



# Regulatory Announcement

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## Emission Standards Adopted for New Marine Diesel Engines

*The Environmental Protection Agency (EPA) is adopting emission standards for new marine diesel engines that will be installed on vessels flagged or registered in the United States. The near-term, Tier 1 standards in this rule are equivalent to the internationally negotiated emission limits for oxides of nitrogen (NO<sub>x</sub>). These standards will go into effect in 2004 and are based on readily available emission-control technology. We will also undertake another rulemaking in a few years to consider a second tier of more stringent standards. This fact sheet contains an overview of the new standards and information about the future rulemaking.*

### Which marine diesel engines are covered by the new standards?

The Tier 1 standards apply to marine diesel engines manufactured January 1, 2004 or later if they will be installed on vessels flagged or registered in the United States<sup>1</sup>. The Tier 1 standards will apply to older engines only if (1) they are converted from land-based to marine engines or (2) they are installed on a new vessel. More specifically, the engines that will be required to meet the standards are:

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<sup>1</sup> This final rule applies to "new" marine diesel engines and to "new" marine vessels that include marine diesel engines. In general, a "new" marine diesel engine or a "new" marine vessel is one that is produced for sale in the United States or that is imported into the United States. The emission standards established in this final rule, therefore, will typically apply to marine diesel engines that are installed on vessels flagged or registered in the United States.

- **Marine diesel engines with per-cylinder displacement at or above 30 liters**

These engines are also known as Category 3 marine diesel engines. They range in size from about 2,500 to 70,000 kilowatts (3,000 to 100,000 horsepower). These are very large marine diesel engines used for propulsion power on ocean-going vessels such as container ships, oil tankers, bulk carriers, and cruise ships.

- **Marine diesel engines with per-cylinder displacement between 2.5 and 30 liters**

These engines are also known as Category 1 and Category 2 marine diesel engines. They range in size from about 500 to 8,000 kilowatts (700 to 11,000 horsepower). These engines are used to provide propulsion power on many kinds of vessels including tugboats, pushboats, supply vessels, fishing vessels, and other commercial vessels in and around U.S. ports. They are also used as stand-alone generators for auxiliary electrical power on many types of vessels.

In 1999, we adopted emission standards for commercial marine diesel engines smaller than 30 liters per cylinder (Category 1 and Category 2). Under that program, the internationally negotiated NO<sub>x</sub> standards would be voluntary until EPA's more stringent Tier 2 standards begin to apply. EPA's Tier 2 standards are more stringent than the MARPOL Annex VI<sup>2</sup> NO<sub>x</sub> standards. EPA's Tier 2 standards also include limits for particulate matter, carbon monoxide, and hydrocarbon emissions. Information about these standards can be found in our fact sheet entitled, "Emission Standards for New Commercial Marine Diesel Engines" (EPA420-F-99-043, November 1999) and on our Web site at [www.epa.gov/otaq/marine.htm](http://www.epa.gov/otaq/marine.htm).

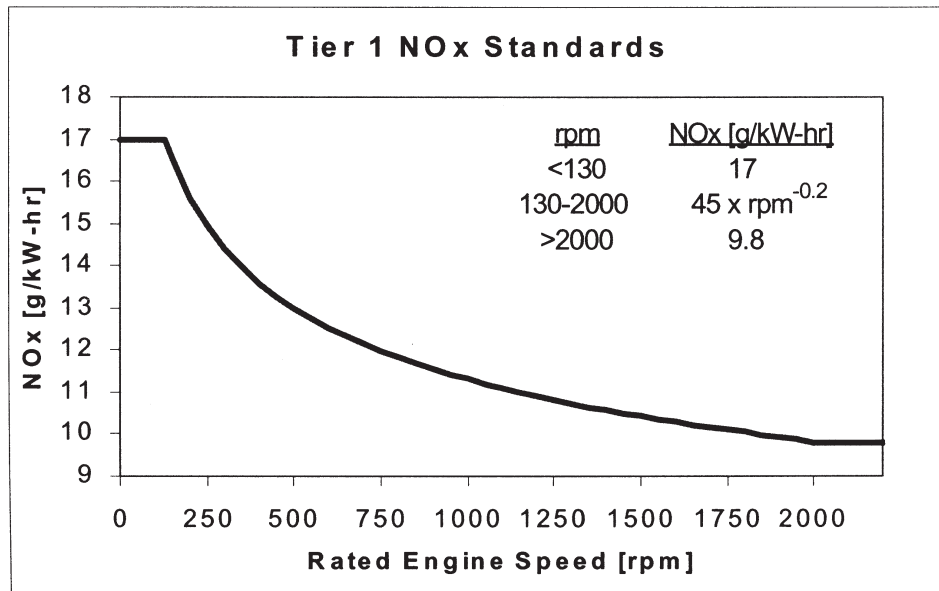
## **What are the new Tier 1 standards?**

