



# Environmental Fact Sheet

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## Emission Standards for New Nonroad Engines

*The U.S. Environmental Protection Agency (EPA) is proposing emission standards for several types of currently unregulated nonroad engines and vehicles. These standards would apply only to newly manufactured products. The proposed standards would reduce the harmful health effects of ozone and carbon monoxide (CO) from these engines and vehicles. They would also help reduce acute exposure to CO and air toxics for persons who operate or who work with or near these engines, and address other environmental problems, such as visibility impairment in our national parks and other wilderness areas.*

### Which engines and vehicles would be covered?

At EPA, we are proposing new standards for emissions of oxides of nitrogen (NO<sub>x</sub>), hydrocarbons (HC), and carbon monoxide (CO) from several groups of previously unregulated nonroad engines and vehicles that cause or contribute to air pollution. The controls for these engines and vehicles have been combined into one proposal because these engines and vehicles share many common characteristics. Differences in their design and use led us to propose separate emission standards for each group.

- **Large Industrial Spark Ignition Engines:** Spark-ignition (SI) nonroad engines rated over 25 horsepower (19 kW) used in commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of other construction, farm, and industrial equipment.

- **Recreational Vehicles:** Spark-ignition nonroad engines used in off-highway motorcycles, all-terrain-vehicles (ATVs), and snowmobiles.
- **Diesel Marine Engines:** Diesel engines rated at or above 50 horsepower (37 kW) used in recreational boats.

We intended to include in this proposal new exhaust standards for highway motorcycles and evaporative standards for gasoline-powered boats. Proposals for these categories are not included in the deadline mandated by the courts, unlike the categories contained in this proposal. We will issue proposals for these remaining categories within the next few months. Interested parties will have opportunity to comment during the public review period when these additional standards are proposed.

### **Why is EPA regulating these engines and vehicles?**

The engines and vehicles covered by this proposal are significant sources of air pollution. They account for about 13 percent of mobile source hydrocarbon emissions, 6 percent of mobile source carbon monoxide emissions and 3 percent of mobile source oxides of nitrogen emissions. The proposed standards are expected to reduce CO emissions by 56 percent and HC+NO<sub>x</sub> emissions by nearly 80 percent from these sources when fully implemented.

The proposed standards continue the process of establishing nonroad standards as required by the Clean Air Act. We are required to study emissions from nonroad engines and vehicles and to set emissions standards if the level of pollutants from these sources cause or significantly contribute to air pollution and, more specifically, if the emissions of CO, NO<sub>x</sub> or volatile organic compounds contribute significantly to the formation of ozone and carbon monoxide in more than one area of the country currently not meeting ozone and carbon monoxide standards. We completed the Nonroad Engine and Vehicle Emission Study in 1991, and in 1994 determined that these sources contribute significantly to ozone or CO nonattainment. We have already set emission standards for most nonroad engines, including farm and construction equipment, locomotives, commercial marine, and lawnmowers.

## What are the Proposed Requirements?

The proposed requirements vary depending on the kind of engine or vehicle. In developing these requirements, we considered specific factors for each type. Among the factors considered were the environmental impacts, the number of hours each year that the engine is used, the need for high-performance vehicles, and the costs. The proposed requirements for each type of engine and vehicle are:

### **Large industrial spark- ignition equipment**

We are proposing a national program to control emissions of CO, NO<sub>x</sub> and HC from nonroad spark-ignition engines over 19 kW that are used in land-based applications (Large SI engines). These engines are used in a variety of industrial equipment, including forklifts, airport ground-service equipment, generators, and compressors. They account for approximately 3 percent of total mobile-source CO, NO<sub>x</sub> and HC emissions nationwide. When fully implemented, the proposed standards would result in an 85 percent reduction in NO<sub>x</sub>, 70 percent reduction in HC emissions and a 90 percent reduction in CO from new engines.

Many Large SI engines are modified automotive engines. While car and truck engines have seen extensive technological developments, Large SI engine designs have changed little during this time. Adopting basic automotive emission-control technologies – electronic fuel systems with three-way catalytic converters – allows for dramatic improvements to engine performance and fuel economy, while reducing CO, NO<sub>x</sub>, and HC emissions by about 90 percent.

The proposed near-term standards are based on similar requirements adopted by the California Air Resources Board in 1998. Further engine testing and a concern for off-cycle emissions led the Agency to propose several additional provisions for the long term, including:

- More stringent emission standards to more accurately reflect the in-use deterioration of emission controls
- Transient duty cycle and associated emission standards
- Field-testing procedures and emission standards
- Basic engine diagnostic requirements
- Measures to reduce evaporative emissions from gasoline-fueled equipment

Proposed Emission Standards for Large SI Engines (g/kW-hr)

| Model Year     | Testing Type                      | Emission standards |     | Alternate emission standards |    |
|----------------|-----------------------------------|--------------------|-----|------------------------------|----|
|                |                                   | HC+NO <sub>x</sub> | CO  | HC+NO <sub>x</sub>           | CO |
| 2004 - 2006    | Duty-cycle testing (steady-state) | 4.0                | 37  | —                            | —  |
| 2007 and later | Duty-cycle testing (transient)    | 3.4                | 3.4 | 1.3                          | 27 |
|                | Field-testing                     | 4.7                | 5.0 | 1.8                          | 41 |

**Nonroad recreational engines and vehicles**

These are spark-ignition nonroad engines used in off-highway motorcycles, all-terrain-vehicles (ATV), and snowmobiles. Emissions from these engines account for approximately 10 percent of HC and 3 percent of CO total mobile source emissions nationwide.

