



Environmental Fact Sheet

Proposed Emission Standards For Locomotives

The Environmental Protection Agency (EPA) is proposing emission standards for oxides of nitrogen (NO_x), hydrocarbons (HC), carbon monoxide (CO), particulate matter (PM) and smoke for newly manufactured and remanufactured diesel-powered locomotives and locomotive engines, which have previously been unregulated. The proposed standards will achieve approximately a two-third reduction in NO_x emissions. This would be equivalent to removing over thirty million passenger cars from the road. HC and PM emissions will be reduced by 50 percent.

Overview of Rulemaking

This rulemaking is being proposed to achieve emissions reductions that will be needed by states to comply with the National Ambient Air Quality Standards (NAAQS) for ozone and PM. The proposed rule is expected to be finalized by the end of 1997 and take effect in 2000. Current unregulated locomotives are estimated to contribute almost 5 percent of the total nationwide emissions of NO_x, which is more than 10 percent of the nationwide mobile source NO_x emissions. This makes locomotives one of the largest remaining unregulated sources of NO_x emissions. Ultimately, when fully phased-in, EPA expects the new standards will achieve approximately a two-third reduction in NO_x emissions. Standards are also being proposed that would ultimately reduce locomotive HC and PM emissions in half. The regulations that are being proposed would affect railroads, locomotive manufacturers and locomotive remanufacturers.

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Health and Environmental Concerns

Emissions from diesel-powered locomotives, such as NO_x, HC, and PM, contribute to air pollution in both urban and rural areas, and have significant health and environmental effects. NO_x is a major component of smog and acid rain. NO_x emissions combine with HC in the atmosphere to form ground-level ozone, the primary constituent of smog. Ozone is a highly reactive pollutant that damages lung tissue, causes congestion, and reduces vital lung capacity, in addition to damaging vegetation. Acid rain damages buildings and crops, and degrades lakes and streams. NO_x also contributes to the formation of secondary PM. PM causes headaches, eye and nasal irritation, chest pain, and lung inflammation. Environmental impacts of PM include reduced visibility and deterioration of buildings.

What are the Main Components of the Proposed Rule?

Since locomotive emissions have not been regulated before, it was necessary for EPA to create a comprehensive program, including not only emission standards, but also test procedures and a full compliance program. In general terms, the overall program is similar to previously established programs for heavy-duty highway engines and other nonroad engines. One unique feature included for locomotives, however, is the regulation of the engine remanufacturing process, including the remanufacture of locomotives originally manufactured prior to the effective date of this rulemaking. Regulation of the remanufacturing process is critical because locomotives are generally remanufactured 5 to 10 times during their total service lives (typically 40 years or more). Standards that only applied to locomotives originally manufactured after the effective date of the rule would not achieve significant emissions reductions in the near term, as those locomotives slowly replaced the existing fleet.

Emission Standards

Three separate sets of emission standards are proposed, with applicability of the standards dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) are proposed to apply to locomotives and locomotive engines originally manufactured from 1973 through 1999, any time they are remanufactured in calendar year 2000 or later. The second set of standards (Tier I) apply to locomotives and locomotive engines originally manufactured from 2000 through 2004. These locomotives and locomotive engines would be required to meet the Tier I standards at the time of original manufacture and at each subsequent remanufacture. The final set of standards (Tier II) are proposed to apply to locomotives and locomotive engines originally manufactured in 2005 and later. Tier II locomotives and loco-

tive engines would be required to meet the applicable standards at the time of original manufacture and at each subsequent remanufacture. Electric locomotives, historic steam-powered locomotives, and locomotives originally manufactured before 1973 do not contribute significantly to the emissions problem, and thus, are not included in this rulemaking.

Production Line Testing

EPA is proposing a production line testing (PLT) program that would require manufacturers and, in some cases, remanufacturers of locomotives to perform production line testing of newly manufactured and remanufactured locomotives as they leave the point where the manufacture or remanufacture is completed. The PLT program for freshly manufactured units would be based on actual testing, while the PLT program for remanufactured units would be based on an audit of the remanufacture kit's installation, with EPA having the ability to require testing if in-use data indicates a possible problem with production.

