

Regulatory Announcement

Clean Air Nonroad Diesel Rule

On May 11, 2004, the U.S. Environmental Protection Agency (EPA) announced a comprehensive rule to reduce emissions from nonroad diesel engines by integrating engine and fuel controls as a system to gain the greatest emission reductions. Engine manufacturers will produce engines with advanced emission-control technologies similar to those upcoming for highway trucks and buses. Exhaust emissions from these engines will decrease by more than 90 percent.

Closely linked to these engine provisions are new fuel requirements that will decrease the allowable levels of sulfur in fuel used in nonroad diesel engines, locomotives, and marine vessels by more than 99 percent. These fuel improvements will create immediate and significant environmental and public health benefits and will enable the use of new, high-efficiency emission-control devices on nonroad engines. At the same time, the Agency is taking the first step toward proposing more stringent emission standards for engines used in locomotives and marine vessels.

By greatly reducing diesel emissions, this rule will result in large benefits to public health that will be even greater than EPA projected at the time the rule was proposed. These benefits include about 12,000 fewer premature deaths and hundreds of thousands fewer incidences of respiratory problems. The overall benefits of the program in dollars significantly outweigh the costs by a factor of about 40 to 1.

This rule culminates a multi-year collaborative process to reduce nonroad diesel emissions. EPA worked closely with stakeholders from industry, state and local governments, environmental and public health organizations, and others in the design of this program.

The Need to Reduce Emissions from Nonroad Diesel Engines

Nonroad diesel engines contribute greatly to air pollution in many of our nation's cities and towns. Nonroad engines currently meet relatively modest emission requirements and therefore continue to emit large amounts of nitrogen oxides (NO_x) and particulate matter (PM), both of which contribute to serious public health problems. Nonroad diesel engines that are affected by the new standards currently account for about 47 percent of diesel PM emissions and about 25 percent of total NO_x emissions from mobile sources nationwide. These proportions are even higher in some urban areas.

Health Effects

Ozone can aggravate asthma and other respiratory diseases, leading to more asthma attacks, use of additional medication, and more severe symptoms that require a doctor's attention, more visits to the emergency room, and increased hospitalizations. Ozone can inflame and damage the lining of the lungs, which may lead to permanent changes in lung tissue, irreversible reductions in lung function if the inflammation occurs repeatedly over a long time period and may lead to a lower quality of life. Children, people with heart and lung disease, and the elderly are most at risk.

Fine particles (PM 2.5) have been associated with an increased risk of premature mortality, hospital admissions for heart and lung disease, and increased respiratory symptoms. Long-term exposure to diesel exhaust is likely to pose a lung cancer hazard. In addition, PM, NO_x, and ozone adversely affect the environment in various ways including visibility impairment, crop damage, and acid rain.

Description of Nonroad Engines Covered by this Final Rule

The new emission standards apply to diesel engines used in most construction, agricultural, industrial, and airport equipment. The standards will take effect for new engines beginning in 2008 and be fully phased in for most engines by 2014. Larger mobile engines (greater than 750 horsepower) have one year of additional flexibility to meet their emission standards.

These emission standards do not apply to diesel engines used in locomotives and marine vessels. However, fuel requirements for these categories are covered in this rule. The Agency is concurrently issuing an [Advance Notice of Proposed Rulemaking](#) announcing the intent to propose more stringent emission standards for engines used in locomotives and marine vessels.

Exhaust Emission Standards

This rule sets emission standards for different sizes of nonroad engines. These standards are similar in stringency to the standards adopted for 2007 and later diesel-powered trucks and buses. The rule also includes new provisions to help ensure that emission-control systems perform as well when operating in actual use as they do in the laboratory. The standards are phased-in over several years to provide adequate lead time to engine and equipment manufacturers. Table 1 shows the new emissions standards.

Table 1
Final Emission Standards in grams per horsepower-hour (g/hp-hr)

Rated Power	First Year that Standards Apply	PM	NOx
hp < 25	2008	0.30	-
25 ≤ hp < 75	2013	0.02	3.5*
75 ≤ hp < 175	2012-2013	0.01	0.30
175 ≤ hp < 750	2011-2013	0.01	0.30
hp ≥ 750	2011-2014 2015	0.075 0.02/0.03**	2.6/0.50† 0.50††

* The 3.5 g/hp-hr standard includes both NOx and nonmethane hydrocarbons.

† The 0.50 g/hp-hr standard applies to gensets over 1200 hp.

** The 0.02 g/hp-hr standard applies to gensets; the 0.03 g/hp-hr standard applies to other engines.

†† Applies to all gensets only.

Nonroad Diesel Fuel

Just as lead was phased out of gasoline to prevent damage to catalytic converters, decreasing sulfur levels in nonroad diesel fuel will prevent damage to the emission-control systems. In addition, reducing sulfur levels will provide immediate public health benefits by reducing particulate matter from engines in the existing fleet of nonroad equipment, while reducing engine maintenance cost. This rule will reduce current sulfur levels from about 3,000 parts per million (ppm) to 15 ppm when fully implemented (a reduction of greater than 99 percent).

This rule will reduce nonroad diesel fuel sulfur levels in two steps. First, starting in 2007, fuel sulfur levels in nonroad diesel fuel will be limited to a maximum of 500 ppm, the same as for current highway diesel fuel. This limit also covers fuels used in locomotive and marine applications (though not to the marine residual fuel used by very large engines on ocean-going vessels).

Second, starting in 2010, fuel sulfur levels in most nonroad diesel fuel will be reduced to 15 ppm. This ultra-low sulfur fuel will create immediate public health benefits and will make it possible for engine manufacturers to use advanced emission-control systems that will dramatically reduce both PM and NOx emissions. In the case of locomotive and marine diesel fuel, this second step will occur in 2012.

Estimated Costs

The cost of producing 15 ppm sulfur for this program is expected to total seven cents per gallon. Because the use of ultra-low sulfur fuel will significantly reduce engine maintenance expenses, we estimate that this net cost will average about four cents per gallon.

The estimated costs for a nonroad equipment manufacturer to comply with this program vary depending on size and complexity of the equipment. As an example, we estimate that for a typical 175-horsepower bulldozer, the modifications will cost approximately \$2,600, compared to the overall price of such a bulldozer of approximately \$240,000. The anticipated costs for most categories of nonroad diesel equipment are in the range of 1-3 percent of the total purchase price.

To reduce the economic impact of meeting new emission standards and requirements for low sulfur fuels, the final rule includes a number of flexibility provisions that are primarily aimed at helping small engine manufacturers and refiners meet the requirements.

Benefits of the Program

Reducing NOx and PM emissions from nonroad diesel engines by more than 90 percent will provide a wide range of public health benefits.

Controlling these emissions will, by 2030, prevent every year about: 12,000 premature deaths, 8,900 hospitalizations, one million work days lost, 15,000 heart attacks, 6,000 children's asthma-related emergency room visits, 280,000 cases of respiratory problems in children, 200,000 cases of asthma symptoms in children, and 5.8 million days of restricted adult activity due to respiratory symptoms.

In dollars, the health benefits of this rule are estimated to be \$80 billion annually once essentially all older engines are replaced. Estimated costs for the engine and fuel requirements are many times less, amounting to about \$2 billion annually in that time frame. Thus, the cost-benefit ratio of this program at that time will be approximately 40-to-1.

For More Information

You can access the final rule and related documents on EPA's web site at:

www.epa.gov/nonroad-diesel

You can also contact EPA at:

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