

## EPA Proposal for More Stringent Emissions Standards for Locomotives and Marine Compression-Ignition Engines

The U.S. Environmental Protection Agency (EPA) is proposing more stringent exhaust emission standards for locomotives and marine diesel engines. The proposal would significantly reduce harmful emissions of diesel particulate matter (PM) and nitrogen oxide (NO<sub>x</sub>) emissions from these engines through a three-part program: (1) tightening emission standards for existing locomotives when they are remanufactured, (2) setting near-term engine-out emission standards, referred to as Tier 3 standards, for newly-built locomotives and marine diesel engines; and (3) setting longer-term standards, referred to as Tier 4 standards, for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency aftertreatment technology. EPA is also proposing provisions to eliminate emissions from unnecessary locomotive idling and is asking for comment on a concept to reduce emissions from existing marine diesel engines when they are remanufactured. This proposal is part of EPA's ongoing National Clean Diesel Campaign (NCDC) to reduce harmful emissions from diesel engines of all types.

### Background

Existing EPA regulations in 40 CFR parts 92 and 94 include standards for emissions of PM, NO<sub>x</sub>, HC and CO from locomotive and marine compression-ignition engines (also called diesel engines). These standards rely on engine-based technologies to reduce emissions. The opportunity to gain large additional public health benefits, as well as the similarities between these engines and highway diesel and nonroad

engines, have led us to consider additional emission controls based on the high-efficiency aftertreatment technologies that will soon be in use by highway and nonroad engines.

## Need to Reduce Locomotive and Marine Diesel

### Emissions

Locomotive and marine diesel engines contribute significantly to air pollution in many of our nation's cities and towns. In the coming decades, these engines are expected to account for an even greater share of overall emissions as other emission control programs take effects for cars, trucks, and other nonroad emissions sources. EPA estimates that, without the emission reductions from today's proposal, by 2030 locomotive and marine diesel engines would contribute more than 65 percent of national mobile source diesel PM<sub>2.5</sub> emissions and 35 percent of national mobile source NO<sub>x</sub> emissions, a key precursor to ozone and secondary PM formation.

Recent air quality data show that about 157 million people live in areas that violate air quality standards for ground-level ozone, also called smog and about 88 million people live in areas that violate air quality standards from PM. These pollutants contribute to serious public health problems that include premature mortality, aggravation of respiratory and cardiovascular disease, aggravation of existing asthma, acute respiratory symptoms and chronic bronchitis. EPA believes that diesel exhaust is likely to be carcinogenic to humans by inhalation. Children, people with heart and lung diseases, and the elderly are thought to be most at risk.

Locomotive and marine diesel emissions reductions are expected to benefit those who live, work, or recreate in and along our nation's coastal areas, rivers, ports, and rail lines. Such reductions are expected to have beneficial impacts on visibility impairment and regional haze, as well as reducing crop damage and acid rain.

### Description of Engines Covered

The proposed requirements would cover all locomotives and many marine diesel engines already subject to EPA emission standards, as follows:

- **Locomotives:** With limited exceptions, the regulations would apply to all line-haul, passenger, and switch locomotives that operate extensively within the United States, including newly manufactured locomotives and remanufactured locomotives that were originally manufactured after 1972. The primary exception is that the new remanufacturing standards would not apply to the existing fleets of locomotives owned by very small railroads.
- **Marine Diesel Engines:** The regulations would apply to newly-built marine diesel engines with displacements less than 30 liters per cylinder installed

on vessels flagged or registered in the United States. These are commonly referred to as marine diesel engines and are divided into three categories for the purposes of EPA's standards. Category 1 are engines above 50 horsepower (hp) and up to 5 liters per cylinder displacement. Category 2 are engines from 5 to 30 liters per cylinder. Category 3 are engines at or above 30 liters per cylinder. EPA is proposing to change the definition of Category 1 and Category 2 engines to reflect a 7 liter per cylinder cut-off.

Marine Diesel engines are used in commercial, recreation, and auxiliary power applications. Commercial propulsion applications range from tug boats to Great Lakes freighters. Recreational propulsion applications range from sailboats to super-yachts. EPA is also requesting comments on whether the Agency should tighten emission standards for certain existing marine diesel engines when they are remanufactured. Marine diesel engines at or above 30 liters per cylinder displacement are not included in this proposal; these engines, which are typically used for propulsion on ocean-going vessels, will be addressed in a separate EPA rulemaking.

## Exhaust Emissions Standards

The proposal consists of a three-part emission control.

First, EPA is proposing to adopt more stringent standards for existing locomotives when they are remanufactured. These standards would take effect as soon as certified remanufacture systems are available (as early as 2008), but no later than 2010 (2013 for Tier 2 locomotives). EPA is also requesting comment on similar requirements for certain existing marine diesel engines when they are remanufactured.