In-Use Emissions Testing

A critical element in the success of the proposed locomotive program is ensuring that manufacturers and remanufacturers produce locomotives that continue to meet emission standards beyond certification and production stages, during actual operation and use. EPA is proposing to adopt an in-use compliance program with two distinct components. The first program would require the manufacturers and remanufacturers to test representative locomotives from all engine families using the full Federal Test Procedure (FTP). This testing would occur at about 75 percent of useful life. Actual repair in the event of a determination of noncompliance or recall action, however, would apply to all locomotives of that family, regardless of whether the locomotives have exceeded their useful lives. Second, EPA is proposing to require that Class I railroads annually test 10 percent of their locomotives which have met or exceeded their useful lives using a modified version of the FTP.

Emission Averaging Provisions

EPA is proposing averaging, banking and trading (ABT) provisions to allow manufacturers and remanufacturers the flexibility to meet overall emissions goals at the lowest cost, while allowing EPA to set emissions standards at levels more stringent than they would be if each and every engine family had to comply with the standards. ABT is also designed to encourage early introduction of cleaner engines, which would secure emissions benefits earlier than would otherwise be the case.

Preemption of State Programs

EPA is proposing regulations that would codify and clarify Clean Air Act preemption of certain state and local requirements relating to the control of emissions from new locomotives and new locomotive engines. This preemption was included in the Clean Air Act because of the inherent interstate

nature of the railroad industry. Moreover, EPA believes that a strong federal program that addresses manufacturing, remanufacturing and in-use compliance is the best way to achieve the necessary emissions reductions.

How Does the Proposed Rule Provide Flexibility to Industry?

- The proposed rule codifies the Clean Air Act's preemption of state and local emission requirements, which is intended to prevent inappropriate burdens on interstate commerce.
- The flexibility provided by ABT lowers the costs to manufacturers and makes it easier to meet the technological challenges posed by the new standards.
- EPA is also proposing to exempt the smallest railroads from compliance with the Tier 0 standards, with some restrictions.

How Much Will the Proposed Rule Cost?

Lifetime cost components consist of initial equipment costs; remanufacturing costs; fuel economy costs; and certification, production line and in-use testing costs. EPA estimates that the lifetime cost per locomotive will be approximately \$80,000 for the Tier 0 standards, \$118,000 for the Tier I standards and \$86,000 to \$266,000 for the Tier II standards (the estimated cost for Tier II locomotives drops from \$226,000 to \$86,000 after manufacturers recover their research and development costs). The average annual cost of this program is estimated to be \$76 million per year. This would be about 0.2 percent of the total freight revenue for railroads in 1995. The average cost-effectiveness of the proposed standards is expected to be about \$170 per ton of NO_x and PM.

What Are the Environmental Benefits?

The primary focus of this rulemaking is on reducing NO_x and PM emissions, although there are also reductions in HC and CO. NO_x emissions from locomotives will be reduced almost 60 percent by 2040, compared to 1990 baseline levels. This would be about 600,000 tons per year. Most of these reductions will come early in the program (e.g., 39 percent reduction by 2010), due to the standards that apply to pre-2000 locomotives when they

are remanufactured. In addition to the NOx benefits of the proposed rule, the proposal will provide some PM benefits through the Tier II standards. A PM reduction of 42 percent is expected by 2040, compared to 1994 baseline levels. This reduction is over 10,000 tons per year, and amounts to over one percent of national PM emissions from mobile sources.

What Opportunities Exist for Public Participation?

EPA desires full public participation in arriving at final rulemaking decisions. EPA solicits comments on all aspects of the proposal from all interested parties. Wherever applicable, full supporting data and detailed analyses should also be submitted to allow EPA to make maximum use of the comments. Commenters are especially encouraged to provide specific suggestions for changes to any aspects of the proposal that they believe need to be modified or improved. A public hearing will also be held approximately 30 days after publication of the proposed rule in the *Federal Register*.

For instructions on submitting written comments, please see the *Federal Register* notice. It is available from the EPA Air and Radiation Docket by calling 202-260-7548; please refer to Docket No. A-94-31. In addition, the proposed rule is available electronically via the EPA Internet server via the dial-up modem on the Technology Transfer Network (TTN), an electronic bulletin board system (BBS).

World Wide Web:<http://www.epa.gov/OMSWWW>

TTN BBS: 919-541-5384 (1200-1440 bps, no parity, 8 data bits, 1 stop bit); voice helpline 919-541-5384.

For More Information

For further information on the proposed rule, please write to:

U.S. Environmental Protection Agency
Engine Programs and Compliance Division
2565 Plymouth Road
Ann Arbor, MI 48105

or call: (313)668-4333



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Federal Preemption of State and Local Control of Locomotives

The Environmental Protection Agency (EPA) is proposing regulations to implement section 209(e) of the Clean Air Act (CAA), which prohibits certain state and local controls for locomotives. These regulations are being proposed in conjunction with new emission standards for locomotives and locomotive engines, which are being proposed under section 213 of the CAA.

