Federal Register

Friday,
October 6, 2000

Part II

Environmental Protection Agency

40 CFR Parts 85 and 86

Emissions Control, Air Pollution From 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Light-Duty On-Board Diagnostics Requirements, Revision; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 85 and 86

[AMS–FRL–6846–4]

RIN 2060–AI12

Control of Emissions of Air Pollution from 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Revision of Light-Duty On-Board Diagnostics Requirements

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Today's action finalizes a major new program to reduce emissions from on-highway heavy-duty engines and vehicles. These reductions will provide for cleaner air and greater public health protection, primarily by reducing ozone pollution. This program is the first phase of a multi-phase strategy to reduce emissions from heavy-duty engines and vehicles.

A key element of this action is a reaffirmation of the technical and economic feasibility of the non-methane hydrocarbon plus nitrogen oxide ($NMHC+NO_X$) standard promulgated in October, 1997 for diesel heavy-duty engines. This previously-codified standard will therefore remain unchanged and effective starting with the 2004 model year for heavy-duty diesel engines. This standard represents about a 50 percent reduction in emissions of nitrogen oxides, as well as reductions in hydrocarbons, from diesel trucks and buses. Heavy-duty diesel engines and vehicles will also be subject to new test procedures and associated requirements beginning in the 2007 model year that will ensure that emission standards are met across a broad range of engine operating conditions.

In addition, this action puts in place new more stringent emission standards and related provisions for heavy-duty Otto-cycle (*e.g.,* gasoline-fueled) engines and vehicles, beginning in the 2005 model year or sooner under two optional programs finalized today. Vehicles in this category include large full size pick-up trucks and the largest cargo and passenger vans. Today's action does not affect vehicles classified as Medium-duty Passenger Vehicles (generally, large SUVs and vans), which are subject to the recently finalized Tier 2 program standards. For heavy-duty Otto-cycle engines and vehicles affected by today's action, emission standards for oxides of nitrogen and hydrocarbons are reduced by approximately 75 percent from current standards.

We are also finalizing requirements for on-board diagnostics systems for all heavy-duty vehicles and engines at or below 14,000 pounds gross vehicle weight rating (GVWR), as well as revising the on-board diagnostics requirements for diesel light-duty vehicles and trucks.

The requirements promulgated or reaffirmed in today's action will result in lower emissions of oxides of nitrogen and hydrocarbons, as well as lower particulate matter due to reductions in secondary particulate formation (secondary particulate matter is not emitted directly from the engine, but is formed when emissions of oxides of nitrogen react with ammonia in the atmosphere to produce ammonium nitrate particulates) and will assist states and regions facing ozone air quality problems that are causing a range of adverse health effects, particularly respiratory impairment and related illnesses. For example, we project a reduction in oxides of nitrogen emissions of 1,028,000 tons per year by 2010, the time frame when all states will have had to demonstrate compliance with air quality standards. In addition, the program will reduce the contribution of the on-highway heavy-duty category to other serious public health and environmental problems, including volatile organic compounds (VOC), secondary particulate matter (PM), and toxic air pollutants.

Furthermore, we project that the significant environmental benefits of this program would come at an average projected long-term cost increase of less than $400 per vehicle for heavy-duty diesel engines (less than approximately $800 in the near-term) and less than $300 per vehicle for heavy-duty gasoline vehicles and engines in both the long-term and near-term.

DATES: This rule is effective December 5, 2000. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of December 5, 2000.

ADDRESSES: All comments and materials relevant to today's action have been placed in Public Docket No. A–98–32 at the following address: U.S. Environmental Protection Agency (EPA), Air Docket (6102), Room M–1500, 401 M Street, S.W., Washington, D.C. 20460. EPA's Air Docket makes materials related to this rulemaking available for review at the above address (on the ground floor in Waterside Mall) from 8:00 a.m. to 5:30 p.m., Monday through Friday, except on government holidays. You can reach the Air Docket by telephone at (202) 260–7548 and by facsimile at (202) 260–4400. We may charge a reasonable fee for copying docket materials, as provided in 40 CFR Part 2.

FOR FURTHER INFORMATION CONTACT: Margaret Borushko, U.S. Environmental Protection Agency, Assessment and Standards Division, 2000 Traverwood Drive, Ann Arbor, MI, 48105–2498. Telephone (734) 214–4334; Fax (734) 214–4816; e-mail borushko.margaret@epa.gov.

SUPPLEMENTARY INFORMATION:

Regulated Entities

This regulation will affect you if you manufacture and sell new heavy-duty motor vehicles, new heavy-duty engines, or new diesel light-duty motor vehicles in the United States. The table below gives some examples of entities that may have to comply with the regulations. But because these are only examples, you should carefully examine these and existing regulations in 40 CFR part 86. If you have questions, call the person listed in the **FOR FURTHER INFORMATION CONTACT** section.

Category	Examples of regulated entities
Industry	Manufacturers of new heavy-duty motor vehicles and engines. Manufacturers of new diesel light-duty motor vehicles and engines.

Internet Access to Rulemaking Documents

Today's action is available electronically on the day of publication from the Internet Web site listed below. Electronic copies of this preamble and regulatory language as well as the Response to Comments document, the Regulatory Impact Analysis and other documents associated with today's final rule are available from the EPA Office of Transportation and Air Quality Web site listed below shortly after the rule is signed by the Administrator. This service is free of charge, except any cost that you already incur for connecting to the Internet.

EPA Web Site:
http://www.epa.gov/docs/fedrgstr/epa-air/

Either select a desired date or use the Search feature.)

Office of Transportation and Air Quality (OTAQ) Web Site:
http://www.epa.gov/oms/

(Look in ''What's New'' or under the ''Trucks/Buses'' or ''Highway Heavy-Duty Vehicles'' topics.)

Please note that due to differences between the software used to develop the document and the software into which the document may be downloaded, changes in format, page length, etc., may occur.

Outline of This Preamble

I. Introduction

Under EPA's classification system, heavy-duty vehicles are those with a gross vehicle weight rating (GVWR) of 8,500 pounds or more.[1] The State of California classifies the lighter end of this class—up to 14,000 pounds GVWR—as ''medium-duty vehicles,'' and recent EPA regulations define certain vehicles from 8,500 to 10,000 pounds GVWR and designed primarily for passenger transportation as ''medium-duty passenger vehicles'' (MDPVs) subject to the recently finalized Tier 2 standards. (*See* 65 FR 6698, February 10, 2000). Heavy-duty engines (HDEs) are engines used in heavy-duty vehicles. Heavy-duty engines and vehicles are used in a wide range of applications, from large full size pick-up trucks to the largest commercial trucks. Because one type of heavy-duty engine may be used in many different applications, EPA emission standards for the heavy-duty class of vehicles have generally been based on the emissions performance of the engine

[1] The Clean Air Act defines heavy-duty vehicles as those with a GVWR of greater than 6,000 pounds. However, EPA has classified vehicles between 6,000 and 8,500 pounds GVWR as light-duty vehicles, while treating them as heavy-duty for statutory purposes. Vehicles weighing between 6,000 and 8,500 pounds GVWR are not addressed generally in this final rulemaking. Gross Vehicle Weight Rating (GVWR) is defined by federal regulation in 40 CFR 86.082–2 as ''The value specified by the manufacturer as the maximum design loaded weight of a single vehicle.'' In other words, it is the weight of the vehicle completely loaded with the maximum load that the manufacturer states the vehicle is capable of carrying.

(and any associated aftertreatment devices) as tested separately from the vehicle chassis.

Highway HDEs are categorized into diesel-cycle (compression-ignited) and Otto-cycle (spark-ignited) engines. Most diesel-cycle engines are fueled by diesel fuel, but heavy-duty diesel-cycle engines can also be fueled by methanol or natural gas. The heavy-duty diesel engine (HDDE) class is further subdivided by EPA into three subclassifications or ''primary intended service classes''; light, medium, and heavy HDDEs (*see* 40 CFR 86.090–2).[2] HDDEs are categorized into one of the three subclasses depending on the GVWR of the vehicles for which they are intended, the usage of the vehicles, the engine horsepower rating, and other factors. The subclassifications allow EPA to more effectively set requirements that are appropriate for the wide range of sizes and uses of HDDEs.

Most highway heavy-duty Otto-cycle vehicles and engines are gasoline-fueled, but may also be fueled with alternative fuels including methanol and gaseous fuels such as natural gas. Heavy-duty Otto-cycle vehicles and engines include large full size pick-up trucks, full size cargo and passenger vans, and the largest sport utility vehicles. Approximately 75 percent of heavy-duty Otto-cycle vehicles are in the 8,500–10,000 pound GVWR range, and the vast majority of these are sold as ''complete'' vehicles.[3] The majority of heavy-duty Otto-cycle vehicles above 10,000 pounds GVWR are sold as ''incomplete'' vehicles, meaning that they are manufactured without their primary cargo carrying container or device attached. These incomplete vehicles (basically the engine plus a chassis) are then manufactured into a variety of vehicles, including recreational vehicles, panel trucks, tow trucks, and dump trucks.

EPA's NO_X standard for 1998 to 2003 model year diesel and Otto-cycle heavy-duty engines is 4.0 grams per brake horsepower-hour (g/bhp-hr). The hydrocarbon standards for 1998 to 2003 model year Otto-cycle engines are 1.1 g/bhp-hr for engines used in lighter vehicles (8500 to 14,000 pounds GVWR) and 1.9 g/bhp-hr for engines used in heavier vehicles (greater than 14,000 pounds GVWR), and the 1998 to 2003 model year hydrocarbon standard for HDDEs is 1.3 g/bhp-hr. EPA currently requires testing of the engine (with emissions control systems in place) rather than the entire vehicle. Thus, the standards are in units of g/bhp-hr (*i.e.,* grams of emissions per unit of work the engine performs over the test cycle), rather than the grams-per-mile unit used for testing passenger cars and light-duty trucks.

Today's action is the continuation of a rulemaking process for heavy-duty engines which began in 1995 with an Advanced Notice of Proposed Rulemaking (ANPRM) (60 FR 45580, August 31, 1995). As discussed below, a 1996 Notice of Proposed Rulemaking proposed the same NMHC+NO_X standards for both Otto-cycle and diesel-cycle engines (61 FR 33421, June 27, 1996). However, EPA did not finalize the proposed NMHC+NO_X standard for Otto-cycle engines in the final rule published in October 1997 (62 FR 54694, October 21, 1997). EPA did finalize a new NMHC+NO_X emission standard for HDDEs, starting with the 2004 model year, but committed to review the appropriateness of this standard in 1999. Today's final action thus addresses two broad issues that remain from earlier rulemaking efforts—a reaffirmation of the NMHC+NO_X standard for diesel engines and new emission standards for heavy-duty Otto-cycle engines and vehicles. The previous rulemaking documents, and the documents referenced therein (*see* EPA Air Docket No. A–95–27), contain extensive background on the engines and vehicles, the affected industry, and the need for lower emissions standards.

Section I of this preamble provides some background information and the regulatory context of today's action, as well as a brief overview of the program. Section II details the air quality need for and the benefits of the program. Subsequent sections provide a detailed description of the specifics of the program and expand on the technological feasibility and economic impacts of the program. A public participation section reviews the process we followed in soliciting and responding to public comment. The final sections deal with several administrative requirements. You may also want to review our Final Regulatory Impact Analysis (RIA) and our Response to Comments document, both of which are found in the docket and on the Agency's website. They provide additional analyses and discussions of many topics raised in this preamble.

A. How Does This Action Relate to the Statement of Principles and Other Rulemakings?

In July of 1995, EPA, the California Air Resources Board, and heavy-duty engine manufacturers representing over 90 percent of annual nationwide engine sales signed a Statement of Principles (SOP) that established a framework for a proposed rulemaking to address concerns regarding the growing contribution of heavy-duty engines to air pollution problems. The SOP contained levels for a new proposed standard for NMHC+NO_X that would become effective in model year 2004. The SOP also contained several key provisions in addition to the standards. The SOP discusses the need to review in 1999 the technological feasibility of the NMHC+NO_X standard and its appropriateness under the Clean Air Act. Also, the SOP outlines a plan for developing technology with the goal of reducing NO_X emissions to 1.0 g/bhp-hr and particulate matter to 0.05 g/bhp-hr while maintaining performance, reliability, and efficiency of the engines. EPA sought early comment on the general regulatory framework laid out in the SOP in an ANPRM on August 31, 1995 (60 FR 45580), then subsequently issued an NPRM on June 27, 1996 (61 FR 33421).

