards for line haul locomotive PM reductions of 50 percent no later than 2012 are appropriate, but a NOx reduction requirement of at least 50 percent should be required concurrently. We believe the Tier 3 NOx requirement should be applied when Tier 3 PM requirements are introduced. U.S. EPA has already determined that similar NOx reductions are technically feasible and cost effective for large engines in other off-road categories by 2011.

- The Tier 2 locomotives PM remanufacturing standard should be required earlier than the 2013 proposed date. The needed technologies will be available for the Tier 3 engines by 2012, if not earlier. Delaying the standard to 2013 means that some older Tier 2 locomotives could be rebuilt to the much less protective original PM standard.

- A retrofit certification process for Tier 0 through Tier 3 locomotives should be established. A certification process is needed so that the benefits of the retrofit technologies can be realized in voluntary programs, such as the Carl Moyer Incentive program. Such a process would also enable retrofit technologies to be appropriately considered in future U.S. EPA rulemakings.

2. Marine Engines

- U.S. EPA has proposed that final standards for Category 1 engines less than 600 kilowatt (kW) be set at Tier 3 levels only. Tier 4 after-treatment technology is 80 to 90 percent more effective. This substantially higher level of control is vitally needed for many California vessels that use engines sized less than 600 kW.

  Aftertreatment technology is feasible for less than 600 kW engines, as illustrated by demonstration projects with clean rebuild technology, diesel particulate filters, and selective catalytic reduction aftercontrol.

  These smaller engines represent a significant portion of California's harborcraft emissions. About 75 percent of California's ferry and excursion vessel engine population uses less than 600 kW engines, as do a significant percentage of other work vessels. Applying Tier 4 rather than Tier 3 standards to these vessels will reduce emissions by more than 80 percent on affected vessels. This would produce an additional 15 to 20 percent reduction from the fleet wide population of vessels that use Category 1 engines.

- The Tier 4 implementation schedule should be moved forward to match the implementation schedule for Tier 4 standards for off-road engines from which marine engines are derived.

  Remanufacture standards for existing Category 1 and 2 marine engines should be developed and could become effective by 2009. Reduced emission remanufacture kits are currently available for some marine engines. Remanufacture standards would greatly accelerate reductions from marine engines, many of which remain in use for 30 years or longer.

<u>Need for Emission Reductions from Locomotive and Marine Engines</u>

Strong and effective federal locomotive and marine emission reduction standards are essential. Emissions from locomotive and marine engines are major contributors to California's ozone and fine particle smog problems. They are also significant sources of elevated cancer risk and high PM exposure in many communities. Highly effective controls on both of locomotive and marine sources are an essential part of our efforts to attain federal ambient air quality standards and to protect community health.

ARB studies to quantify health risks from mobile source emissions of diesel PM have shown that living near a large port complex and living near major rail facilities result in elevated exposure to diesel PM. For example, the Health Risk Assessment for the

Los Angeles/Long Beach ports determined that the elevated cancer risk from all port-related PM emissions is greater than 500 cases per million for approximately 50,000 people who reside within up to two miles of the ports.

In addition to the elevated cancer risk, PM and NOx emissions also contribute to many other health impacts, such as premature death, hospital admissions due to respiratory and cardiovascular causes, asthma and other respiratory symptoms. California is not unique in this respect. Poor air quality plagues much of the nation. Locomotive and marine emissions are significant nationwide contributors to ozone and diesel PM exposures.

Conclusion

ARB staff appreciates the opportunity to comment on the Notice of Proposed Rule Making (NPRM). Additional detail and support for our recommendations is presented in the attachment to this letter. We urge U.S. EPA to establish the most stringent feasible standards for locomotive and marine engines. It is vital that the highly effective Tier 4 standards, as proposed in the NPRM, be adopted. In addition we recommend U.S. EPA strengthen the final rule to include our suggestions either through the changes we have proposed or by crafting equally effective and timely alternatives. Finally, we urge U.S. EPA to take final action on this proposal before the end of 2007.

If U.S. EPA staff has questions or desire more information regarding ARB staff comments, please contact me at (916) 322-2890 or via e-mail at mscheibl@arb.ca.gov.

Sincerely,

Michael H. Scheible
Deputy Executive Officer

Attachment

cc: See next page.