Clean Air Act Preemption Requirements

In section 209(e) of the CAA, Congress preempted state and local governments from adopting or enforcing "any standard or other requirement relating to the control of emissions from ...new locomotives or new engines used in locomotives." (Given the nature of locomotive remanufacturing, EPA is defining "new locomotives and new engines used in locomotives" to include existing locomotives when they are remanufactured.) EPA is proposing regulations that would implement this preemption consistent with Congressional intent to prevent unreasonable burdens on interstate commerce.

Prohibited Controls

The proposed regulations would prohibit state and local governments from adopting or enforcing any controls that significantly affect a locomotive manufacturer's or remanufacturer's design. EPA also is proposing to define by regulation a period during which state and local governments would be

explicitly prohibited from adopting three categories of controls that EPA has determined would affect a manufacturer's or remanufacturer's design: 1) emission standards (and related requirements), 2) non-federal in-use testing programs, and 3) emission control retrofit requirements. This period would be equivalent to 1.25 times useful life, where useful life is the average period during which a locomotive is operated before it is remanufactured (typically about 6 years). Locomotives would also be required to be in compliance with the federal emission standards throughout the useful life.

Comparison to Other Mobile Sources

The preemption being proposed is based on the same principles applied to other mobile sources. Most significantly, this preemption is based on a U.S. District Court decision (*Allway Taxi Inc. v. City of New York*) that stated that state controls on emissions of non-new motor vehicles are preempted by the Clean Air Act if those controls have an effect on manufacturers of new motor vehicles. Since the Clean Air Act preemption provisions for nonroad vehicles and engines are similar to those for motor vehicles, EPA has consistently applied this principle to other nonroad sources, although the application of this principle varies somewhat from industry to industry. The proposed regulations for locomotives do differ significantly from previous regulations dealing with preemption in that they include a codification of the principle outlined in the Allway court case (i.e., the explicit preemption period for certain types of controls). This was done to provide more certainty to all parties involved, and because unique features of locomotives and railroads made it appropriate.

Environmental Impacts of Preemption

The proposed preemption regulations would not have any adverse impacts on the environment because of EPA's proposed aggressive control program that is designed to achieve the maximum possible environmental benefits. EPA is proposing emission standards that will apply both when a locomotive or locomotive engine is originally manufactured and each time that it is remanufactured. The new standards will achieve a two-third reduction in NOx emissions. Standards are also being proposed that will ultimately reduce locomotive hydrocarbon and particulate emissions in half. EPA is proposing an extensive compliance program, including in-use testing, to ensure that the projected emission reductions are achieved. Without preemption, on the other hand, there is more of a potential for some shift of freight traffic to more polluting forms of transportation that could occur if

the costs of rail transportation increased significantly due to a patchwork of state and local regulations. (For example, transport by rail causes about one-third of the pollution as transport by truck per ton-mile of freight.)

Benefits of a Strong Federal Program

Given the inherent interstate nature of the railroad industry, EPA believes that a strong federal program that addresses manufacturing, remanufacturing and in-use compliance can best achieve the necessary emissions reductions. This is especially true since many state governments lack the resources to control emissions from locomotives. Since EPA is proposing such a strong federal program, there would be little that any state could do to further reduce locomotive emissions. Also, a patchwork of state and local regulations would be inefficient, and could hinder EPA's ability to implement a uniform national control program.

For More Information

Information on the proposed rule for locomotive standards is available electronically via the EPA Internet server via the dial-up modem on the Technology Transfer Network (TTN), an electronic bulletin board system (BBS).

World Wide Web: <http://www.epa.gov/OMSWWW>

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Environmental Benefits of Proposed Emission Standards for Locomotives

The Environmental Protection Agency (EPA) is proposing emission standards for oxides of nitrogen (NO_x), hydrocarbons (HC), carbon monoxide (CO), particulate matter (PM) and smoke for newly manufactured and remanufactured locomotives and locomotive engines. The proposed standards will achieve approximately a two-third reduction in NO_x emissions and will reduce HC and PM emissions by half.