On October 21, 1997, EPA issued a final rule (62 FR 54694). The centerpiece of the final rule was a new NO_X+NMHC standard of 2.4 g/bhp-hr (or 2.5 g/bhp-hr with a 0.5 g/bhp-hr NMHC cap) for 2004 and later model year heavy-duty diesel-cycle engines. The rule also adopted other related compliance provisions for diesel-cycle heavy-duty engines beginning with the 2004 model year, as well as revisions to the useful life for the heavy heavy-duty diesel engine service class.

In the June 27, 1996, NPRM, EPA proposed the same NMHC+NO_X standard for diesel and Otto-cycle heavy-duty engines. During the comment period several commenters urged the Agency to reconsider its proposal for Otto-cycle engines. The commenters argued that the proposal ignored the true low emissions capability of gasoline-powered vehicles equipped with advanced three way catalysts. Environmental groups provided comments highlighting manufacturers' certification data for the 1996 model year, which included some engine families with emission levels considerably below the standards proposed for the 2004 model year. One commenter recommended that the proposed standard be phased in earlier than 2004 for Otto-cycle engines since the emissions control technology capable of meeting the NMHC+NO_X standard was more advanced for Otto-cycle engines than for diesel engines. On the basis of these comments, EPA determined to reexamine the proposed standards for Otto-cycle engines and no new NMHC+NO_X standards were finalized for on-highway heavy-duty Otto-cycle engines in the October 21, 1997, final rule.

Lastly, on October 29, 1999, EPA published an NPRM that proposed, among other things, to reaffirm the technical and economic feasibility of the 2004 model year diesel NO_X+NMHC standard and to add appropriate emission standards for heavy-duty Otto-cycle vehicles and engines. (*See* 64 FR 58472, October 29, 1999.) Today's final rule is the conclusion of the first phase of EPA's strategy to achieve substantial emission reductions from heavy-duty vehicles and engines. The second phase, affecting the 2007 and later model years, is addressed in a proposal published on June 2, 2000 (65 FR 35430).

B. What Is the ''1999 Technology Review''?

In addition to the elements of the 1997 final rule described above, EPA finalized a regulatory provision providing for a 1999 review of the new NMHC+NO_X emission standard for HDDEs. EPA committed to ''reassess the appropriateness of the standards under the Clean Air Act, including the need for and technical and economic feasibility of the standards based on information available in 1999'' (*See* 62 FR 54699, October 21, 1997). This provision was put in place because the technologies required to meet the 2004 NMHC+NO_X standard for HDDEs were, at the time the standard was finalized, not yet fully developed and proven. This commitment was spelled out in regulatory language in the final rule in 40 CFR 86.004–11, paragraph (a)(1)(i)(E), which reads:

''No later than December 31, 1999, the Administrator shall review the emissions standards set forth in paragraph (a)(1)(i) of this section and determine whether these standards continue to be appropriate under the Act.''

While this specific regulatory provision is limited to the NMHC+NO_X standard for review in 1999, in the preamble to the final rule EPA committed to investigating or seeking comment on several other issues in the context of the 1999 review. Our October 29, 1999 NPRM proposed to make certain findings regarding these issues and sought comment. Today's action presents our final findings regarding these issues. These additional issues include:

• An evaluation of whether the appropriateness and technical feasibility of the 2004 standards depend upon changes to diesel fuel.

• A review of the appropriateness of the 2004 NMHC+NO_X standard in the context of the current PM standard.

C. How Does This Action Relate to the Consent Decrees With Heavy-duty Diesel Engine Manufacturers?

The Department of Justice and EPA completed consent decrees with seven of the largest heavy-duty diesel engine manufacturers in the U.S. in order to resolve the problems uncovered from current and past heavy-duty diesel engines which the government does not believe meet existing standards and defeat device rules. In these consent decrees with the Federal Government six of the manufacturers are required, among other things, to meet a 2.5 g/bhp-hr limit on NMHC+NO_X no later than October 1, 2002. The majority of these engine manufacturers have also agreed to produce engines by October 1, 2002 that meet a not-to-exceed limit, a Euro III limit (on which the Agency's finalized supplemental steady-state cycle is based), and to test engines over and eventually comply with a load response test and emission limits.[4] The fact that these engine manufacturers have agreed to meet the 2004 standards in 2002 gives the Agency additional confidence that the NMHC+NO_X standard reviewed in today's action is appropriate for the 2004 model year. However, these Consent Decrees are not the basis for the Agency's factual finding that the standards contained in today's final rule are appropriate under the Clean Air Act. Other elements of these consent decrees that are carried over to today's final rule include the addition of a new steady state certification test and a new ''not-to-exceed'' (NTE) approach to assure in-use compliance. In addition, under the consent decrees the manufacturers are required to invest considerable resources to evaluate instrumentation and methodologies for on-road testing.

The Agency believes these consent decrees will partially address the emission problems from previously produced engines. However, we do not believe that relying on the current compliance program and the use of enforcement actions in the future is the most appropriate long term method to assure in-use compliance of heavy-duty engines under all operating conditions. We estimate that the more than one million engines at issue in these consent decrees produced since 1988 will have resulted in excess NO_X emissions of more than 15 million tons over the lifetime of the engines, with an estimated 1.3 million excess tons of NO_X being emitted in 1998 alone. To put this in perspective, the Agency's National Air Pollutant Emission Trends report for 1900–1996 estimates the total U.S. emission inventory for annual NO_X emissions was 23.3 million tons. These estimates do not include the previously unknown excess NO_X emissions from on-highway heavy-duty diesels. Assuming the total 1998 national NO_X emissions are similar to 1996, the 1.3 million tons excess NO_X emissions from heavy-duty diesels in 1998 represent approximately five percent of the national total. The new compliance requirements contained in this final rule assure that the public's health and welfare will be better protected from these types of excess emissions in the future.

[4] The Consent Decrees establish target limits for a load response test of 1.3 times the federal test procedure (FTP) standard for NMHC+NO_X and 1.7 times the FTP standard for PM. These limits would take effect for affected manufacturers after October 1, 2002. However, the Consent Decrees establish a process to determine whether these limits should be modified to ensure that they are the lowest achievable given the technology available at the time. Under this process, manufacturers would submit load response test data with their certification applications starting with the 1999 model year, and by October 1, 2000, the parties to the Consent Decrees would review these data to determine appropriate emission limits.

D. How Does This Action Relate to the Light-duty Tier 2 Program?

In December of 1999 we finalized a major, comprehensive program designed to reduce emission standards for passenger cars, light trucks, and large passenger vehicles (including sport-utility vehicles, minivans, vans, and pickup trucks) and to reduce the sulfur content of gasoline (see 65 FR 6698, February 10, 2000). Under the program, automakers will produce vehicles designed to have very low emissions when operated on low-sulfur gasoline, and oil refiners will provide such cleaner gasoline nationwide. This comprehensive program is referred to in this preamble as the ''Tier 2/Gasoline Sulfur program,'' or simply the ''Tier 2 program.''

The proposal for the Tier 2/Gasoline Sulfur program (64 FR 26004, May 13, 1999) raised specific issues relating to vehicles over 8,500 pounds GVWR, and thus classified as heavy-duty vehicles. We requested comment in the Tier 2 NPRM on several potential options that would have applied more stringent standards to vehicles over 8,500 pounds GVWR, including the possibility of extending the GVWR limits that define light-duty trucks. Specifically, we requested comment in the Tier 2 NPRM on, among other options, requiring ''all complete trucks in the 8,500–10,000 pound GVWR range to meet light-duty standards ''(64 FR 26089).

We subsequently proposed to include all personal use passenger vehicles (including gasoline and diesel fueled) between 8,500 and 10,000 pounds GVWR in the Tier 2 program. This group of vehicles would include large SUVs and passenger vans and may include other types of "crossover" multipurpose vehicles in the future, depending on new vehicle designs. We proposed this change in our NPRM concerning emissions standards for 2004 and later heavy-duty vehicles and engines (64 FR 58472, October 29, 1999).

Tier 2 standards for these passenger vehicles above 8,500 pounds GVWR were finalized in the Tier 2 final rule (65 FR 6698, February 10, 2000). These vehicles are included in the Tier 2 program beginning in 2004 and are required to meet the final Tier 2 standards in 2009 and later. To effect this, we created a new category of heavy-duty vehicles termed "medium-duty passenger vehicles" (MDPVs). We define medium-duty passenger vehicles as any complete heavy-duty vehicle less than 10,000 pounds GVWR designed primarily for the transportation of persons including conversion vans (*i.e.,* vans that are intended to be converted to vans primarily intended for the transportation of persons).[5] We do not include any vehicle that (1) has a capacity of more than 12 persons total or, (2) that is designed to accommodate more than 9 persons in seating rearward of the driver's seat or, (3) has a cargo box (*e.g.,* a pick-up box or bed) of six feet or more in interior length. MDPVs will generally be grouped with heavy light-duty trucks (HLDTs) in the Tier 2 program.

Today's final rule does not, therefore, include provisions for those vehicles that meet the new definition of medium-duty passenger vehicle. The provisions in this final rule applicable to complete heavy-duty vehicles are applicable to (1) vehicles under 10,000 pounds GVWR that are not captured in the medium-duty passenger vehicle definition (*e.g.,* large pick-up trucks, 15-passenger vans), or (2) vehicles over 10,000 pounds GVWR. For more information on the new medium-duty passenger vehicle category see the Tier 2 final rule. (See 65 FR 6698, February 10, 2000.)

E. What Are the Basic Components of the Program?

Today's action contains requirements that can generally be separated into those that apply to diesel engines and vehicles and those that apply to Otto-cycle engines and vehicles. Some elements of the program harmonize EPA's regulatory program with California's Medium-duty vehicle (MDV) program (*e.g.,* vehicle-based standards for complete Otto-cycle heavy-duty vehicles below 14,000 pounds GVWR), while others may differ from California's current requirements. (Also, as noted above, some complete gasoline and diesel-fueled heavy-duty vehicles from 8,500 to 10,000 pounds GVWR are incorporated into the Tier 2 program, and are thus are not subject to the requirements in today's action (*See* 65 FR 6698, February 10, 2000).) The details of these requirements are found in section III of this preamble.

Due to lead time requirements in the Clean Air Act (CAA, or "the Act"),[6] we are not able to finalize some of the new provisions described below to be in effect in time to apply to the 2004 model year as we originally proposed.[7] We are therefore not finalizing some of the heavy-duty diesel provisions until the 2007 model year, which avoids uncertainties regarding lead time and stability issues. New standards for heavy-duty Otto-cycle vehicles and engines can not be implemented earlier than the 2005 model year due to the lead time provisions in the Act. However, manufacturers of these vehicles and engines are given two optional compliance programs that they may select in lieu of the 2005 program, one that starts in 2003 (referred to as "Option 1" in the remainder of this preamble) and one that starts in 2004 (Option 2). The 2003 and 2004 implementation options offer some incentives relative to the 2005 program to encourage adoption by manufacturers. The two early-introduction options would result in greater emission reductions than the 2005 program.

This final rule therefore allows heavy-duty manufacturers to retain the statutorily-allowed four year lead time and begin implementation of the new provisions in a time frame that provides enough lead time under the Clean Air Act. However, this final rule also allows manufacturers to meet some new requirements early. Manufacturers electing to comply early would be essentially waiving the four years of lead time that the Clean Air Act allows. Manufacturers that participate in these programs and introduce cleaner technologies early are to be commended for taking positive steps towards protection of the environment. These early introduction options are described further under section III below and also in the Response to Comments document.

1. What Applies to Diesel Engines and Vehicles?

Today's action finalizes our finding that the 2004 $NMHC+NO_X$ standard for heavy-duty diesel engines (HDDEs) is technologically feasible, cost-effective, and appropriate under the Clean Air Act, in the context of the current PM standard. This includes a finding that a change in diesel fuel formulation is not required to make the 2004 model year $NMHC+NO_X$ standards technologically feasible and appropriate under the CAA.

