



Regulatory Announcement

Emission Standards for New Marine Diesel Engines

The U.S. Environmental Protection Agency (EPA) is proposing emission standards for certain categories of new marine diesel engines. The proposed standards would reduce the harmful health effects of ozone from these engines, particularly in and around our commercial ports and coastal areas.

Which engines would be covered?

EPA is proposing emission standards for new marine diesel engines at or above 30 liters per cylinder. These are very large marine engines used primarily for propulsion power on ocean-going vessels such as container ships, tankers, bulk carriers, and cruise ships. While the vessels that use these engines can be flagged in the United States and in other countries, the proposed standards would apply only to engines on U.S.-flag vessels. We are requesting comment on whether to apply them to engines on foreign-flag vessels as well.

We are also proposing new requirements for marine diesel engines at or above 2.5 liters per cylinder but less than 30 liters per cylinder on U.S. vessels. These engines are used for propulsion power on marine vessels such as tugs, fishing vessels, supply boats, and other small- and medium-size commercial vessels. They are also used for auxiliary power on vessels of all sizes. We set standards for these engines in our 1999 Commercial Marine Diesel Engine rule (64 FR 73300, December 29, 1999; 40 CFR 94).

Why is EPA regulating these engines?

The engines covered by this proposal contribute to ozone and ambient particulate matter and carbon monoxide levels in commercial ports and coastal areas. The proposed standards address a group of marine diesel engines that were left unregulated in our 1999 commercial marine diesel engine rule.

We estimate that these engines account for about 1.5 percent of national mobile source nitrogen oxide (NO_x) emissions. This contribution can be higher on a port-specific basis. For example, these engines contribute about 7 percent of mobile source NO_x in Baton Rouge/New Orleans, Louisiana, and Wilmington, North Carolina, and about 5 percent in Miami/Fort Lauderdale, Florida, and Corpus Christi, Texas. In addition, these ships can have a significant impact on inventories in areas without large commercial ports. For example, Santa Barbara, California, estimates that engines on ocean-going marine vessels contribute about 37 percent of total NO_x in their area. The relative importance of these emissions in the inventory, both national and local, is expected to increase as emissions from other mobile sources decrease due to our emission control programs for highway vehicles and heavy-duty trucks.

Engines on foreign-flag vessels are estimated to account for about 95 percent of in-port NO_x emissions and about 60 percent of total NO_x emissions from this source. We are seeking comment on applying the proposed standards to engines on foreign-flag vessels as well.

These engines are subject to internationally-negotiated NO_x standards in accordance with Annex VI to the International Convention for the Prevention of Pollution from Ships (the Annex VI NO_x limits). The international standards are not currently enforceable because the required number of countries have not ratified the Annex and it has not yet gone into force. The U.S. government is preparing the appropriate documents for the President to submit Annex VI to the Senate for its advice and consent to ratification. Besides setting standards for NO_x emissions, Annex VI regulates ozone-depleting emissions, sulfur oxides emissions and shipboard incineration, and contains other environmentally protective measures. In transmitting Annex VI to the Senate, the Administration will work with Congress on new legislation to implement the Annex. At the same time, the United States government supports a revision of the Annex VI standards for NO_x emissions, taking into account the emission reduction potential of new control technologies. By ratifying the Annex, the United States will promote environmentally responsible international emission standards at the International Maritime Organiza-

tion (IMO) and recognize the role the IMO plays in protecting the world's marine environment from pollution. We have already requested the Marine Environment Protection Committee of the IMO to begin consideration of more stringent NOx emission limits for marine diesel engines. In addition, once the Annex goes into force, amendment of NOx standards will be made easier through the tacit amendment process that would then apply.

The standards we are proposing today continue the process of establishing nonroad standards as required by the Clean Air Act. We are required to set emission standards for nonroad engines and vehicles if their emissions of carbon monoxide (CO), NOx or volatile organic compounds contribute significantly to air pollution in more than one area of the country currently not meeting National Ambient Air Quality Standards (NAAQS) for ozone and carbon monoxide. We completed the Nonroad Engine and Vehicle Emission Study in 1991. In 1994 we determined that these sources contribute significantly to ozone or CO nonattainment, and we proposed a first set of standards for land-based nonroad engines. Since then, we have set emission standards for most nonroad engines, including farm and construction equipment, locomotives, other commercial marine engines, recreational vehicles, and lawnmowers.

What are the proposed requirements?

We are proposing enforceable emission limits under the Clean Air Act for marine diesel engines at or above 30 liters per cylinder on U.S. vessels. The proposed Tier 1 standards are equivalent to the internationally negotiated NOx standards and would be enforceable under U.S. law for new engines built in 2004 and later. We are also considering adoption of a subsequent second tier of standards or, alternatively, not adopting Tier 2 standards in this rule but instead establishing a schedule for a future rulemaking that will address Tier 2 standards. The second tier of standards we are currently considering would be more stringent than the international standards, reflecting continued improvements in emission control technology that have occurred since the international standards were agreed upon. Such a second tier of standards could be achieved through engine-based emission controls and would apply to new engines built in 2007 and later. The second tier of standards would also set HC and CO emissions to ensure that these emissions do not increase on an engine-specific basis. Particulate matter emissions from these engines are primarily due to the characteristics of the fuel they use (residual fuel, typically a high-sulfur fuel with a tar-like consistency that remains at the

end of the refinery process), and we are requesting comment on whether we should consider a sulfur content limit for that fuel. If we adopt a second tier of standards, we would review them prior to their effective date to take into consideration continued development of new technologies, such as selective catalytic reduction and water-based emission reduction techniques, and international activity such as action at IMO to set more stringent international standards.