Overview of Rulemaking

EPA is proposing emission standards for locomotives that will provide significant emission reductions to help states comply with National Ambient Air Quality Standards (NAAQS) for ozone and PM. The proposed rule is expected to be finalized by the end of 1997 and take effect in 2000. Since locomotive emissions have not been regulated before, it was necessary for EPA to create a comprehensive program, including not only emission standards, but also test procedures and a full compliance program. Three separate sets of emission standards are proposed, with applicability of the standards dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) are proposed to apply to locomotives and locomotive engines originally manufactured from 1973 through 1999, any time they are remanufactured in calendar year 2000 or later. The second and third sets of standards (Tier I and Tier II) will apply to locomotives and locomotive engines originally manufactured on or after January 1, 2000 (Tier II stan-

dards will take effect on January 1, 2005). These locomotives and locomotive engines will also be required to meet the same standards at each subsequent remanufacture. The Agency is also proposing a rigorous emission testing program to make sure that locomotives comply with these standards for the life of the locomotive.

Health and Environmental Concerns

Most locomotives in the U.S. are powered by diesel engines. Thus locomotives have significant NO_x emissions, as well as HC and PM emissions, all of which have significant health and environmental effects. NO_x is a major component of smog and acid rain. NO_x emissions combine with HC in the atmosphere to form ground-level ozone, the primary constituent of smog. Ozone is a highly reactive pollutant that damages lung tissue, causes congestion, and reduces vital lung capacity, in addition to damaging vegetation. Acid rain damages buildings and crops, and degrades lakes and streams. NO_x also contributes to the formation of secondary PM. PM causes headaches, eye and nasal irritation, chest pain, and lung inflammation. Environmental impacts of PM include reduced visibility and deterioration of buildings.

Locomotive Emission Inventories

Locomotive NO_x emissions are estimated to represent about 4.7 percent of NO_x emissions from all mobile and stationary sources in the U.S. Locomotive PM and HC emissions are both estimated to represent less than one-quarter of one percent of total national emissions. Thus, the focus of the proposed regulation is on NO_x emission reductions. It should be noted that in some urban areas that have very high rail traffic, such as Chicago or El Paso, NO_x emissions can represent nearly one-tenth of the total NO_x inventory.

Current National Locomotive Emission Inventories

	Metric Tons Per Year	Percent of Total Inventory (All Sources)
NO _x	980,000	4.7
PM-10	24,000	0.1
HC	38,000	0.2

What Are the Environmental Benefits?

When fully phased-in, the proposed emission standards will reduce NO_x emissions from locomotives by nearly two-thirds, and HC and PM emissions by half. However, they will also achieve very significant emission reductions in the near term. These reductions, which are shown below, are being heavily relied upon by those areas that have very high rail traffic, as well as Southern California, which has moderately high rail traffic and very significant air quality needs. To put these national NO_x emission reductions into context, the 348,000 ton per year reduction expected in 2005 would be equivalent to removing about 20 million passenger cars from the road. In addition, NO_x emission reductions will also lead to reductions in ambient concentrations of secondary PM. It has been estimated that about 4 tons of nitrate particulate is formed from every 100 tons of NO_x emitted. Thus, the secondary PM reduction expected in 2005 is about 14,000 tons per year.

Projected National Emission Reductions (Metric Tons Per Year)

Year	2005	2010	2015	2020
NO _x	348,000	382,000	417,000	451,000
PM	300	1,700	3,200	4,700
HC	400	2,500	4,500	6,600
Secondary PM*	14,000	15,000	17,000	18,000

* Assumes 4 tons of nitrate particulate formed for each 100 tons of NO_x emitted.

Reductions from Existing Locomotive Fleet

The fact that so much of the NO_x emission reduction will come early in the program is due to the Tier 0 standards that apply to existing locomotives when they are remanufactured. These standards are a unique feature of this proposed regulation, and would represent the first time that EPA has regulated the remanufacturing of an existing fleet on such a large scale. Such regulation of the remanufacturing process is critical because locomotives are generally remanufactured five to ten times during their total service lives (typically 40 years or more). Standards that would only apply to locomotives originally manufactured after the effective date of the rule would not achieve significant emissions reductions until those future locomotives replaced a significant number locomotives in the existing fleet. For the first 13 years of the program, the majority of projected NO_x emission reductions will be the result of the Tier 0 emission standards that apply to existing locomotives.

Projected NO_x Emission Reductions From Locomotives Manufactured Before and After January 1, 2000 (Metric Tons Per Year)

Year	2005	2010	2015	2020
Tier 0 (Pre-2000 Locomotives)	275,000	234,000	194,000	153,000
Tier I & II (Later Locomotives)	73,000	148,000	223,000	298,000

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