In addition, this action finalizes a new set of supplemental test procedures to more closely represent the range of real world driving conditions of heavy-duty diesel engines. These elements are specifically designed to provide additional certainty that the standards will be met under a wide range of operating conditions. These elements apply to all heavy-duty diesel engines, except those in Medium-duty Passenger Vehicles, which are subject to the Tier 2 program. First, we are adding a steady-state test requirement to the current Federal test procedures (FTP) for HD diesel engines. Emission results from this test must meet the numerical standards for the pre-existing Federal test procedure (*i.e.,* the $NMHC+NO_X$ standards noted above, a CO standard of 15.5 g/bhp-hr, and a PM standard of 0.10 g/bhp-hr). This steady-state test requirement becomes effective starting with the 2007 model year. Second, we are also finalizing Not-to-Exceed (NTE) test procedures for testing of in-use engines. These NTE procedures apply under any conditions that could reasonably be expected to be seen in normal vehicle operation and use, including an expanded range of ambient conditions. Emission results from this test procedure must be less than or equal to 1.25 times the pre-existing Federal test procedure standards noted above. The NTE test and associated emission limits are effective starting with the 2007 model year. Third, we are finalizing a Load Response Test (LRT) certification data submittal requirement for heavy-duty diesel engines, effective starting with the 2004 model year.

We are also finalizing on-board diagnostic (OBD) requirements applicable to heavy-duty diesel vehicles and engines up to 14,000 pounds GVWR. Heavy-duty diesel vehicles and

[5] The conversion from cargo to passenger use usually includes the installation of rear seating, windows, carpet, and other amenities.

[6] Clean Air Act Section 202(a)(3)(C) requires that "Any standard promulgated or revised under this paragraph and applicable to classes or categories of heavy duty vehicles or engines shall apply for a period of no less than 3 model years beginning no earlier than the model year commencing 4 years after such revised standard is promulgated."

[7] An exception is the 2004 $NMHC+NO_X$ standard for heavy-duty diesel engines, which was finalized in a 1997 rulemaking. We did not revise or reconsider this standard in this final rule.

engines must be equipped with an OBD system capable of detecting and alerting the driver of certain emission-related malfunctions or deterioration. These requirements are phased in from the 2005 through 2007 model years.

Lastly, we are finalizing the proposed provisions that require engine manufacturers to provide, to EPA, documentation necessary to read and interpret information broadcast by engine on-board computers and ECM's which relate to emission control devices and auxiliary emission control devices (AECDs). As explained in section III.A.6, these provisions are finalized with minor revisions based on public comment.

2. What Applies to Otto-cycle Engines and Vehicles?

Today's action finalizes new, more stringent emission standards for all Otto-cycle heavy-duty engines and vehicles (except, as already noted, those vehicles defined as MDPVs and covered by the Tier 2 program). We are also finalizing a major change to the structure of the regulatory program for Otto-cycle heavy-duty vehicles and engines and the way in which it applies to the different categories of vehicles. Currently, EPA has an engine-based regulatory program for all heavy-duty vehicles, in that the engine alone is tested and must currently meet engine-based standards.[8] Engine testing currently applies to all diesel-cycle and Otto-cycle heavy-duty vehicles. One of the key elements of today's action is to begin regulating a subset of heavy-duty vehicles using chassis-based requirements. The heavy-duty vehicles that are subject to chassis-based requirements are complete Otto-cycle heavy-duty vehicles with a gross vehicle weight rating (GVWR) up to 14,000 pounds.[9] We are retaining an engine-based approach for engines used in incomplete Otto-cycle vehicles up to 14,000 pounds GVWR and all Otto-cycle vehicles above 14,000 pounds GVWR (and optionally, for Otto-cycle complete vehicles, under Option 1, for the 2003 through 2006 model years). As noted earlier, manufacturers have the choice of three options, one that provides the lead time that we must allow by statute (Option 3), and two others that allow earlier introduction of cleaner technologies (Options 1 and 2).

For the primary engine-based program, we are finalizing a new $NMHC+NO_X$ standard of 1.0 g/bhp-hr that will start in the 2005 model year and remain in place at least through the 2007 model year (Option 3). As an alternative, manufacturers may select a standard of 1.5 g/bhp-hr $NMHC+NO_X$ that would apply to the 2004 through 2007 model years, then change to a 1.0 g/bhp-hr $NMHC+NO_X$ standard in the 2008 model year (Option 2).[10] Further, if a manufacturer desires some additional flexibility beyond that provided by Option 2, they may certify their Otto-cycle complete vehicles to engine-based standards (rather than to the California LEV–I chassis-based standards that would apply under Option 2) through the 2006 model year, provided that they implement these new standards for engines and vehicles starting with the 2003 model year (Option 1). Like Option 2, the engine-based standard in Option 1 transitions from 1.5 g/bhp-hr to 1.0 g/bhp-hr in the 2008 model year. We believe that manufacturers are capable of meeting the requirements under any of these options, and we encourage them to take advantage of the opportunity to introduce cleaner Otto-cycle heavy-duty vehicles sooner rather than later.

For the vehicle-based program, we are harmonizing federal standards with the California Medium-duty Vehicle (MDV) Low Emission Vehicle I (LEV–I) standards. These standards, shown in the table below, would apply to Otto-cycle complete vehicles in the weight categories shown. The standards are for emissions over the FTP and vehicles will be tested at adjusted loaded vehicle weight (ALVW), also known as test weight (TW).[11] The standards apply at a useful life of 120,000 miles. We are also finalizing an averaging, banking, and trading (ABT) program tied specifically to this vehicle-based program. Under Option 3, these standards would begin with the 2005 model year. Under Option 2, these standards would apply starting with the 2004 model year. Under Option 1, Otto-cycle complete vehicles could be certified to these standards or to the engine-based standards through the 2006 model year, as noted earlier, starting with the 2003 model year.

TABLE 1.—FULL-LIFE EMISSION STANDARDS FOR OTTO-CYCLE COMPLETE VEHICLES

[Grams per mile]

Vehicle weight category (GVWR)	Non-methane organic gas (NMOG)	NO_X	CO
8,500–10,000 lbs[1]	0.28	0.9	7.3
10,001–14,000 lbs	0.33	1.0	8.1

[1] Excluding medium-duty passenger vehicles, which are covered by the Tier 2 program.

In addition, the Otto-cycle vehicle-based program includes the chassis-based enhanced evaporative emission test procedures. We are also requiring onboard refueling and vapor recovery (ORVR) controls on all complete Otto-cycle heavy-duty vehicles up to 10,000 pounds GVWR. These requirements are phased from 2004 to 2006 under Options 1 and 2, and from 2005 to 2006 under Option 3.

As with diesel heavy-duty vehicles, we are finalizing OBD requirements applicable to heavy-duty Otto-cycle vehicles and engines up to 14,000 pounds GVWR. Heavy-duty Otto-cycle vehicles and engines must be equipped with an OBD system capable of detecting and alerting the driver of certain emission-related malfunctions or deterioration. These requirements are phased in from 2004 to 2007 under Options 1 and 2, and from 2005 to 2007 under Option 3.

Lastly, as with diesel heavy-duty engines, we are finalizing the proposed provisions that require engine manufacturers to provide, to EPA, documentation necessary to read and interpret information broadcast by engine on-board computers and ECM's which relate to emission control devices and auxiliary emission control devices (AECDs). As explained in section

[8] Engine-based standards are expressed in terms of emissions per unit of work per unit of time, whereas chassis-based (or vehicle-based) standards are expressed in terms of amount of emissions per mile driven by the vehicle.

[9] "Complete" vehicles are those that are manufactured with their primary cargo carrying container or device attached, whereas "incomplete" vehicles are those that are manufactured without the primary cargo carrying container or device attached. Incomplete vehicles (basically the engine plus a chassis) are then manufactured into a variety of vehicles, such as recreational vehicles, panel trucks, dump trucks, fire trucks, and tow trucks.

[10] It is very important that readers note the recent EPA proposal (65 FR 35430, June 2, 2000) regarding the second phase of our strategy to reduce emissions from heavy-duty vehicles. This second phase will include more stringent emission standards for heavy-duty vehicles and engines (diesel and Otto-cycle) in the 2007/2008 time frame. EPA's recent proposal proposed standards for heavy-duty Otto-cycle engines that would take effect in the 2008 model year. The recent proposal gives manufacturers notice of the stringency of future standards being sought by the Agency, and in fact, these future standards may be finalized before manufacturers have to ultimately commit to Option 1 or Option 2. Consequently, the 2008 standard of 1.0 g/bhp-hr in today's final rule is intended to be a placeholder for tighter standards that will result from future final action by EPA prior to 2004; it is not intended to represent the standard that the Agency believes to be ultimately feasible or appropriate in that time frame.

[11] ALVW or TW is the actual weight of the vehicle, known as curb weight, plus half pay load. It is also the average of the curb weight and GVWR, or (CW + GVWR)/2.

III.A.6, these provisions are finalized with minor revisions based on public comment.

As noted above, to address statutory lead time requirements we are offering three options for manufacturers of Otto-cycle heavy-duty engines and vehicles, one that starts with the 2003 model year, one that starts with the 2004 model year, and one that starts with the 2005 model year. A manufacturer must select one option for its entire heavy-duty Otto-cycle product line. (Manufacturers may not select one option for some engine families and another option for other engine families, or one option for engines and another for vehicles. The selected option must apply to all HD Otto-cycle vehicles and engines sold by the manufacturer, for the time prescribed under the regulations that describe the options.) These options, summarized briefly below, are described in greater detail in section III of this preamble.

Option 1 (2003 implementation)

- Engine-based standard of 1.5 g/bhp-hr for the 2003—2007 model years.
- Engine-based standard of 1.0 g/bhp-hr starting with the 2008 model year.[12]
- Chassis-based standards shown in Table 1.
- Option to certify Otto-cycle complete vehicles to chassis-based or engine-based standards for 2003—2006 model years.
- OBD phased in from 2004 to 2007, for 8,500 to 14,000 lbs GVWR.
- ORVR phased in from 2004 to 2006, for 8,500 to 10,000 lbs GVWR.

Option 2 (2004 implementation)

- Engine-based standard of 1.5 g/bhp-hr for the 2004—2007 model years.
- Engine-based standard of 1.0 g/bhp-hr starting with the 2008 model year.[13]
- Chassis-based standards shown in Table 1; 100% compliance in 2004 model year.
- OBD phased in from 2004 to 2007, for 8,500 to 14,000 lbs GVWR.
- ORVR phased in from 2004 to 2006, for 8,500 to 10,000 lbs GVWR.

Option 3 (2005 implementation)[14]

- Engine-based standard of 1.0 g/bhp-hr starting in 2005 model year.[15]
- Chassis-based standards shown in Table 1; 100% compliance in 2005 model year.
- OBD phased in from 2005 to 2007, for 8,500 to 14,000 lbs GVWR.
- ORVR phased in from 2005 to 2006, for 8,500 to 10,000 lbs GVWR.

II. Is the Program Needed, and How Much Effect Will It Have on Emissions?

A. Environmental Need

This section presents information on the health and environmental impacts caused by air pollution from heavy-duty (HD) engines and vehicles (diesel and gasoline[16]), as well as EPA's assessment of the continuing need for additional emission reductions from HD engines and vehicles in order to meet the air quality needs of the U.S. This section also reviews our projections of the emission reductions that will result from today's action.

When we published the original 1997 final rule for the 2004 standards, we included a detailed analysis and explanation of the health impacts and air quality need for the program. Recently, as a part of our October 29, 1999 proposal of today's program mentioned above, we reassessed and updated our evaluation of the air quality need for the original program, as well as for the new provisions we proposed in the October proposal. Today, after performing further analysis and with the benefit of a range of comments from the public, we present our conclusions. As explained below and in the Regulatory Impact Analysis, our most recent analyses confirm our earlier assessments that the nationwide emission reductions from the original 1997 program, as well as the additional reductions that will occur from today's new requirements, are significant and will help many areas to comply with the health-based ambient air quality standards.