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Attachment to the July 2, 2007 letter
California Air Resources Board Staff Comments

Docket EPA-HQ-OAR-2003-0190 – Proposed Rulemaking on the Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder

Need for Locomotive and Marine Emission Reductions

Emissions from locomotive and marine engines are major contributors to California's ozone and fine particle smog problems. California locomotive and marine engines contribute 30 percent of smog forming oxides of nitrogen (NOx) and 35 percent of toxic diesel particulate matter (PM) from mobile sources that move goods around and through California.

Hundreds of thousands of Californian's live close enough to ports and rail facilities to suffer highly elevated exposures to this pollution. Millions of other Californian's live further downwind from these facilities but still have elevated risks. The ARB recently published studies to quantify risks from mobile source emissions of diesel PM. One study covers emissions from the combined ports of Los Angeles and Long Beach. The second covers one of California's largest railyards located in Roseville, a suburb northeast of Sacramento. We just released draft similar studies for ten additional railyards and are currently developing a study for the Port of Oakland to be released as a draft this fall. Seven additional railyard studies are scheduled to be completed by the end of this year.

The Health Risk Assessment (HRA) for the Los Angeles / Long Beach ports determined that the elevated cancer risk from all port-related PM emissions is greater than 500 cases per million cases for approximately 50,000 people who reside within up to two miles of the ports and a risk of greater than 10 cases per million for about eight million residents within about 60 miles. Category 1 and 2 marine engine emissions in commercial harbor craft produce a significant fraction of port-related exposure.

Category 1 and 2 marine engines, which will be addressed by this rulemaking, are used in harbor craft as both propulsion and auxiliary engines, and in ocean-going vessels as auxiliary engines. Our current statewide emissions inventory estimates that commercial harbor craft contribute about 4 tons per day (tpd) of PM and 90 tpd of NOx. Ocean-going vessel auxiliary engines contribute another 4 tpd of PM and 44 tpd of NOx. Of the combined 8 tpd of PM and 134 tpd NOx, approximately 40 percent of these emissions come from engines that are less than 600 kilowatts (kW). The HRA estimated that the commercial harbor craft contribution to these emissions produce an elevated cancer risk of greater than 200 cases per million for about 5,000 residents and greater than 10 cases per million for about 1.5 million residents.

The impact of emissions from Category 1 and 2 is greater than the statewide figures indicate because the emissions are concentrated in California's coastal non-attainment districts, particularly in port areas. The Los Angeles region (South Coast) is in

non-attainment for both PM 2.5 and ozone, and attainment requires extensive emission reductions from all sources.

California's Efforts to Reduce Locomotive and Marine Emissions

Air pollution from international trade and domestic goods movement in California is a major public health concern at both regional and community levels. Goods movement is now the dominant contributor to transportation emissions in the State. The ARB's "Emission Reduction Plan for Ports and Goods Movement in California" identifies the many actions necessary to reduce these emissions and protect public health. The basic strategies to reduce emissions include regulatory actions at both the State and federal level, incentive programs, lease agreements, careful land use decisions, and voluntary actions. The measures to address all significant emissions sources involved in international and domestic goods movement, including trucks, locomotives, marine vessels, harbor craft, and cargo handing equipment are under way. Rules for sources under ARB's direct authority have been adopted and more are under development. Also, a significant amount of existing incentive funds has been applied to goods movement emission sources and ARB has prioritized continued funding on this source of statewide significance.

For locomotives, the plan proposes to control NOx and PM by 90 percent. To achieve these air quality goals, the plan relies heavily on new U.S. Environmental Protection Agency (U.S. EPA) Tier 4 locomotive emission standards combined with accelerated fleet turnover of locomotives once U.S. EPA establishes new standards. Accelerating the introduction of Tier 4 locomotives into California service is a similar approach to the 1998 Memorandum of Understanding (MOU) we have with the Class 1 railroads for locomotives in the South Coast Air Basin. This MOU requires a Tier 2 NOx fleet average in the South Coast Basin by 2010. Because of the high growth of international trade through California's gateway ports, full control of locomotives, a federally preempted source, is vital.