Second, EPA is proposing near-term emission standards, referred to as Tier 3 standards, for newly-built locomotive and marine engines. These standards would reflect the application of technologies to reduce engine-out PM and NO<sub>x</sub> emissions and would phase in starting in 2009.

Third, EPA is proposing long-term emissions standards, referred to as Tier 4, for newly-built locomotives and marine diesel engines. These standards are based on the application of high-efficiency catalytic aftertreatment technology and would phase in beginning in 2014 for marine diesel engines and 2015 for locomotives. These standards are enabled by the availability of clean diesel fuel with sulfur content capped at 15 parts per million, which will be available beginning by 2012. These marine Tier 4 engine standards would apply only to commercial marine diesel engines above 800 hp and recreational marine diesel engines above 2,000 hp.

The proposal would result in PM reductions of about 90 percent and NO<sub>x</sub> reductions of about 80 percent from engines meeting these standards, compared to engines meeting the current standards. The proposed standards would also yield sizeable reductions in emissions of HC, CO, and other air toxics.

## Program Costs

EPA estimates the annual cost of complying with the proposed program to be about \$600 million in 2030. The average price in 2030 of a locomotive is expected to increase by less than three percent (about \$49,000 per unit) as a result of the proposed standards. In the marine markets, the expected impacts in 2030 are different for engines above and below 800 hp. Increases in engine and vessel prices for commercial engines below 800 hp and recreational engines are expected to be small (less than one percent). The average price of a commercial marine diesel engine above 800 hp is expected to increase by about 8.5 percent for Category 1 engines and about 19 percent for Category 2 engines. The average price of a marine vessel using these larger engines is expected to increase much less, about 1 percent for vessels using Category 1 engines above 800 hp (about \$16,000) and 3.6 percent for vessels using Category 2 engines above 800 hp (about \$142,000). The expected impacts on prices in the locomotive and marine transportation service market would be less than one percent.

## Program Benefits

These proposed standards would result in substantial benefits to public health and welfare and to the environment. EPA estimates that by 2030 this comprehensive emission control program would reduce annual emissions of NO<sub>x</sub> and PM by 765,000 and 28,000 tons, respectively, and the magnitude of these reductions would continue to grow well beyond 2030. EPA estimates that the monetized health benefits of this rule in 2030 would be approximately \$12 billion. The value of the benefits would be much greater than the projected program cost of \$600 million per year. By 2030, the rule would annually prevent 1,500 premature mortalities; over 1,100 hospitalizations; 170,000 work days lost; and 1,000,000 minor restricted-activity days and other quantifiable benefits.

Figure 1 Projected NOx Emissions (tons per year with and without the Proposed New Controls