1. Need for Additional NO_X and NMHC Reductions

a. NO_X and NMHC Cause Adverse Health and Welfare Effects

Oxides of nitrogen (NO_X) and volatile organic compounds (VOC) are precursors in the photochemical reaction which forms tropospheric ozone. VOC emissions from mobile sources consist mostly of nonmethane hydrocarbons (NMHC). There is a large body of evidence showing that ozone can cause harmful respiratory effects including chest pain, coughing, and shortness of breath, most severely affecting people with compromised respiratory systems, children, and outdoor workers. In addition, NO_X and VOCs can both harm human health directly. Beyond their human health effects, other negative environmental effects are also associated with ozone, NO_X, and VOCs. Ozone reduces crop yields and forestry yields and harms ornamental plants. NO_X, and in some cases VOCs, contribute to the secondary formation of particulate matter (PM), acid deposition, and the overgrowth of algae in coastal estuaries. These environmental effects, as well as the health effects noted above, are described in the Regulatory Impact Analysis.

b. Standards for 2004 HD Diesels Are a Key Part of State Air Pollution Control Plans

Since we published the final rule establishing the 2004 HD diesel emission standards in 1997, states have considered the projected emission reductions from these engines to be an important component of their overall State Implementation Plans (SIPs). The NO_X and NMHC nationwide emission reductions that will result from these standards beginning in the 2004 model year will help states to attain the ozone NAAQS. States have incorporated the beneficial effects of the 2004 HD diesel standards into their air quality modeling and they continue to count on the emission reductions from this program to meet their air quality goals.

c. New Standards for 2005 HD Gasoline Engines and Vehicles Are Important for States in Meeting Their Air Quality Goals

Today, many states are finding it difficult to show how they can meet or maintain compliance with the current National Ambient Air Quality Standard (NAAQS) for ozone by the deadlines established in the Clean Air Act. In December, 1999, 92 million people (1990 population) lived in 32 metropolitan areas designated

[12] A recent EPA proposal would replace the 2008 standards finalized today by more stringent standards. See 65 FR 35430, June 2, 2000.

[13] *Ibid.*

[14] 2005 model year engines or vehicles whose model year begins prior to 4 years from the date of signature of this final rule may be exempted from the 2005 model year requirements under this option. Exempted engines or vehicles would comply with requrements otherwise applicable to the 2004 model year.

[15] A recent EPA proposal would introduce more stringent standards starting in the 2008 model year. See 65 FR 35430, June 2, 2000.

[16] We will use the terms ''otto-cycle engine'' and ''gasoline engine'' interchangeably in this document. Most otto-cycle engines today are powered by gasoline, but some alternative fuel technologies also operate as otto-cycle engines.

nonattainment under the 1-hour ozone NAAQS.[17]

There is a very clear risk that there will be elevated levels of ground-level ozone above the 1-hour NAAQS during the time period when the heavy-duty gasoline vehicle standards of this rulemaking will take effect. The reductions in oxides of nitrogen (NO_X) and volatile organic compounds (VOCs) projected from the proposed new standards will benefit public health and welfare by reducing ozone levels. This assessment is based upon our recent and extensive ozone air quality modeling and analysis performed for the Tier 2/Gasoline Sulfur rulemaking, which predicts that a significant number of areas across the nation are at risk of failing to meet the 1-hour ozone NAAQS even with Tier 2 and other controls currently in place. Because ozone concentrations causing violations of the 1-hour ozone standard are well established to endanger public health and welfare, we conclude that today's new standards for 2005 and later gasoline heavy-duty vehicles are warranted.

Projected Air Quality Problems Remain After Tier 2/Gasoline Sulfur Program Is in Place

In conjunction with our Tier 2/Gasoline Sulfur rulemaking efforts, we performed ozone air quality modeling for nearly the entire eastern U.S. covering metropolitan areas from Texas to the Northeast, and for a western U.S. modeling domain. This modeling predicted that without further emission reductions, a significant number of areas now experiencing ozone exceedances across the nation are at risk of failing to meet the 1-hour ozone NAAQS in 2004 and beyond, even with the Tier 2/Gasoline Sulfur program and other controls currently in place.

The general pattern that the ozone modeling shows is a broad reduction between 1996 and 2007 in the geographic extent of ozone concentrations above the 1-hour NAAQS, and in the frequency and severity of exceedances. In the absence of additional controls beyond those that will be achieved by current control programs—including the Tier 2/Gasoline Sulfur program—we expect there will be a slight decrease below 2007 ozone concentrations and frequencies of exceedances in 2030. However, the general trends and modeling results show that many of the areas we modeled may have exceedances continuously throughout the period from 2007 to 2030 without further reductions in emissions. Others may briefly attain and then return to nonattainment by 2030 or earlier. Although for practical reasons we limited our modeling of ozone concentrations to 1996, 2007, and 2030, we expect that concentrations between 2007 and 2030 will generally track the national emissions trend, showing a period of improvement after 2007 followed by a reversal of the trend and deterioration back towards the 2007 levels. Because individual areas' emissions trends differ, we expect that the air quality of individual areas will also vary from this general pattern.

We believe that there is a risk that future air quality in each of these areas would exceed the ozone standard during the time period when this rule will take effect. This belief is based on three factors: (1) Recent exceedances in 1995–1997 or 1996–1998, (2) predicted exceedances in 2007 or 2030 after accounting for reductions from Tier 2 and other local or regional controls currently in place or required, and (3) our assessment of the magnitude of recent exceedances, the variability of meteorological conditions, transport from areas with later attainment dates, and other variables involved in predicting future attainment such as the potential for some areas to experience unexpectedly high economic growth rates, growth in vehicle miles traveled, varying population growth from area to area, and differences in vehicle choice.

Based on the Tier 2 modeling analyses and information from recently-submitted SIPs, we have determined that over 71 million people (1996 population) in 21 metropolitan areas are likely to be exposed to unhealthy levels of ground level ozone at some point in time between 2004 and 2030 without significant additional controls. These 21 areas are those that currently violate 1-hour ozone NAAQS and are predicted by the best ozone modeling we have available to be likely to exceed the 1-hour ozone standard without significant new controls. This analysis accounts for the expected benefits from the Tier 2 program and other control programs already in place.[18] It does not include additional control measures that states would need to implement to meet their requirements under the recently proposed SIP findings. We list these metropolitan areas and discuss how we conducted the analysis in the RIA for this final rule.

There are 14 additional metropolitan areas, with another 35 million people in 1996, for which the available ozone modeling and other evidence is less clear regarding the need for additional reductions. The RIA lists the areas we put in this second category. Our Tier 2 ozone modeling predicted these 14 areas to need further reductions to avoid exceedances during the period when the standards are effective. For all of these areas, recent air quality monitoring data indicate that exceedances may occur in 2007 or 2030. Eight areas have recent exceedances, but local ozone modeling and other evidence indicates attainment in 2007. Based on this evidence, we have kept these areas separate from the previous set of 21 areas. However, we still consider there to be some risk of future exceedances for these eight areas.

For the other six of the 14 areas, the air quality monitoring data shows current attainment but with less than a 10 percent margin below the NAAQS. This suggests that these areas may remain without exceedances for some time, but that there is still a risk of future exceedance of the NAAQS due, for example, to meteorological conditions that may be more severe in the future.

There is significant risk that at least some of these 35 areas will violate the NAAQS in 2004 or thereafter without additional reductions. We consider the situation in these areas to support our belief that, overall, additional reductions are needed.

Today's Program Will Help Areas Meet Their Attainment and Maintenance Requirements

The HD gasoline vehicle standards finalized today, and the HD diesel standards reviewed today, will help all of the areas discussed above to either meet their attainment deadlines, to maintain attainment in the future, or both. The new program will be very important to each of the areas with deadlines in 2005 and later that will require (or may require) additional emission reductions (2005 is the year that new gasoline HD vehicles will begin to enter the fleet). As Table 2 shows, there are 10 such areas with almost 66 million people. The following table lists these areas and their expected attainment dates:

[17] Memorandum to the Docket, Drew Kodjak, EPA, January 12, 2000 (found in the docket for this rule as well). Information on ozone nonattainment areas and population as of December 13, 1999.

[18] Air quality modeling shows that improvements in ozone levels can be expected to occur throughout the country because of the Tier 2/Gasoline Sulfur program. EPA found that the program significantly lowers the model-predicted number of exceedances of the ozone standard by one tenth in 2007, and by almost one-third in 2030 (Tier 2/Gasoline Sulfur Final RIA, Docket A–97–10, Document Number V–B–1).

Metropolitan area	Attainment deadline	Modeling predictions	Population (millions)
Baltimore	2005	VOC Shortfall	2.6
Philadelphia	2005	NO_X and VOC Shortfall	6.0
Greater Connecticut (Hartford and other MSAs).	2007 (requested extension)	Contingent on New York Attainment	2.4
New York City, NY–NJ–CT	2007	VOC and NO_X Shortfall	19.9
Houston, TX	2007	NO_X Shortfall	4.3
Chicago, IL–IN	2007	Regional modeling to analyze existence of shortfall is underway.	8.6
Milwaukee, WI	2007	Regional modeling to analyze existence of shortfall is underway.	1.6
Dallas, TX	2007 (requested extension)	Local modeling shows nonattainment in 2007.	4.6
Beaumont-Port Arthur, TX	2007 (requested extension)	Local modeling shows nonattainment in 2007.	0.4
Los Angeles (South Coast Air Basin), CA	2010	Approved SIP with commitments for unspecified additional controls.	15.5
			65.9

All of the areas in Table 2 with 2005 or later attainment deadlines will be able to take credit in their attainment demonstrations (or in revisions to their demonstrations) for the expected reductions from both the preexisting standards for HD diesel engines and from today's new standards for HD gasoline engines and vehicles. (EPA has not approved deadline extensions for Dallas and Beaumont/Port Arthur at this time; if their requested extensions (to 2007) are approved, these areas, too, could take credit for today's program). The ability to take credit for the new HD gasoline vehicle standards will be especially important for the several areas with emission ''shortfalls'' (*i.e.*, those for which we have made our proposal to approve their attainment demonstrations contingent on their adoption of new measures for further emission reductions).

In addition to helping 8 areas from Table 2 meet their attainment deadlines (plus Dallas and Beaumont/Port Arthur if they receive a deadline extension to 2005 or later), the new program will help these and all other areas with current or potential future ozone problems to maintain their attainment into the future. This includes at least the 37 areas we expressed concern about earlier. In effect, the emission reductions of this program will reduce the risk that these areas that today are in or approaching attainment will fall back into nonattainment as they face economic development and growth in vehicle travel.

The Program Will Help States Avoid More Costly Measures

In general, the task of states to reach and maintain attainment will be easier and the economic impact on their industries and citizens will be lighter if, as a result of today's new gasoline HD vehicle standards, they are able to forego other, less cost effective programs. Following implementation of the Regional Ozone Transport Rule, states will have already adopted emission reduction requirements for nearly all large sources of VOC and NO_X for which cost-effective control technologies are known and for which they have authority to control. Those that remain in nonattainment therefore will have to consider their remaining alternatives.

Thus, the emission reductions from the standards we are proposing today will ease the need for states to find first-time reductions from the mostly smaller sources that have not yet been controlled, including area sources that are closely related to individual and small business activities. The emission reductions from today's standards will also reduce the need for states to seek even deeper reductions from large and small sources that have previously implemented emission controls.

Conclusion

In summary, the best air quality modeling available shows that, in the absence of further emission controls, many metropolitan areas totaling over 100 million people are at risk of failing to meet the 1-hour ozone NAAQS during the period when these standards will be implemented. Further, as we discussed earlier, ozone concentrations exceeding the 1-hour ozone NAAQS have clearly been shown to endanger public health and welfare. We conclude, therefore, that, given the concentrations of ozone during the time period when this rule will take effect, further control of ozone-forming NO_X and hydrocarbons is justified under the Act.

Today's new national standards for HD gasoline vehicles will result in significant reductions in these pollutants. Thus, this program will be an important part of many states' strategies for meeting their air quality requirements and maintaining attainment into the future, including at least 8–10 of these areas that, as discussed above, will be directly assisted in meeting their upcoming attainment deadlines. At the same time, this program will allow states to avoid less attractive measures that would generally provide less emission reduction at a higher cost.

d. HD Diesel and Gasoline Engines Contribute to Total NO_X and VOC Emissions

HD engines and vehicles are major contributors to nationwide emissions of NO_X and they are moderate contributors to nationwide emissions of VOC (estimates of a geographic area's emissions are called ''emission inventories''). The RIA for this rule describes in detail recent emission inventory modeling completed by EPA for this rule. Table 3 summarizes EPA's current estimates for national NO_X and VOC contributions from major mobile source categories.

TABLE 3.—ESTIMATED 2000 NATIONAL NO_X AND VOC EMISSIONS

[Thousand short tons per year]

Emission source	NO_X	NO_X (percent)	VOC	VOC (percent)
Light-Duty Vehicles	4,420	18	4,098	25
Heavy-Duty Vehicles	3,759	15	355	2
Nonroad Engines and Vehicles	5,343	22	2,485	15
Other (Stationary Point and Area Sources)	10,656	44	9,567	58
Total Nationwide Emissions	24,178		16,505	

Table 3 indicates that HD gasoline and diesel vehicles currently represent about 15 percent of national NO_X emissions and two percent of national VOC emissions. Moreover, as described in more detail in the RIA, the local heavy-duty vehicle NO_X contributions are higher than the national average in many important urban areas.