For marine engines the Plan relies upon reductions of 25 percent in reactive organic gas (ROG), NOx, and PM by 2010 and 40 percent by 2020. Tier 4 standards for these engines are critical to meeting these goals.

The following sections discuss recommended improvements to the proposed locomotive and marine standards and provide support for the feasibility of such improvements.

1. Locomotives

There are a number of key areas where ARB staff recommends the proposal be strengthened, with a particular focus on freight line haul locomotives. The Notice of Proposed Rulemaking (NPRM) indicates a number of areas where U.S. EPA has stated there are alternative approaches it might consider. The NPRM has solicited comments on these options and we have a number of specific suggestions.

Tier 4 NOx and PM Freight Line Haul Locomotive Standards

Tier 4 oxides of nitrogen (NOx) standards for freight line haul locomotives should be applied concurrently with the introduction of the Tier 4 PM standards. General Electric (GE) and Electro-Motive Diesel, Inc. (EMD) were able to develop the redesigned Tier 2 line haul locomotives in the 1998-2004 timeframe. This process included time for extensive in-use testing in 2003 and 2004. This occurred while Tier 0 and Tier 1 locomotive engine upgrades and redesigns were accomplished simultaneously between 1999 and 2002. At the same time, GE and EMD and other manufacturers were developing numerous Tier 0 remanufacturing kits (over 90) for U.S. EPA to certify from 1994-2006.

The NPRM indicates that diesel particulate filter (DPF) and Selective Catalytic Reduction (SCR) have been demonstrated to be mature and cost-effective for other mobile sources. Further, the NPRM concludes that the research and experience gained from application of DPF and SCR to trucks and off-road engines can be applied, with some exceptions, to locomotives. Finally the NPRM indicates that the proposed Tier 4 aftertreatment can be accommodated within the size constraints of existing locomotives. Based on the above, ARB staff believes that within six years, by the end of 2014 at the latest, the necessary research (already underway), design, and bench and in-use testing should be completed so that new Tier 4 NOx and PM line haul locomotives are fully commercially available by 2015.

Tier 3 NOx for Line Haul Locomotives

Tier 3 standards for line haul locomotive PM reductions of 50 percent no later than 2012 are appropriate, but a NOx reduction requirement of at least 50 percent should be required concurrently. NOx reduction requirements should be applied when Tier 3 PM requirements are introduced in 2012. U.S. EPA has already determined that similar NOx reductions are technically feasible and cost-effective for large engines in other off-road categories by 2011. ARB staff believes a Tier 3 line haul locomotive NOx standard of 3.0 g/bhphr is feasible without aftertreatment, and that this standard would be an essential element of California's efforts to attain the ozone and PM standards.

Tier 0-3 PM Remanufacturing Line Haul Locomotive Standards

The proposed Tier 0 and Tier 1 PM remanufacturing standards are power assembly (i.e., pistons, rings, cylinder liners) upgrades that are currently certified or available and need minor improvements. The Tier 2 and Tier 3 PM remanufacturing upgrades (e.g., valve stem seals and closed crankcase ventilation system improvements) will take more effort, but these upgrades are not full engine redesigns. Tier 2 PM remanufacturing certifications should be available by the end of 2010 and should be required for Tier 2 rebuilds starting in 2011, the earliest date any significant number of Tier 2 units are expected to undergo their initial remanufacture. Further, the proposed Tier 3 PM only standard is equivalent to the Tier 2 remanufacturing standard, and will

not require a major engine redesign. ARB staff believes locomotive manufacturers have or can acquire the necessary resources to produce the Tier 0-3 remanufacturing upgrades by the end of 2010, and at the same time continue with new Tier 3 and 4 development. In addition there are other companies (e.g., CSX, Wabtec, NREC) that can help fill the remanufacturing niche for the Tier 0, 1, and 2 remanufacturing standards.

Diesel PM reductions from Tier 2 locomotives are especially important in California. Because of our emission reduction agreements with the railroads, California will have an accelerated introduction of Tier 2 locomotives by 2010. We believe the Tier 2 locomotives PM remanufacturing standard should be required earlier than the 2013 proposed date. The needed technologies will be available for the Tier 3 engines by 2012, if not earlier. Delaying the standard to 2013 means that some older Tier 2 locomotives could be rebuilt to the much less protective original PM standard. This delays health benefits another five to seven years, and makes little sense if a better option is nearly available. We believe acceleration of the initial compliance dates is technically possible, and needs to be required at the earliest feasible date.