We are also proposing new requirements for engines at or above 2.5 liters per cylinder but less than 30 liters per cylinder. The Tier 2 standards finalized for these engines in our 1999 commercial marine diesel engine rule apply to engines built in 2007 and after. Until then, and until Annex VI enters into force internationally, engine manufacturers are encouraged to voluntarily comply with Tier 1 standards, which are equivalent to the as yet unratified international NOx standards. Because Annex VI has not yet gone into force, we believe it is appropriate to require engine manufacturers to certify these engines to the Tier 1 standards beginning in 2004.

We are also proposing to eliminate the foreign trade exemption for all marine diesel engines on U.S. vessels. That exemption was available for engines installed on U.S. flag vessels that spend less than 25 percent of total operating time within 200 nautical miles (230 statutory miles) of U.S. territory.

How would the standards affect these engines?

The proposed Tier 1 standards, as well as the Tier 2 standards under consideration, could be achieved through the application of existing diesel engine emission control technologies in varying degrees, depending on the type of engine. These technologies include improved fuel injection (injection timing, injection pressure, rate shaping, common rail injection systems and electronic controls), intake air management (more effective turbocharging and aftercooling, and valve timing), and combustion chamber modifications (higher compression ratios, piston geometry, and injector location).

Are there any voluntary emission standards?

We are proposing voluntary low emission standards that reflect the use of advanced technologies such as fuel cell or selective catalyst reduction technology. These standards are included as part of the Blue Cruise program described in the proposal. This is a voluntary multi-media

incentive-based program in which participant vessel owners can receive special recognition from EPA for installing and using technologies that reduce waste and air emissions.

Are there any special compliance provisions?

To implement these standards for marine diesel engines at or above 30 liters per cylinder in an effective way, we are proposing several compliance requirements. In general, the proposed compliance program reflects our traditional manufacturer-based approach. This is in contrast to the international approach reflected in Annex VI, which holds the vessel owner responsible for compliance once the engine is delivered onboard. Many of the proposed compliance provisions, including certification, engine labeling, and warranty requirements, are similar or identical to the compliance provisions that we finalized in our 1999 rulemaking. In addition, we are including a post-installation verification provision which would require an emission test after an engine is installed on a vessel. We are also proposing an onboard measurement provision that would apply to engines with adjustable parameters or add-on emission control devices. Manufacturers of these engines would be required to equip the engine with an onboard measurement device. The owner of a vessel with such an engine would have to perform an onboard measurement when the vessel approaches within 175 nautical miles (200 statutory miles) of the U.S. coastline from the open sea or when it adjusts an engine parameter within that distance. The results of this onboard measurement will demonstrate that the engine is in compliance with the relevant standards when it is operated in an area that affects U.S. air quality.

What are the expected health and environmental benefits of the proposed standards?

Engine manufacturers are already producing engines that achieve the Tier 1 standards because the internationally equivalent standards apply to engines installed on ships constructed on or after January 1, 2000. We do not expect additional emission reductions from adopting the proposed Tier 1 standards. A second tier of NO_x limits, if adopted, is expected to reduce national inventories of NO_x emissions from these engines by about 11 percent by 2030. Applying such a second tier of standards to engines on foreign flag vessels could increase the 2030 NO_x emission reductions from Category 3 marine diesel engines to 26 percent.

What are the expected costs of the proposed program?

The costs of the proposed Tier 1 standards are negligible and reflect certification and compliance costs only. We do not anticipate that there will be any engineering or design costs associated with the Tier 1 standards because manufacturers are already certifying engines to the Annex VI standards through our voluntary certification program.

The estimated cost to industry of complying with the Tier 2 standards being considered is about \$115,000 per engine, with an additional estimated cost of about \$5,000 annually to maintain the equipment. This represents a 7 percent increase in the total engine cost and about 0.1 percent increase in the total vessel cost. The estimated cost-per-ton for the Tier 2 standards would be about \$145 per ton of NOx emissions.

Public Participation Opportunities

The proposal and related documents are available at www.epa.gov/otaq/marine.htm. We welcome your comments on this proposal. For instructions on submitting written comments, please see the *Federal Register* notice. You may submit written comments until July 16, 2002. Please refer to Docket No. A-2001-11. The address for submitting written comments is: Margaret Borushko (Docket No. A-2001-11), U. S. Environmental Protection Agency, Office of Transportation and Air Quality, 2000 Traverwood Drive, Ann Arbor, MI 48105. You may also submit comments by email to c3marine@epa.gov.

We will hold a public hearing on June 13, 2002, at the Hyatt Regency Long Beach, California. Detailed information about the hearings will be published in the *Federal Register* and at www.epa.gov/otaq/marine.htm.

For More Information

You can access documents on marine diesel engines electronically on the OTAQ Web site given above, or by contacting the OTAQ library at:

U.S. Environmental Protection Agency
Office of Transportation and Air Quality Library
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