The RIA also contains updated emission inventory modeling for HD vehicles in future years. The results show that without additional HD NO_X control beyond the 1998 standards, national NO_X emissions from HD vehicles would decline for the next few years but that this trend would reverse around 2006. After that, without additional emission controls, NO_X emissions from the HD vehicle fleet would again increase as a result of future growth in the HD vehicle market. A similar trend is seen for national NMHC emissions from HD vehicles—we project that NMHC emissions will decrease until around 2009, after which growth in numbers of vehicles will offset emission reductions and NMHC emissions from HD vehicles will increase (see Chapters 6 and 7 of the RIA).[19]

2. Need for Particulate Matter Reductions

a. PM Emissions Cause Adverse Health and Welfare Effects

Particulate matter is the general term for the mixture of solid particles and liquid droplets found in the air.

Particulate matter includes dust, dirt, soot, smoke, and liquid droplets that are directly emitted into the air from natural and manmade sources, such as windblown dust, motor vehicles, construction sites, factories, and fires. Particles are also formed in the atmosphere by condensation or the transformation of emitted gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. Motor vehicle particle emissions and the particles formed by the transformation of motor vehicle gaseous emissions (secondary particles) tend to be in the fine particle range. Fine particles (those less than 2.5 micrometers in diameter) are a health concern because they easily reach the deepest recesses of the lungs.

Scientific studies suggest that airborne particles likely play a causal role in a range of serious respiratory health problems. The key health effects categories associated with particulate matter include premature mortality, aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days), aggravated asthma, acute respiratory symptoms (*e.g.,* coughing, difficult or painful breathing, chronic bronchitis, and shortness of breath). Exposure to fine particles is associated with such health effects as premature mortality or hospital admissions for cardiopulmonary disease. PM also causes damage to materials and soiling and is a major cause of substantial visibility impairment in many parts of the U.S.

These health and environmental effects are discussed further in the RIA, and additional information may be found in EPA's Air Quality Criteria Document for particulate matter.[20] In addition to the harmful health effects that are linked to particulate matter, diesel exhaust as a whole is also suspected of causing serious health effects. (See Section II.A.3. below)

b. Current and Future Compliance With the PM_{10} NAAQS

Compliance with the current PM_{10} standard continues to be a problem. The most recent PM_{10} monitoring data indicates that 15 counties designated PM_{10} nonattainment counties, with a population of 8.6 million in 1996, violated the PM_{10} NAAQS in the period 1996–1998. The RIA lists these 15 counties. The recent PM modeling analysis we performed for the Tier 2 rulemaking predicts that without additional controls, 8 of these areas, comprising a population of 7.8 million, are at high risk of failing to meet or maintain the PM_{10} NAAQS even with Tier 2 and other controls currently in place. An additional 5 areas, with a population of almost 17 million, are at significant risk of failing to maintain the NAAQS without further reductions in PM_{10}.[21]

c. Contribution of HD Diesel and Gasoline Vehicles to Particulate Matter

Because we are not changing the particulate matter emission standards for HD vehicles in this rule, the effect of this rule on PM results primarily from reductions in NO_X emissions and in turn reductions in the secondary formation of nitrate particles in the atmosphere. Most available modeling of PM emissions, however, focuses only on direct (primary) emissions of PM.

We have not attempted to quantify the contribution of HD vehicles to the secondary nitrate particles formed from the large NO_X emissions of these vehicles in this final rule. We are convinced that this contribution is substantial, especially in regions of the country where ammonia levels in the air are relatively high (NO_X reacts with ammonia to form ammonium nitrate particles). Similarly, we believe that the very significant NO_X reductions from HD diesel and gasoline vehicles that will result from the 2004 standards will also result in important reductions in the HD contribution to nitrate PM.

3. Air Toxics From HD Engines and Vehicles

In addition to contributing to the health and welfare problems associated with exceedances of the National Ambient Air Quality Standards for ozone and PM_{10}, emissions from HD diesel and gasoline vehicles include a

[19] The emission inventory modeling we performed for this rule includes the excess emissions that occurred as a result of certain HD diesel engines manufactured between 1988 and 1998. These engines were at issue in the "consent decrees" involving certain HD diesel engine manufacturers, as discussed in Section I.C. above.

[20] U.S. EPA, 1996, Air Quality Criteria for Particulate Matter, EPA/600/P–95/001aF.

[21] See the Regulatory Impact Analysis for the Tier 2/Gasoline Sulfur final rule, which is available in the docket for this rule and through the Office of Transportation and Air Quality web page at www.epa.gov/oms.

number of air pollutants that increase the risk of cancer or have other negative health effects. These air pollutants include benzene, formaldehyde, acetaldehyde, 1,3-butadiene, and diesel exhaust. For several of these pollutants, motor vehicle emissions are believed to account for a significant proportion of total nation-wide emissions. All of these compounds are products of combustion; benzene is also found in nonexhaust emissions from gasoline-fueled vehicles. The reductions in hydrocarbon emissions from HD vehicles resulting from today's program will further reduce the potential cancer risk and other health risks from these air toxics because many of these pollutants are themselves VOCs. Diesel engine exhaust is also a potential concern because of its possible carcinogenic and mutagenic effects on people.

We are addressing the issues raised by air toxics from motor vehicles and their fuels in a separate rulemaking, pursuant to section 202(l)(2) of the Act. Our proposed rule, which was signed July 14, 2000, proposes a list of 21 mobile source air toxics as well as standards to limit on the amount of benzene in gasoline. It also sets out a Technical Analysis Plan whereby EPA will continue to conduct research and analysis and to revisit the need for and appropriateness of additional controls on toxic emissions from motor vehicles and fuels in a 2004 rulemaking.

B. Today's Action Will Result in Large Emission Reductions

1. Reductions Due to Emission Standards for Heavy-Duty Diesel Engines

We have made several improvements in our analysis of HDDE emissions since our earlier analyses (in the original 1997 rulemaking and in the 1999 proposal). Chapter 6 of the RIA provides a detailed explanation of the methodology we used to estimate the emission reductions that will result from the requirements for heavy-duty diesel engines associated with today's action. The primary improvement is to include the previously unknown excess emissions from many engines between 1988 and 1998. These engines were at issue in the ''consent decrees'' involving certain HD diesel engine manufacturers, as discussed in Section I.C. above (''How Does This Action Relate to the Consent Decrees?''). As result of this modeling change, our estimates of the contribution of the emissions of pre-1999 engines rose significantly relative to those in the proposal, which did not include these excess emissions.

The other important improvement in the modeling resulted from a better understanding of the likely balance manufacturers will make in their efforts to control both NO_X and NMHC in order to meet the combined NO_X + NMHC standard. Since some current engines are already able to meet very low NMHC levels, we expect that manufacturers will generally be able to design for NO_X levels slightly less stringent than we had originally expected and still meet the combined standard. Our modeling for the final rule thus results in slightly less NO_X control as well as somewhat more NMHC control than did our analysis for the proposed rule.

Table 4 and Figures 1 and 2 show our projections of total national NO_X and NMHC emissions and the estimated emission reductions from HD engine controls in future years. The projected emissions decline over the next several years, due to implementation of stricter controls, but then, unless there are additional controls (including the HD diesel NO_X controls reaffirmed in this rule), they begin to rise due to growth in the number of vehicle miles traveled. Without additional emission controls, by the 2005–2010 time frame, the NO_X and NMHC emissions from HD diesels will be on an accelerating rise into the future. With the diesel engine emission controls reaffirmed in today's action, we believe that NMHC emissions from these engines will not return to the 2005 ''without-control'' levels until after 2020, and that NO_X emissions will not return to the 2005 ''without-control'' levels until after 2030.

TABLE 4.—ESTIMATED NATIONAL NO_X AND NMHC EMISSIONS AND EMISSION REDUCTIONS FROM HEAVY-DUTY DIESEL VEHICLES

[Thousand short tons per year]

Year	NO_X			NMHC		
	Without new controls	With new controls	Emission reduction	Without new controls	With new controls	Emission reduction
2005	2,450	2,260	186	178	168	10
2010	2,460	1,820	635	177	142	35
2015	2,700	1,750	949	208	156	52
2020	2,990	1,810	1,180	238	173	65
2030	3,610	2,090	1,520	286	203	84

Figure 1 – Projected National Exhaust NOx Emissions from HDDEs

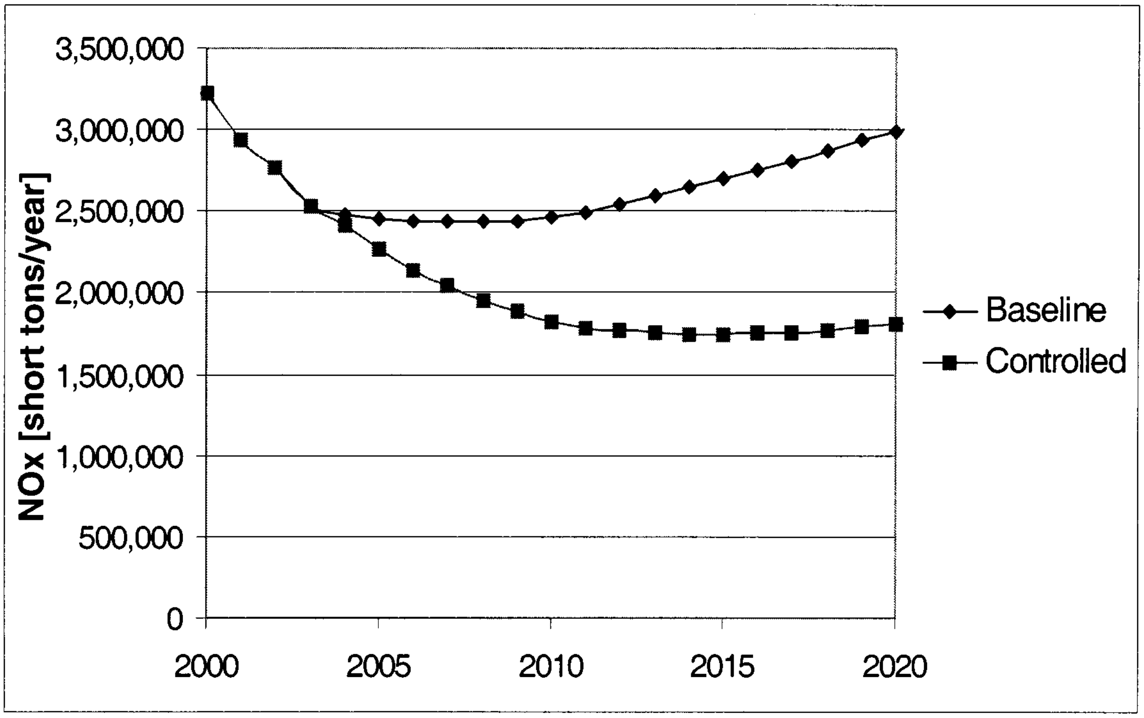
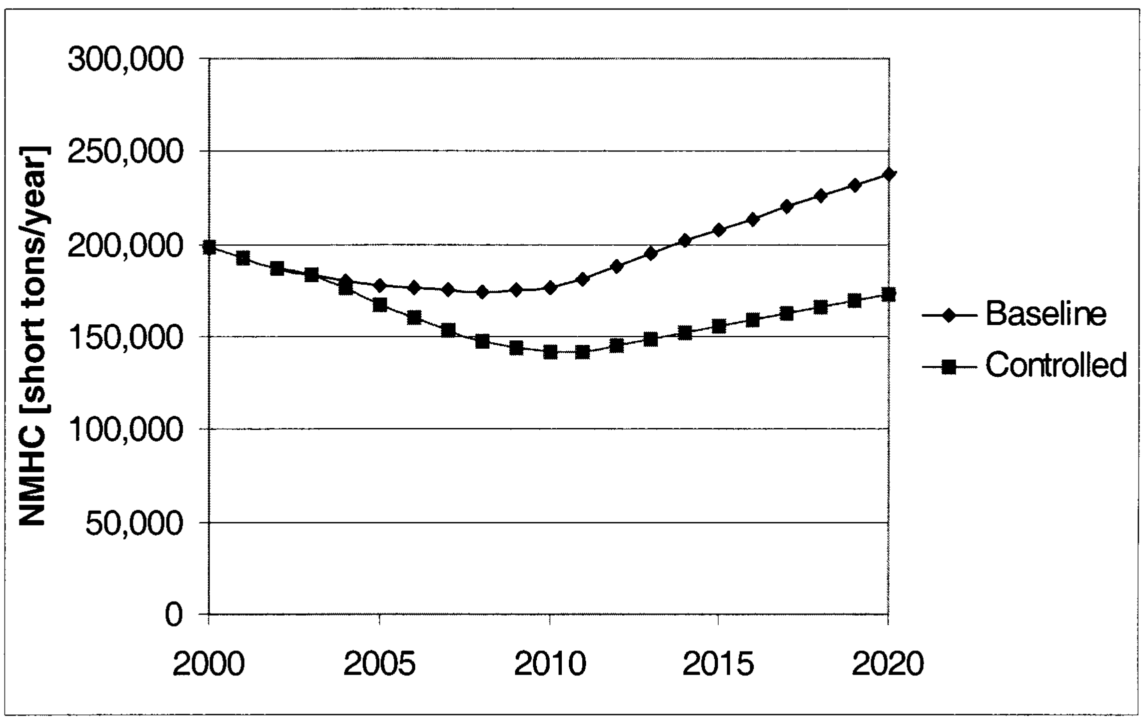


Figure 2 – Projected National Exhaust NMHC Emissions from HDDEs



BILLING CODE 6560–50–C

Although this rule does not require reductions in direct PM emissions, the standards are expected to result in significant reductions in the concentrations of secondary PM. Secondary PM is formed when NO_X reacts with ammonia in the atmosphere to yield fine particles in the form of ammonium nitrate. The chemistry governing the conversion of NO_X to secondary PM is very complex and varies from region to region. As a result, we do not present an estimate of the tons of PM reduction that can be expected from this program. However, because of the large NO_X reductions that this program will cause, we believe that the reductions in NO_X-related PM will also be significant.