Need for a U.S. EPA Locomotive Retrofit Aftertreatment Certification Process

We encourage the development of a retrofit certification process for Tier 0 through Tier 3 locomotives. A certification process is needed so that the benefits of the devices can be realized in voluntary programs, such as the Carl Moyer Incentive program, and such an effort would enable retrofit technologies to be appropriately considered in future U.S. EPA rulemakings.

ARB staff estimates that existing Tier 0 through Tier 3 line haul locomotives may represent 90 percent of the national locomotive emissions in 2020, based on the anticipated Tier 4 implementation schedule. Due to their long lives, these locomotives will represent the majority of freight line haul locomotives emissions well into the future. Therefore, we recommend U.S. EPA establish a retrofit certification process for highly effective aftertreatment devices on locomotives. ARB staff believes retrofit aftertreatment devices for existing U.S. locomotives can be technically demonstrated to be cost-effective within the next two to four years.

ARB is currently working on a research project to bench test a compact SCR device that could potentially provide up to 80 percent NOx and 50 percent PM reductions on existing freight line haul locomotives. In-use demonstration testing is planned for a freight line haul locomotive and it is possible this work could be completed by the end of 2008. Under this schedule, a retrofit SCR aftertreatment device could be ready for certification by 2009 or 2010.

As another example, there is current testing of a diesel oxidation catalyst (DOC), estimated to provide a 50 percent reduction in PM, on an existing in-service freight line haul locomotive. This locomotive has been operating for six months of a one year in-use demonstration testing program. If the testing proves successful, this aftertreatment device potentially could be verified by ARB or certified by U.S. EPA by 2009.

Switch Locomotive Standards

Switch locomotive standards should be set at levels at least as stringent as proposed, but we recommend alignment of the implementation dates with line haul locomotives. As noted in the NPRM, significant changes have occurred in the rail industry since the previous 1998 rulemaking that impact switch locomotives. Today's line haul locomotives (e.g., 4,000 hp versus 2,000 hp) are too large for practical use in switching service. Sales of new conventional switch locomotives in the United States are negligible and have been so for many years. Smaller builders have entered the market to sell refurbished locomotives using non-road engines, the most notable being the "gen-set" locomotive. The gen-set locomotive uses one to three newly built non-road diesel engines and are certified under 40 CFR Part 92 emission testing requirements. Current gen-set locomotives already exceed the proposed Tier 3 switch locomotive standards, and with aftertreatment are anticipated to meet Tier 4 levels before 2015.

We believe there will be a growing trend to provide financial incentives from federal and state agencies (e.g., California's Carl Moyer Program and Texas Emission Reduction Program) to replace older (40 years on average in California) switch locomotives with advanced technology switch locomotives that can provide up to 90 percent reduction in both NOx and PM, a 20 to 40 percent savings in diesel fuel consumption, and reductions in greenhouse gases. Further, the existing Tier 2 or 3 nonroad engines in the gen-set switch locomotives can be upgraded with future cleaner Tier 4 nonroad engines upon remanufacture. In addition, the gen-set switch locomotive has ample space and is more easily adaptable than traditional diesel-electric locomotive engines for retrofitting of aftertreatment devices such as DOC, DPF, and SCR.

Locomotive National Idle Reduction Device (IRD) Requirement

U.S. EPA requested comment on the need for a national locomotive idle reduction device requirement. We support the U.S. EPA's proposal to require idle reduction devices on all new Tier 3 and 4 locomotives. We also recommend requiring the installation (retrofit) of an idle reduction device on all existing regulated locomotives upon remanufacture. In general, purchases by railroads of Tier 0 through 2 locomotives were ordered with idle reduction devices. In California, because of our 2005 agreement with Class 1 railroads (BNSF and UPRR), nearly all intrastate locomotives in California will be equipped with idle reduction devices by June 30, 2008.