The near-term Tier 1 standards we are adopting are equivalent to the internationally negotiated NO<sub>x</sub> limits adopted by the International Maritime Organization (IMO) in MARPOL Annex VI. These Tier 1 standards will be enforceable on U.S. vessels with engines manufactured January 1, 2004 or later. These standards were voluntary for Category 1

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<sup>2</sup> MARPOL is the International Convention on the Prevention of Pollution from Ships, 1973, as Modified by the Protocol of 1978 Relating Thereto. You can obtain more information about this Annex and the associated NO<sub>x</sub> Technical Code in Docket A-97-50, Document II-B-01. Copies of updated versions can be obtained from the International Maritime Organization ([www.imo.org](http://www.imo.org)).

and Category 2 marine diesel engines under our 1999 rule; they are now mandatory for those as well as Category 3 marine diesel engines. As shown in the figure, the NOx standard varies from 9.8 to 17.0 grams per kilowatt-hour (g/kW-hr), depending on an engine's maximum operating speed.



These near-term standards are achievable with less than one year of lead time because manufacturers are already certifying their engines to the equivalent international standards under our program for Voluntary Statements of Compliance. These near-term standards are being achieved through the application of currently available technology, including optimized turbocharging, higher compression ratios, and optimized fuel injection. Engines meeting the Tier 1 standards have emission levels about 20 percent lower than uncontrolled levels.

The Tier 1 standards will continue to apply to Category 3 marine diesel engines until we adopt more stringent standards in a future rulemaking. The Tier 1 standards will continue to apply to Category 1 and Category 2 marine diesel engines until 2007, when the more stringent Tier 2 standards we adopted in 1999 go into effect.

## **Why is EPA adopting the Tier 1 standards if they are the same as the international limits?**

The international standards apply to engines installed on vessels constructed on or after January 1, 2000, but they are not yet enforceable. The MARPOL Annex VI NO<sub>x</sub> limits will go into force twelve months after the Annex has been ratified by 15 countries representing at least 50 percent of the world merchant shipping tonnage. Adopting the international NO<sub>x</sub> limits in this rule makes them enforceable for engines on U.S. vessels under U.S. law.

As of January 2003, more than four years after it was adopted, the Annex has been ratified by six countries representing about 26 percent of the world's merchant shipping.<sup>3</sup> We expect that it will be ratified by several other countries, including the United States, and will go into effect in the next few years.

## **What are EPA's plans for the Tier 2 standards for Category 3 marine diesel engines?**

This final rule commits us to adopt technology-forcing Tier 2 standards for Category 3 marine diesel engines by April 2007. We will consider the availability of advanced technologies such as those used in other diesel engine applications as well as water emulsification and selective catalytic reduction. Engine manufacturers are already developing ways to apply these technologies to marine diesel engines. While there is a certain amount of information available about these advanced technologies now, there are several outstanding technical issues concerning their widespread commercial use, including the impacts of fuel sulfur on emissions, emissions at low engine loads, and particulate matter emissions. Adopting the standards at a later date will allow us to obtain important additional information on the use of these advanced technologies that we expect to become available over the next few years. This will also allow us to pursue further negotiations in the international arena to achieve more stringent global emission standards for marine diesel engines.

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<sup>3</sup> The countries that have ratified Annex VI are Sweden, Norway, Bahamas, Singapore, Marshall Islands, and Liberia. Information about Annex VI ratification can be found at [www.imo.org](http://www.imo.org) (look under Conventions, Status of Conventions - Complete List).