The term ''hydrocarbons'' includes many different chemical compounds. Analysis of hydrocarbons in the ambient air shows that many of these compounds can be classified as toxic air emissions including benzene, formaldehyde, acetaldehyde, and 1,3-butadiene. Hydrocarbons from HD diesel engines include approximately 1.1 percent benzene, 7.8 percent formaldehyde, 2.9 percent acetaldehyde, and 0.6 percent 1,3-butadiene. Therefore, the 117,000 tons per year reduction in NMHC we project for 2030 would result in about a 14,000 tons per year reduction in air toxics. These issues are discussed in more detail in the RIA.

EPA also believes the regulations in today's action will tend to reduce noise. One important source of noise in diesel combustion is the sound associated with the combustion event itself. When a premixed charge of air and fuel ignites, the very rapid combustion leads to a sharp increase in pressure, which is easily heard and recognized as the characteristic sound of a diesel engine. The conditions that lead to high noise levels also cause high levels of NO_X formation. Fuel injection changes and other NO_X control strategies we expect manufacturers to pursue in meeting HD diesel standards should generally have the effect of reducing engine noise.

2. Reductions Due to Emission Standards for Heavy-Duty Gasoline Vehicles and Engines

In evaluating the environmental impact of today's heavy-duty gasoline engine and vehicle standards for 2005 and later, we developed estimates of exhaust NO_X and NMHC emissions from HDGVs (excluding California) both with and without the effect of the standards. The analysis performed to estimate the emission reductions from HD gasoline vehicles and engines in this final rule is identical to the analysis performed for the Agency's recently announced proposal to reduce emissions from HD gasoline engines in the 2007 time frame (published on June 2, 2000 (65 FR 35430)). This analysis is different than the analysis we performed for the proposed rulemaking. In the proposal we used the EPA MOBILE5 emission model, with in-use adjustment factors developed specifically for the proposal. As discussed in the RIA, the draft MOBILE6 emission rates for HD gasoline engines and vehicles have been completed, so we use those emission rates in this final rule. Because MOBILE6 is not complete, we used the updated emission rates from MOBILE6 in MOBILE5 for our analysis. The EPA report in which these emission rates are reported has gone through an external stakeholder review.[22] For this final rule we use zero-mile deterioration rates for 1988 and later model year HD gasoline exhaust emissions developed for the draft MOBILE6 emission model. The impact of this change on this final rule, as compared to the proposal, was to decrease the estimated in-use emission rates, for both the baseline and controlled scenarios, for 1998 and later model year HD gasoline engines. Full details of the environmental impact analysis can be found in Chapter 7 of the RIA. The following paragraphs summarize the key results.

Table 5 and Figures 3 and 4 show our projections of exhaust NMHC+NO_X emissions from HD gasoline vehicles both with and without the standards established today. As the table and figures show, without further controls we project that NO_X emissions will increase from current levels without further controls. With implementation of the standards, we expect that NO_X emissions from HDGVs will begin decreasing immediately in 2005 and will continue to decrease far into the future. In the case of exhaust NMHC emissions, we project that in the absence of new controls, they will decline over the next several years but then begin to increase beginning around 2010. With implementation of the standards, we expect the exhaust NMHC emissions from HDGVs to decrease significantly from ''without control'' emissions. Although we project that these emissions will level off and gradually begin to rise again after 2020, the level of emissions will remain well below ''without control'' emissions well past 2030.

TABLE 5.—ESTIMATED NATIONAL NO_X AND NMHC EMISSIONS AND EMISSION REDUCTIONS FROM HEAVY-DUTY GASOLINE VEHICLES

[Thousand tons per year]

Year	NO^X			NMHC		
	Without controls	With controls	Emission reduction	Without controls	With controls	Emission reduction
2005	378	362	16	70	69	1
2010	409	258	151	61	48	13
2015	441	199	242	62	41	21
2020	476	172	304	68	40	28
2030	539	152	387	80	43	37

BILLING CODE 6560–50–P

[22] ''Update of Heavy-Duty Emission Levels (Model Years 1988-2004+) for use in MOBILE6'', EPA document EPA–420–R–99–010.

Figure 3 – Projected Exhaust NOx Emissions from HDGVs

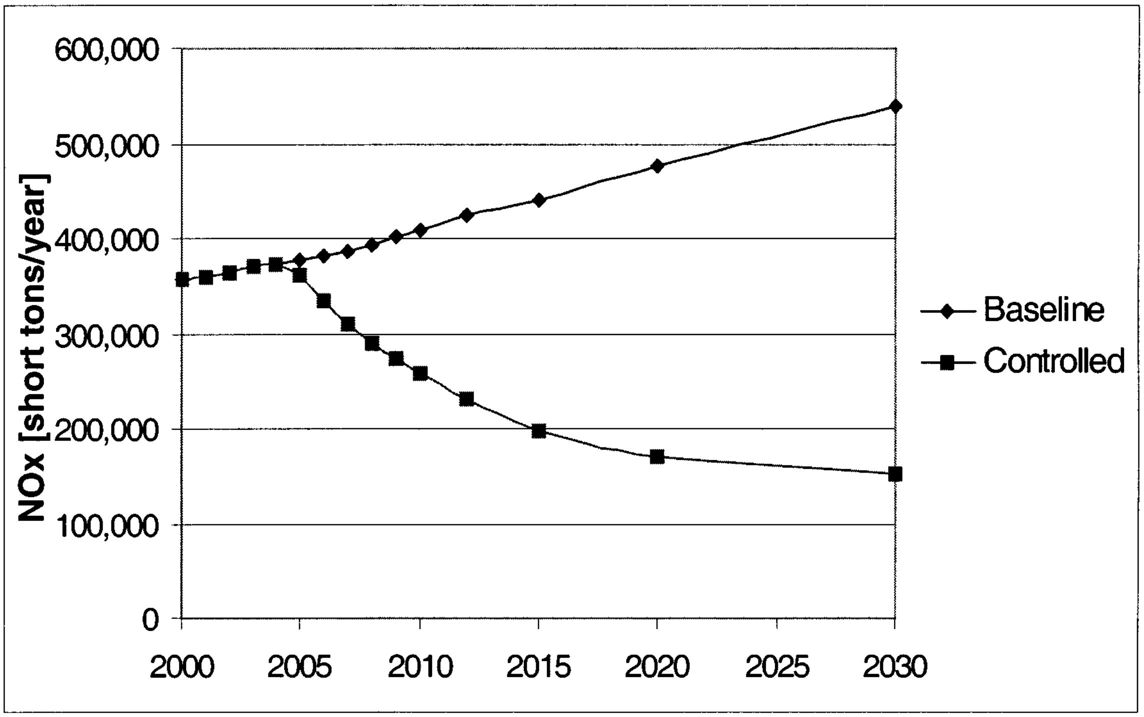
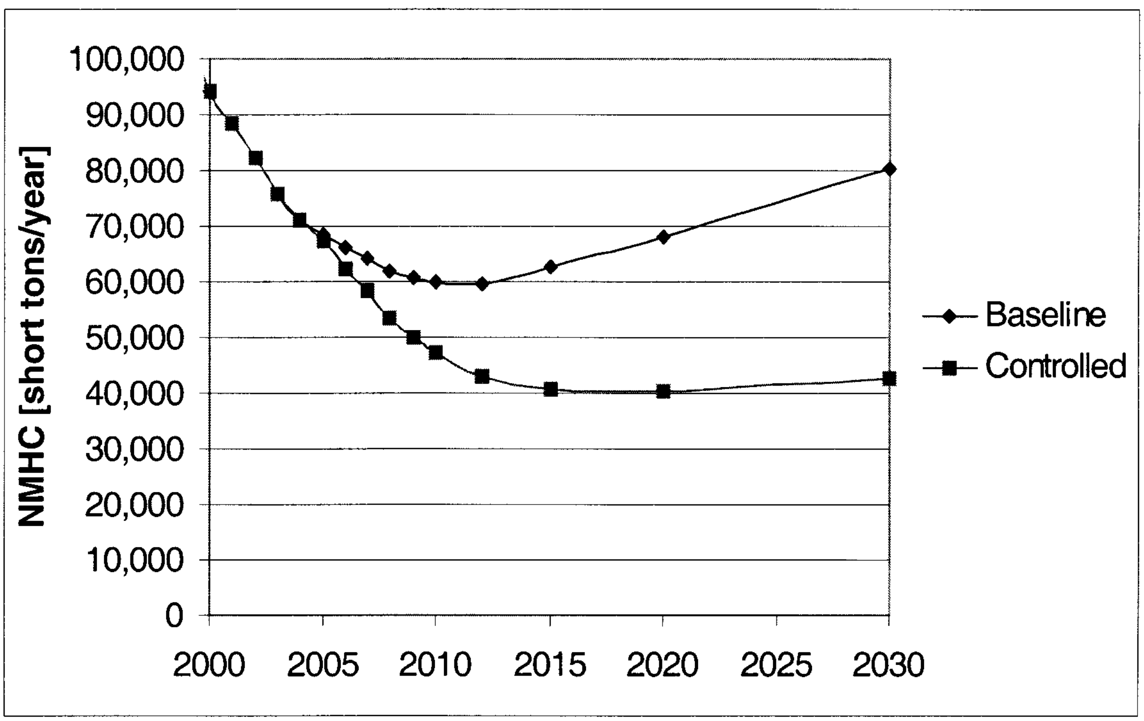


Figure 4 – Projected 49-State Exhaust NMHC Emissions from HDGVs



BILLING CODE 6560–50–C

As with HD diesel engines, we believe that the NO_X reductions that will result from these standards will result in a corresponding reduction in secondary nitrate PM formed from NO_X. Similarly, we believe that the NMHC reductions will result in corresponding reductions in several toxic air pollutants.

C. Benefits of the Supplemental Requirements and In-Use Control Measures of Today's Action

We consider that the supplemental test procedure and in-use control measures of today's action will play a vital role in achieving the full emission reductions expected from the diesel and gasoline engine standards promulgated or reviewed today. As described elsewhere in this preamble, these measures include the following:

- new supplemental test procedure requirements for diesel engines,
- onboard diagnostics (OBD) requirements for vehicles (and engines intended for vehicles) rated at less than 14,000 lbs GVWR, and
- the ''CAP–2000'' in-use testing requirements for gasoline vehicles below 14,000 lbs GVWR.

The new supplemental test procedure requirements will ensure that engines are designed to meet the appropriate standards under a broad range of operating conditions. The in-use testing requirements will ensure that engines meet the appropriate standards throughout their useful lives. Finally, the OBD requirements will help ensure that engines in-use continue to operate according to design intent and that designs are durable and robust in the field. If vehicles and engines malfunction or deteriorate in ways that are not noticed by the driver, emissions may be far above the design intent of the engine or vehicle for thousands, if not tens of thousands of miles. On-board diagnostic systems are uniquely suited to identify such malfunctions. Such identification is a very important part of ensuring that the engines and vehicles continue to operate as they were designed and thus continue to provide the air quality benefits envisioned by this program.