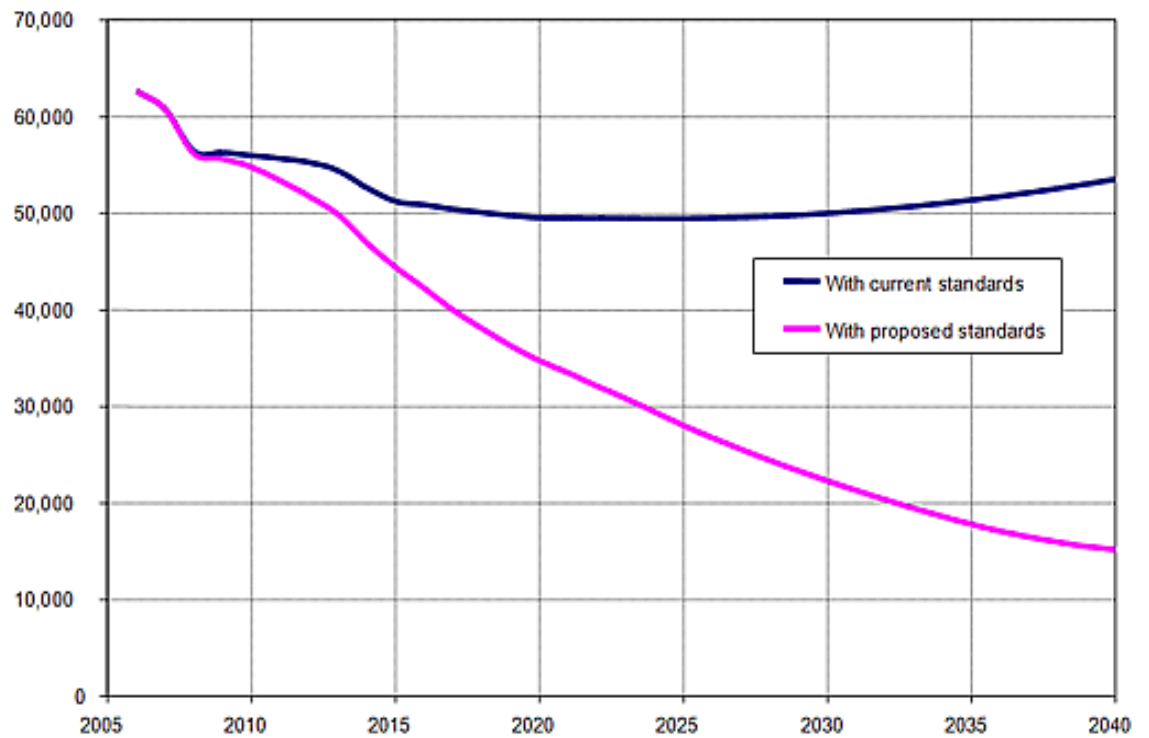
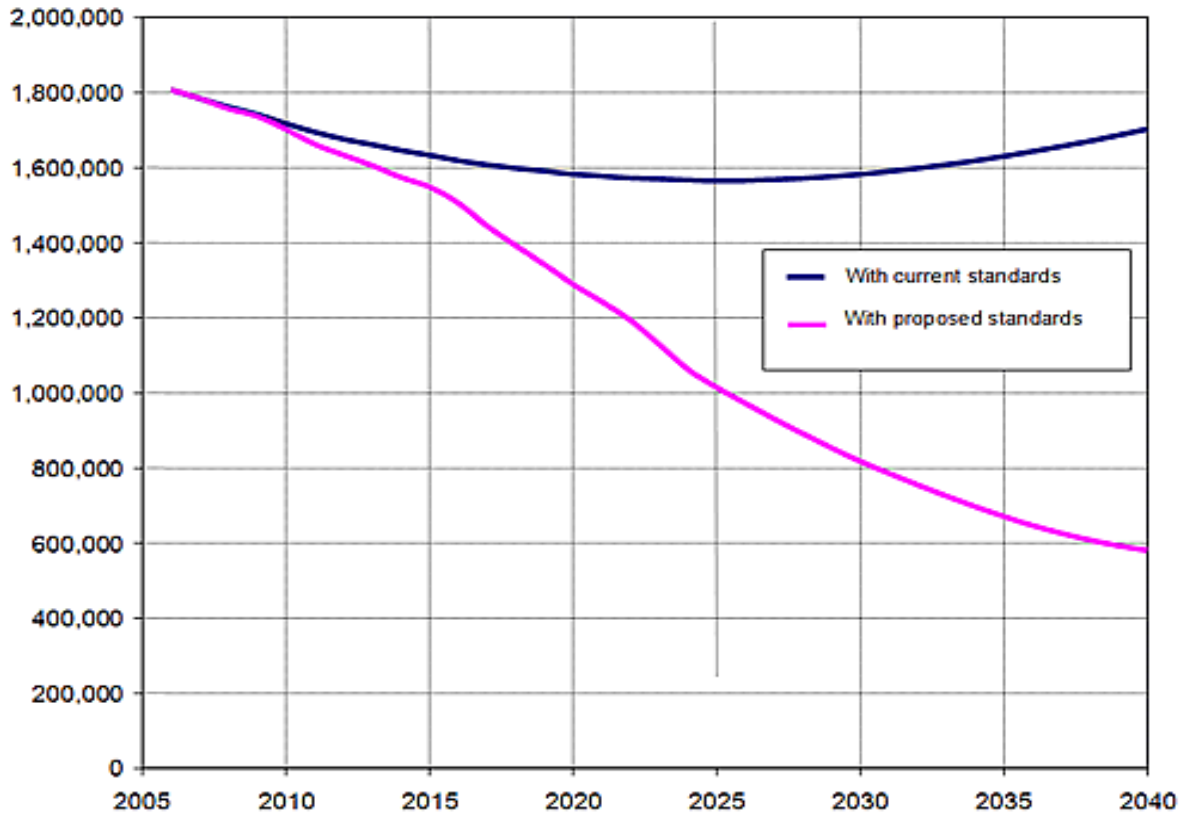


Figure 2 Projected PM2.5 Emissions (tons per year) with and without the Proposed New Controls

## Public Participation Opportunities

EPA welcomes your comments on this rule. Comments will be accepted for 90 days beginning when this proposal is published in the Federal Register. All comments should be identified by Docket ID No. EPA-HQ-OAR-2003-0190 and submitted by one of the following methods:

Internet: [www.regulations.gov](http://www.regulations.gov)

E-mail: [A-and-R-Docket@epa.gov](mailto:A-and-R-Docket@epa.gov)

Mail:

Environmental Protection Agency  
Air and Radiation Docket and Information Center (6102T)  
1200 Pennsylvania Avenue NW  
Washington, DC 20460

Hand Delivery:

EPA West building  
EPA Docket Center (Room 3340)  
1301 Constitution Avenue NW  
Washington, DC

A public hearing will also be held in Seattle, Washington, and Chicago, Illinois, after publication of the proposed rule in the **Federal Register**. Additional information about the hearing will be printed in the **Federal Register**.

## For More Information

You can access the rule and related documents on EPA's Office of Transportation and Air Quality (OTAQ) Web site at:

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

For more information on this rule, please contact the Assessment and Standards Division information line at:

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