The fuel and emission benefits achieved through the use of idle reduction devices are widely recognized. The fuel savings alone, after several years of use, easily offsets the cost of the device. The cost benefits are even greater when accounting for the added benefit to public health from reduced emissions. However, freight interstate line haul locomotives move throughout the country and there needs to be a standard to ensure the full nationwide implementation of these cost-effective emission reductions. Therefore, we support the need for a national requirement of idle reduction devices on all new Tier 3 and 4 and other regulated line haul locomotives upon remanufacture.

U.S. EPA Locomotive Test Methods and Certification

U.S. EPA requested comments on revised provisions for testing, certification, and compliance. Current U.S. EPA test and certification methods are generally adequate for existing locomotives. However, there are two areas that would benefit from improvement, including accounting for transition and cold start emissions. ARB staff believes that some adjustments should be made in the existing 40 CFR Part 92 locomotive emission testing to account for transient emissions. Also, GE Smartburn (engine adjustments to lower NOx or PM tradeoffs within specific geographical regions), and use of Distributed Power Units (DPUs), Consist Management, and Trip Optimizers can provide emission reductions for specific locomotive operations. However, accounting for these emission reductions within the current 40 CFR Part 92 line haul duty cycle is problematic. We recommend that further research and investigation be done to account for these potential emission reductions in areas where they may occur.

2. Marine

There are three key areas where we believe the proposal should be strengthened for the marine standards. These improvements are needed to reduce health risks for communities near the nation's ports and are needed to meet ozone and PM air quality standards.

First, we recommend extending the Tier 4 marine engine requirements for full NOx and PM control to a larger segment of Category 1 engines. Second, we recommend application of Tier 3 and Tier 4 marine engine requirements on an accelerated schedule, similar to that applied to other non-road engines.

Third, we recommend establishing rebuild standards for marine engines, for the same reasons the U.S. EPA has proposed such standards for locomotives. Many marine engines have very long lives and can be rebuilt several times. We believe that substantial, cost-effective emission reductions will be possible at the time of rebuild. Where they are available, they should be required.

Tier 4 after-treatment technology is needed on Category 1 engines less than 600 kW.

California has a significant population of Category 1 marine engines that are less than 600 kW. About 90 percent of the engines in California's commercial harbor craft fleet are less than the 600 kW size cut point that U.S. EPA proposes to exclude from the Tier 4 standards. These engines account for about 40 percent of the total harborcraft emissions. About 75 percent of California ferry and excursion vessel propulsion engines fall into the less than 600 kW size range. This is also true for 87 percent of tow boat and 33 percent of tugboat propulsion engines. These types of ferries and tow and tug boats will continue to be used extensively in California's harbors and bays, working close to shore at a high percent load. Without Tier 4 standards for less than 600kW engines, overall PM and NOx emissions from harborcraft will be 15 to 20 percent greater than necessary.

One option for addressing this concern would be to require after treatment standards for less than 600 kw engines used in specific types of vessels that are used in goods movement and people transportation. Under this approach, engines less than 600 kW engines used in ferries, tugs, and tow boats would be subject to standards based on full use of feasible and cost-effective after treatment standards.

After-treatment technology is feasible for less than 600 kW engines.

The NPRM indicates that catalytic exhaust treatment systems pose several significant packaging and weight challenges for vessels that use smaller engines. We agree that aftercontol based Tier 4 standards may not appropriate for all categories of vessels, such as recreational and small commercial fishing vessels. While the number of fishing vessels are large (about 75 percent of California's commercial harbor craft fleet), their contribution to the emissions inventory is relatively small (25 percent) and declining. Additionally, our survey of commercial harbor craft indicated that fishing vessels do not spend a significant portion of their operating time inside the harbor and so pose less of a concern for health risk.

However, requiring Tier 4 standards for engine less than 600 kW for those vessel categories that work on a daily basis and spend a significant portion of their time within the harbor, such as ferries, tugs, and tow vessels, is essential. Establishing Tier 4 standards for engine less than 600 kW maximum power would ensure that new vessels are designed to accommodate aftercontrol technologies and would prevent the possibility that low emitting Tier 4 engines could be displaced by using several smaller Tier 3 engines instead of one or two larger Tier 4 engines. We believe that the use of after-treatment technology in these categories of harbor craft is feasible for new build applications, as well as retrofit in some cases.