## **Is EPA adopting standards for particulate matter from Category 3 engines?**

We are not adopting emission standards for particulate matter (PM) from Category 3 engines in this final rule. The majority of PM emissions from large marine diesel engines comes directly from the high concentration of sulfur in the residual fuel they use, so the simplest way to reduce these emissions is by removing sulfur from the fuel. Annex VI provides a mechanism to control the sulfur content of fuels used by vessels that operate in specially designated SO<sub>x</sub> Emission Control Areas (SECAs). After the Annex goes into force, ships operating in these designated areas must use marine fuel with a sulfur content below 15,000 ppm or aftertreatment technology to achieve equivalent emission reductions (for comparison, sulfur levels in marine residual fuels may be as high as 45,000 ppm). We intend to investigate this special designation for one or more areas in the United States. We will also reconsider this issue in our future rulemaking.

## **Are the testing and certification requirements similar to the international program?**

The certification and testing requirements we are adopting for Category 3 engines are similar, but not identical to the provisions contained in Annex VI and the associated NO<sub>x</sub> Technical Code. The differences between the two programs are intended to ensure that test data be representative of actual in-use conditions and that manufacturers demonstrate that the emission controls will be durable for the full useful life of the engine. We specify that this useful life for Category 3 engines is three years, based on the time that engines operate before being rebuilt for the first time. To allow manufacturers time to incorporate these changes in their testing and certification procedures, we are adopting a provision that will allow manufacturers to certify their engines with EPA by using the international procedures on an interim basis, after which they must use the procedures in this final rule.

For Category 1 and Category 2 engines, we specify certification and testing requirements based on the requirements we adopted for these engines when we set the Tier 2 standards in 1999. Similar to the provisions for Category 3 engines, we allow manufacturers to certify their engines using the international procedures until the Tier 2 standards apply.

## **What is a Statement of Voluntary Compliance?**

As noted above, manufacturers are already producing engines that meet the Annex VI standards. EPA issues Statements of Voluntary Compliance for engines that meet the requirements of Annex VI using the procedures in the NOx Technical Code. This certification process addresses the need for manufacturers to sell compliant engines before the Annex goes into force. An EPA-issued Statement of Voluntary Compliance is similar to an EPA-issued Certificate of Conformity, which we issue for engines that meet the emission standards and other requirements in 40 CFR part 94. We expect that engine manufacturers will be able to apply for both of these documents in a single application.

For more information about our voluntary certification program, see “Guidance for Certifying to MARPOL Annex VI,” VPCD-99-02. This letter is available on our Web site at: [www.epa.gov/otaq/regs/nonroad/marine/ci/imolettr.pdf](http://www.epa.gov/otaq/regs/nonroad/marine/ci/imolettr.pdf).

## **How will EPA’s future rule interface with international action?**

As explained above, we are making a commitment to develop more stringent standards under the Clean Air Act for marine diesel engines used on U.S. vessels. The Act requires us to adopt standards that reflect the greatest degree of emission reductions achievable through the application of technology that will be available, taking into consideration the availability and costs of the technology, and noise, energy, and safety factors. We will also consider whether we have the discretion under the Clean Air Act to apply any second tier of standards to engines on foreign vessels that enter U.S. ports.

Most ocean-going vessels that come to the United States are flagged in other countries and are subject to the international standards. The United States will be participating in discussions under the International Maritime Organization to advocate a new set of more stringent emission standards for marine diesel engines that would apply to engines on both U.S. and foreign vessels. These discussions are expected to begin in the next few years. The schedule for our future rulemaking will allow us to take into account progress in the international arena toward more stringent emission standards for marine diesel engines.

## **Will EPA consider more stringent standards for Category 1 and Category 2 marine diesel engines in the future rule?**

As part of our future rule, we also intend to consider more stringent standards for Category 1 and Category 2 marine diesel engines. We proposed Tier 3 standards for these engines in 1998 but did not finalize them in 1999 due to concerns about the emission-control technology necessary for greater reductions. We expect that additional information will be available soon that will help us determine if the more advanced technologies that will be applied to the land-based counterparts of these engines can be used on marine diesel engines.

## **Where Can I Get More Information?**

You can access documents on marine diesel engines on the Office of Transportation and Air Quality Web site at:

[www.epa.gov/otaq/marine.htm](http://www.epa.gov/otaq/marine.htm)

You can also contact us at:

U.S. Environmental Protection Agency  
Assessment and Standards Division  
2000 Traverwood Drive  
Ann Arbor, MI 48105  
voice-mail: (734) 214-4636  
e-mail: [asinfo@epa.gov](mailto:asinfo@epa.gov)

You can access documents related to MARPOL Annex VI on the International Maritime Organization Web site at: [www.imo.org](http://www.imo.org)