For example, we expect that use of EGR will become increasingly widespread as manufacturers comply with the 2004 diesel standards. The EGR systems will likely cut engine-out emissions by as much as one-half. Should an EGR system malfunction in the absence of OBD provisions, the emissions could double without the driver becoming aware of the malfunction (since a non-functional EGR system may not change the performance of the vehicle, depending upon the nature of the specific malfunction). A similar situation exists for gasoline (Otto-cycle) vehicles and engines, which depend on catalytic converters and evaporative emission control systems. A failed or deteriorated catalyst, or a defective evaporative leak detection monitor, can result in a large increase in emissions. Without the OBD system, those emissions may never be identified and the malfunctions would probably never be repaired.

Benefits such as those described above are not easily quantified but are critical to the success of our program as a whole. Without any one of these compliance and in-use control measures, the benefits of today's action will undoubtedly be diminished, and perhaps to a very significant degree.

As we discussed in the proposal, we are also very concerned that additional factors may jeopardize the large emission reductions estimated in today's rule: the lack of OBD systems for HD vehicles rated at greater than 14,000 lbs GVWR; the lack of an effective in-use program for all HD engines and vehicles; and the lack of supplemental test procedures for HD gasoline engines similar to those being finalized today for diesels. As we discuss in the Response to Comments document, and in the proposal, we received broad support from states, environmental organizations, and industry to move forward with developing a proposal to address these important issues through a subsequent rulemaking process.

III. Content of the Final Rule

The following is a description of the regulations being adopted in this final rule, with any changes from the proposal also noted. A summary of the requirements is contained in preamble Section I., above. A full description of our analysis of comments received on the proposal, and our rationale for our response to those comments and any subsequent change to the final rule from the proposal, are contained in the Response to Comments for the rule.

A. What Are the Requirements for Heavy-duty Diesel Engines?

This section summarizes those actions which are being finalized in today's rule which will effect heavy-duty diesel engines.

1. Review of 2004 NMHC+NO_X Standard

One of the principal components of today's final action is the decision that the 2004 NMHC+NO_X standards for HDDE continue to be appropriate under the Clean Air Act. In our 1997 final rule (62 FR 54694) which established the 2.4 g/bhp-hr NMHC+NO_X standards (or optionally a 2.5 g/bhp-hr NMHC+NO_X with a limit of 0.5 g/bhp-hr NMHC) we agreed to perform a technological review of the standards to review the standards' appropriateness. Based on the information presented in our NPRM, as well as our analysis of comments received on the proposal and the technological feasibility and cost discussions below, we have determined these standards continue to be appropriate for the 2004 model year. As part of the reaffirmation process, EPA also examined the relationship between on-highway diesel fuel quality and the 2004 emission standards. Based on the data presented in the proposal, and our analysis of the comments received on the NPRM, no changes in on-highway diesel fuel quality are necessary or will be provided for the 2004 model year. Therefore, we have decided not to reconsider or revise these standards.

2. New Requirements

The October 29, 1999 NPRM for HDDEs contained a proposal for a new set of supplemental test requirements which would take effect in model year 2004 concurrent with the existing 2004 FTP standards (NMHC+NO_X standard of 2.5g/bhp-hr, PM standard of 0.10 g/bhp-hr for all HDDEs except urban buses, etc.). The proposed supplemental tests included the NTE, the supplemental steady-state test, and additional requirements. In the NPRM, we expressed concern regarding our ability to provide HDDE manufacturers with the four years of lead time required by the Clean Air Act for the implementation of the supplemental requirements in model year 2004 considering our compressed rulemaking schedule (See 64 FR 58475). Clean Air Act Section 202(a)(3)(C) requires that ''Any standard promulgated or revised under this paragraph and applicable to classes or categories of heavy duty vehicles or engines shall apply for a period of no less than 3 model years beginning no earlier than the model year commencing 4 years after such revised standard is promulgated.'' Due to this CAA requirement and the timing of this final rule, the Agency is not able to promulgate a mandatory supplemental program with a model year 2004 implementation. Due to stability concerns raised by engine manufacturers, EPA will implement the supplemental requirements beginning in 2007. In the time frame from 2004 through 2006, the Agency has existing regulatory and enforcement authority, and policy guidelines which we are confident will ensure the majority of the environmental benefits of the supplemental test procedures will be met. As discussed below this includes the existing CAA prohibition on the use of defeat devices, and our existing guidance policy on the use of AECDs and defeat devices. With these policies and agreements in place, the Agency sees no need to establish a voluntary program which would implement the supplemental test procedures for the time frame prior to 2007. The following is a detailed discussion of the tools available to the Agency to ensure that the anticipated environmental benefits of the supplemental test procedures will occur prior to model year 2007.

Section I.C. of this preamble provides background information on the HD Consent Decrees (CD) which the Agency established with a number of HDDE manufacturers in 1998. The great majority of heavy-duty diesel engines are manufactured by companies covered by a CD—approximately 90 percent of the estimated model year 1999 total HDDE U.S. production, and greater than 95 percent of heavy-heavy duty diesel engines which power the line-haul truck application. The heavy heavy-duty diesel engines are the largest on-highway engines and accumulate the most miles of usage, therefore the engines manufactured by CD companies represent the vast majority of HDDE emissions.

The majority of the engines subject to the CDs must meet a not-to-exceed emission limit of 1.25 times the 2004 HDDE standards, as well as a number of additional supplemental requirements, no later than October 1, 2002 (these are sometimes referred to as ''pull-ahead'' engines). The CD manufacturers must produce these pull-ahead engines for two years from the date they are in full compliance with all requirements of the Consent Decrees. Therefore, the pull-ahead engines will be manufactured for what is essentially model years 2003 and 2004, and possibly beyond, depending on whether the engines produced by October 2002 are in full compliance with the Consent Decrees. During the rulemaking process, several of the CD companies made public statements that they were having difficulty in preparing to meet all the CD requirements for pull-ahead engines. If these companies cannot manufacturer engines meeting all the CD requirements by October, 2002, the Agency believes that under the terms of the Consent Decrees, the noncomplying companies will be required to manufacturer pull-ahead engines beyond model year 2004 until they are in full compliance for two straight years.

For engines which meet all of the Consent Decree requirements as of October 2002 and therefore would no longer be subject to these requirements for engines produced after October of 2004, EPA would not expect manufacturers to change their designs in ways that would noticeably increase emissions and will closely scrutinize designs and use our defeat device prohibition and guidance policy to assure this does not happen.[23]

Therefore, regardless of whether the CD provisions terminate after model year 2004, the Agency believes the CD manufacturers will continue to manufacture engines for model years 2005 and 2006 which demonstrate compliance with the 2004 standards and satisfy the emission performance provisions of the Consent Decrees.

There are a number of HDDE companies not covered by a CD, and not all engines covered by a CD must meet a pull-ahead requirement which includes supplemental test procedure limits at the 2.5g/bhp-hr $NMHC+NO_X$ level. These engines are concentrated in the light-heavy and medium-heavy-duty diesel market, therefore their overall emission impact is relatively small—less than 25 percent of the emissions from a given year's total HDDE production based on recent certification estimates. However, we will continue to apply our existing statutory authority, regulatory authority, and policy guidance to those engines not covered by a consent decree between model years 2004 and 2006 to ensure that these engines comply with all applicable 2004 emission standards and control emissions over the wide range of anticipated operating conditions.

In October of 1998, EPA issued guidance policy on AECDs and the defeat device prohibition for HDDEs. This guidance document includes the recommended use of the not-to-exceed test procedure and the Euro-3 steady state test (on which the 2007 supplemental steady state test is based) as screening tools for the manufacturers to use to provide the Agency additional assurance they are meeting all applicable regulatory requirements. One company not covered by a Consent Decree has already voluntarily submitted documentation and test data for their 2000 model year HDDE engine family as requested in the Agency's October 1998 guidance regarding emissions during the Euro-3 steady state test and not-to-exceed emission performance, including a voluntary statement of compliance with NTE and Euro-3 emission limits.[24] The Agency anticipates engine manufacturers will submit the requested information for model years up to 2006, after which the NTE and supplemental steady state test procedures will be mandatory certification requirements.

As noted above, we are adding two supplemental sets of requirements for HDDEs: (1) A supplemental steady-state test (SSS); and (2) Not-To-Exceed requirements (NTE). Like current emission requirements, these new requirements apply to certification, production line testing, and vehicles in actual use. These supplemental requirements will take effect with the 2007 model year. All existing compliance provisions (*e.g.,* warranty, certification, production line testing, recall) are applicable to these new requirements as well, except as noted in the regulations. The supplemental requirements establish new emission standards for HDDEs, and these new standards will be enforced in the same manner as the preexisting FTP standard. The new SSS will become part of the Agency's existing selective enforcement audit (SEA) program; however, as discussed in the Response to Comments document, the NTE, as well as the MAEL and EPA selected steady-state ''mystery points'' discussed below have been excluded from the SEA regulations. In addition, we are finalizing a third supplemental test procedure for heavy-duty diesel engines—a Load Response Test—as a data submittal requirement only, which will take effect with the 2004 model year. These supplemental requirements will provide assurance that engines are designed to achieve the expected level of in-use emissions control over all expected operating regimes in-use. These procedures are described in greater detail in the following sections.

a. Not-to-Exceed Test Under Expanded Conditions

We are finalizing a Not-To-Exceed (NTE) requirement applicable to HDDEs. The NTE approach establishes an area (the ''NTE control area'') under the torque curve of an engine where emissions must not exceed a specified value for any of the regulated pollutants.[25] The NTE requirement would apply under any engine operation conditions that could reasonably be expected to be seen by that engine in normal vehicle operation and use, as well as a wide range of real ambient conditions. The NTE control area, emissions requirements, and ambient conditions and test procedures for HDDEs are described below. These requirements would take effect starting in the 2007 model year and would apply to new engines as well as in use throughout the useful life of the engine.

[23] See ''Heavy-duty Diesel Engines Controlled by Onboard Computers: Guidance on Reporting and Evaluating Auxiliary Emission Control Devices and the Defeat Device Prohibition of the Clean Air Act'', October 15, 1998. Document available in EPA Air Docket A–98–32.

[24] See—Statement of Compliance for Engine Family YNDXH04.6FAB, available in EPA Air Docket A–98–32.

[25] Torque is a measure of rotational force. The torque curve for an engine is determined by an engine ''mapping'' procedure specified in the Code of Federal Regulations. The intent of the mapping procedure is to determine the maximum available torque at all engine speeds. The torque curve is merely a graphical representation of the maximum torque across all engine speeds.

At the time of certification manufacturers would have to submit a statement that its engines will comply with these requirements under all conditions which may reasonably be expected to occur in normal vehicle operation and use. The manufacturer must provide a detailed description of all testing, engineering analysis, and other information that forms the basis for the statement. This certification statement must be based on testing and/or research reasonably necessary to support such a statement. This supporting information must be submitted to EPA at certification upon request; manufacturers are not necessarily required to submit NTE test data during certification. Start up conditions are excluded from NTE testing.

The NTE test procedure can be run in a vehicle on the road or in an emissions testing laboratory using an appropriate dynamometer. The test itself does not involve a specific driving cycle of any specific length (mileage or time), rather it involves driving of any type which could reasonably be expected to occur in normal vehicle operation that could occur within the bounds of the NTE control area. The vehicle (or engine) is operated under conditions that may reasonably be expected to be encountered in normal vehicle operation and use, including operation under steady-state or transient conditions and under varying ambient conditions. Emissions are averaged over a minimum time of thirty seconds and then compared to the applicable emission limits. The applicable ambient conditions and the methodology for correcting emissions results for temperature and/or humidity are described in the following section. The test procedure can be found in § 86.1370–2007 of the regulations.

Examples of the NTE control area are illustrated in Figures 5 and 6. With the exception of two limited regions under the torque curve (described below), the NTE control area for diesels includes all engine operation at or above 30 percent of the maximum torque value of the engine and all engine operation at or above a specific engine speed calculated based on the maximum power of the engine.[26] Two small regions are excluded (or ''carved out'') from the NTE control area. As described in the proposed rule, these regions are excluded due to the technical challenges associated with controlling emissions in these areas, as well as the fact that engines do not tend to spend a lot time operating in these regions. The combination of the NTE control area and the emission limits within the zone effectively accomplish the Agency's goals of ensuring that emissions are controlled over a wide range of in-use operation. First, we exclude the area under the torque curve that falls below the curve representing 30 percent of the maximum power value of the engine (as distinguished from maximum torque). This region is carved out for all pollutants. Second, a PM-specific region is ''carved out'' of the NTE control area. The PM-specific area of exclusion is generally in the area under the torque curve where engine speeds are high and engine torque is low, and can vary in shape depending upon several speed-related criteria and calculations detailed in the regulations.