One example of a successful retrofit of a smaller Category 1 engine (400 hp) is the rebuild and diesel particulate filter retrofit of a propulsion engine on a U.S. Navy workboat. In 2006, one of the two Detroit Diesel 12V-71 propulsion engines in a U.S. Navy workboat operating in the Suisun Bay was rebuilt with the Clean Cam Technology (CCT) system, including combustion chamber and injector modifications and addition of a turbocharger. The preliminary emissions test results indicated that the rebuilt engine reduced PM emissions by over 30 percent and NO_x by approximately 70 percent. This rebuilt engine was then retrofitted with a Rypos active diesel particulate. The CCT and Rypos active DPF, used in combination, achieved over 80 percent reduction of PM and over 70 percent reduction of NO_x. Durability testing of the system was successfully completed in late 2006.

An example of the successful use of selective catalytic reaction (SCR) exhaust aftercontrol on a new build vessel is the Solano of the Vallejo Baylink Ferry. The Solano is a high speed ferry designed and built with SCR exhaust aftercontrol, which reduces NOx by about 60 percent. This ferry has been in operation since 2004. Technologies such as compact SCR, currently being introduced into the marketplace, are facilitating a wider use of SCR in marine applications.

There are harborcraft that operate at low load for a significant portion of their operating time. For these harborcraft, the application of actively regenerating filters or hybrid technology could facilitate meeting cleaner Tier 4 standards. Foss Maritime Company, in partnership with the Ports of Los Angeles and Long Beach, is currently designing and building a hybrid tug which will operate on battery power during low load periods, such as idling, and on a combination of battery and diesel engine for high load operation. These modifications will produce the higher exhaust temperatures required by some aftercontrol technology. The hybrid design alone is estimated to reduce NOx and PM emissions by 44 percent, as well as sulfur dioxide, and carbon emissions. Foss believes that this hybrid tug design will be adaptable for retrofit to existing harbor tugs as well.

Wet exhaust systems have also been cited as providing a technical challenge for meeting aftercontrol based standards. Vessel and engine manufacturers may need to redesign these systems to introduce water in the exhaust downstream of emission controls, or to convert to an insulated dry exhaust design.

There are technical issues to overcome in applying Tier 4 aftercontrol based standards to smaller marine engines in some applications. Tier 4 standards may not be appropriate for all vessel categories, such as recreational and fishing. However, for vessel types that work daily and usually close to shore, such as ferries and tug/tow vessels, these standards must be established so that new vessel designs will evolve to include aftercontrol technology.

<u>The Tier 4 implementation schedule should be moved forward</u>

We support the proposed implementation timing for the Tier 3 standards but believe that the timing for the Tier 4 standards should be accelerated. Final Tier 4 standards for off-road engines over 25 hp come into effect between 2013 and 2015 with exhaust aftertreatment expected to be used to meet both NOx and PM standards. Engines used in vessels are marinized versions of these off-road engines. Therefore Tier 4 standards for these marine engines should be achievable in a similar time frame or shortly thereafter. Introducing Tier 4 standards for <600 kW engines alone in 2016 would provide, statewide, an additional 4 tpd NOx and nearly 0.1 tpd PM in 2020, and an additional 8 tpd NOx and about 0.15 tpd PM in 2025.

<u>Remanufacture standards for existing category 1 and 2 marine engines are needed</u>

ARB staff encourages the U.S. EPA to include remanufacture standards for existing Category 1 and 2 marine engines. We believe that remanufacture standards should become effective no later than 2009. Many marine engines remain in use for 30 years and longer and are rebuilt on a periodic basis. Remanufacture standards would greatly accelerate reductions from these engines. Tiered standards, allowing different levels of reductions, would allow flexibility in the standard. Reduced emission remanufacture kits are currently available for some marine engines which can provided 40 to 60 percent reductions in PM and NOx.

Support test procedures

We support the proposed revisions to the test procedures. Specifically, we support the revisions that allow for field testing and for other alternative test procedures to be used upon approval. Both of these provisions are expected to be very useful for determining comparable emission reductions for emission control devices that can range from simple passive diesel particulate filters to complex hybrid battery systems. The field testing provisions may be especially important for locomotive and marine application engines as they can be difficult to test within a laboratory. We are appreciative of the variety of ways that brake specific emission testing appear to be allowed based on the flow charts for the default test procedures of Section 1065.15.