Recreational Vehicle Exhaust Emission Standards

| Vehicle                 | Model Year     | Emission standards           |               | Phase-in |
|-------------------------|----------------|------------------------------|---------------|----------|
|                         |                | HC<br>g/kW-hr                | CO<br>g/kW-hr |          |
| Snowmobiles             | 2006           | 100                          | 275           | 100%     |
|                         | 2010           | 75                           | 200           | 100%     |
|                         |                | HC+NO <sub>x</sub> *<br>g/km | CO*<br>g/km   |          |
| Off-highway Motorcycles | 2006           | 2.0                          | 25.0          | 50%      |
|                         | 2007 and later | 2.0                          | 25.0          | 100%     |
| ATVs                    | 2006           | 2.0                          | 25.0          | 50%      |
|                         | 2007 and 2008  | 2.0                          | 25.0          | 100%     |
|                         | 2009           | 1.0                          | 25.0          | 50%      |
|                         | 2010 and later | 1.0                          | 25.0          | 100%     |

\* The motorcycle and ATV g/km standards relate to a vehicle test rather than an engine test. Thus the g/km standards cannot be compared directly to the g/kW-hr standards for the other sectors. For example, an ATV emitting 2.0 g/km HC+NO<sub>x</sub> could emit as much 16 g/kW-hr when tested on an engine-basis.

## Recreational Vehicle Estimated Emission Reductions by 2020

| Vehicle                 | HC  | CO  |
|-------------------------|-----|-----|
| Snowmobiles             | 63% | 63% |
| Off-highway motorcycles | 90% | 38% |
| ATVs                    | 84% | 34% |

### Recreational marine diesel engines

These are marine diesel engines used on recreational boats. Emissions from recreational marine diesel engines account for approximately 0.5 percent of NO<sub>x</sub> emissions and 0.2 percent of PM emissions relative to total nationwide mobile-source emissions. When fully implemented, the proposed standards would result in a 41 percent reduction in HC+NO<sub>x</sub> and a 22 percent reduction in PM from new engines.

These engines vary greatly in size, but are generally produced by modifying land-based nonroad diesel engines. The recreational engines share many features with the counterpart commercial marine diesel engines, but are generally designed for higher power and greater performance.

### Proposed Recreational Marine Diesel Emission Limits and Implementation Dates

| Subcategory                       | Implementation Date | HC+NO <sub>x</sub><br>g/kW-hr | PM<br>g/kW-hr | CO<br>g/kW-hr |
|-----------------------------------|---------------------|-------------------------------|---------------|---------------|
| power ≥ 37 kW<br>0.5 ≤ disp < 0.9 | 2007                | 7.5                           | 0.40          | 5.0           |
| 0.9 ≤ disp < 1.2                  | 2006                | 7.2                           | 0.30          | 5.0           |
| 1.2 ≤ disp < 2.5                  | 2006                | 7.2                           | 0.20          | 5.0           |
| 2.5 ≤ disp                        | 2009                | 7.2                           | 0.20          | 5.0           |

## How Would the Standards Affect These Engines and Vehicles?

The proposed standards would require the application of existing gasoline or diesel engine technologies in varying degrees, depending on the type of engine. These technologies would include modified 2-stroke engine technology (e.g., recalibrating, clean carburetion, fuel system upgrades), changing from 2-stroke to 4-stroke engine technology, modified 4-stroke technology (e.g., recalibrating, fuel system upgrades), or improved diesel combustion and aftercooling.

## **Health and Environmental Benefits**

The engines and vehicles covered by this proposal are significant sources of air pollution. We estimate their contribution to total mobile-source emissions to be 13 percent for HC, 6 percent for CO, and 3 percent for NO<sub>x</sub>. When fully implemented, the proposed standards are expected to reduce CO emissions by more than 50 percent and HC+NO<sub>x</sub> emissions by nearly 80 percent from these sources.

When finalized, these standards would help avoid a range of adverse health effects associated with ambient ozone, CO, and PM levels, especially in terms of respiratory impairment and related illnesses. They will also help reduce acute exposure to CO, air toxics, and PM for persons who operate or who work with or near these engines. They will also help address other environmental problems, such as regional haze in our national parks and other Class I areas where recreational vehicles and marine engines are often used.

## **Costs**

The estimated costs of complying with the standards vary by engine group. Costs range from about \$50 to \$200 per engine for snowmobiles, less than \$100 for ATVs to about \$600 per engine for recreational marine diesel engines and Large SI engines. These costs would be offset in many cases by consumer savings from reduced fuel consumption and engine maintenance resulting from the application of more efficient technologies. We estimate that U.S. consumers would save more than \$400 million in fuel annually as a result of these emission-control technologies.

## **Public Participation Opportunities**

The proposal and related documents are available at [www.epa.gov/otaq](http://www.epa.gov/otaq). 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 December 19, 2001. Please refer to Docket No. A-2000-01. The address for submitting written comments is: Margaret Borushko (Docket No. A-2000-01), 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 [nranprm@epa.gov](mailto:nranprm@epa.gov).

Public hearings will be held near Washington, DC on October 24, 2001 and in Denver, CO on October 30, 2001. Detailed information about the hearings will be published in the *Federal Register* and at [www.epa.gov/otaq](http://www.epa.gov/otaq).