Examples of the NTE control area, including the areas excluded from the zone, are shown below in Figures 5 and 6. The A, B, and C engine speeds are the same as those defined for the supplemental steady state test and described in the regulations. Note that there are two possible constructions of the PM ''carve-out'' detailed in the regulatory language. The example in Figure 5 shows the PM carve-out as it would look if the C speed is below 2400 revolutions per minute (rpm), while Figure 6 shows the construct of the PM carve-out if the C speed is above 2400 rpm.

BILLING CODE 6560–50–P

[26] The maximum torque value and maximum power of the engine are derived as part of the engine mapping procedures specified in 40 CFR 86.1332.

Figure 5 – Example NTE Control Area for Heavy-Duty Diesel Engines – C Speed < 2400 rpm

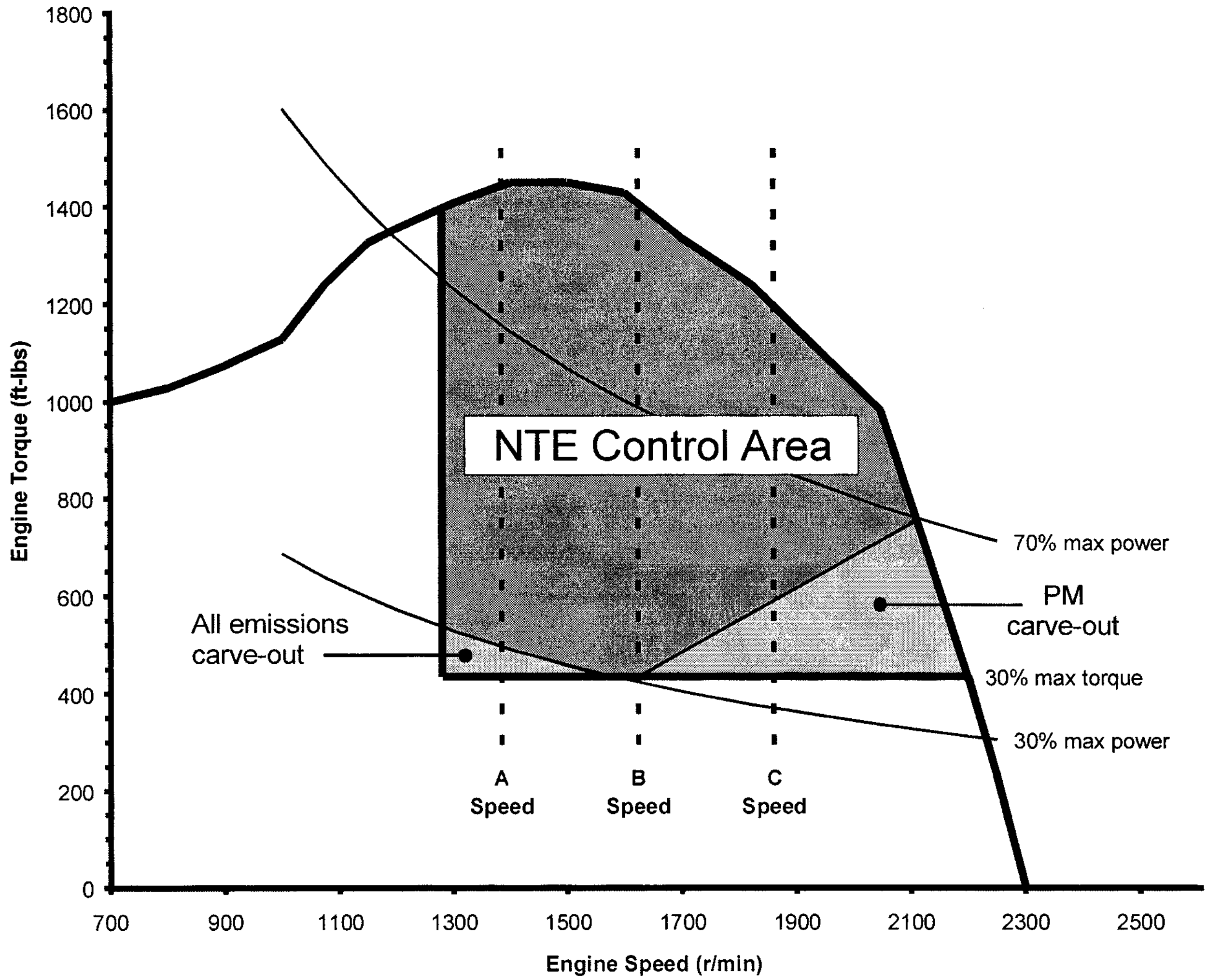
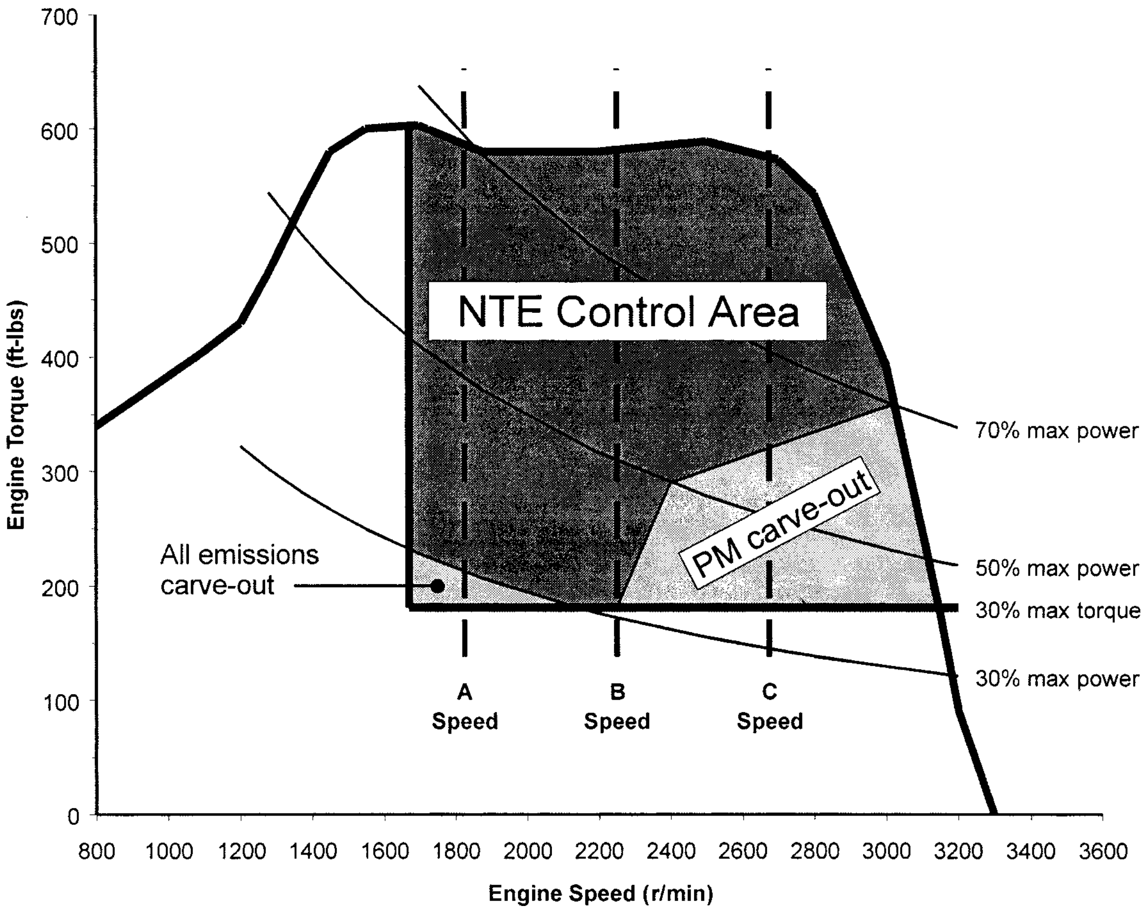


Figure 6 – Example NTE Control Area for Heavy-Duty Diesel Engines – C Speed > 2400 rpm



BILLING CODE 6560–50–C

Within the NTE control area, emissions of each of the regulated pollutants (NMHC + NO_X, CO, PM), when averaged over a minimum time of 30 seconds, must not exceed 1.25 times the applicable FTP standards (or FEL if ABT is used). In addition, manufacturers must meet either a smoke limit or an opacity limit within the NTE control area. The filter smoke limit is 1.0 on the Bosch smoke number scale. The alternative opacity limits is a thirty second average smoke opacity of four percent for a five inch path for transient testing and a ten second average smoke opacity of four percent for a five inch path for steady state testing.

b. Deficiencies for NTE Emission Standards

Today's action establishes NTE deficiency provisions for HDDEs similar to the deficiency provisions that apply to OBD systems. This will allow the Administrator to accept a HDDE as compliant with the NTE standards even though some specific requirements are not fully met. We are finalizing these NTE deficiency provisions because we believe that, despite the best efforts of manufacturers, for the first few model years it is possible some manufacturers may have technical problems that are limited in nature but cannot be remedied in time to meet production schedules. This provision will be available for manufacturers through model year 2009. The NTE deficiency provision will only be considered for failures to meet the NTE requirements. EPA will not consider an application for a deficiency for failure to meet the FTP or Supplemental Steady State standards.

The NTE requirements are a new regulatory provision HDDE manufacturers have not been required to meet in the past. The NTE, in combination with the expanded conditions requirements, require compliance with the standard over a wide range of engine operating conditions. Given the complexity of designing, producing, and installing the components and systems that are needed to comply with the emission standards, a number of HDDE manufacturers have expressed concern with their ability to comply with all aspects of the NTE. In particular, manufacturers have expressed concern regarding compliance at the higher ambient temperature and altitude conditions that are covered by the NTE test for higher engine family horsepower ratings under high load operation. While we believe that full compliance can and in most cases will be achieved by model year 2007 given other changes in the NTE standards we have made to address these issues, we also believe that some level of relief may be needed to allow for certification of some engines that, despite the best efforts of the manufacturers, are deficient in their ability to achieve the NTE emission requirements.

As discussed elsewhere in this final rule, manufacturers have identified a number of technical issues which they anticipate manufacturers having difficulties overcoming. These include the availability of sensors and actuators with the necessary accuracy, precision, and repeatability to control engine and emission control hardware to the degree necessary to meet the NTE requirements under high load conditions during elevated temperatures and altitudes. Another example raised by some engine manufacturers was concerns with the limitation of current generation turbochargers, including compressor exit temperature limits and turbine wheel speed limits. While EPA projects that improvements in sensors, actuators and turbocharger materials will reduce these limitations in the future, manufacturers are concerned improvements may not be sufficient or may not occur early enough to allow the NTE requirements to be met for all engine families under certain operating conditions by 2007. These issues are discussed in more detail in the Response to Comments document and in the docket for this rulemaking.[27] The NTE deficiency provision will provide additional lead time to manufacturers to resolve those technical compliance issues, if such lead time is needed.

NTE deficiencies will be granted only if compliance would be infeasible or unreasonable considering such factors as, but not limited to: technical feasibility of the given hardware, need for more lead time, or production cycles including phase-in or phase-out of engine designs.

Specific NTE deficiencies should not be carried over from the previous model year except where unreasonable hardware or software modifications would be necessary to correct the deficiency, and the manufacturer has demonstrated an acceptable level of effort toward compliance as determined by the Administrator. Furthermore, EPA will not accept any NTE deficiency requests that result from the complete failure of a major emission control component or system to operate (''major'' emission control components being those for exhaust aftertreatment devices, exhaust gas recirculation system components, turbo-machinery components, other emission control hardware, or other sensor or actuator hardware).

An NTE deficiency request must include a description of all AECDs which would be used by the engine to comply with the deficiency being requested, if applicable. In addition, the NTE deficiency request must include a description of the control system the manufacturer will use to maintain regulated NTE emissions to the lowest practical level.

The EPA NTE deficiency allowance should only be seen as an allowance for minor deviations from the NTE requirements. The NTE deficiency provisions contained in this final rule would allow a manufacturer to apply for relief from the NTE emission requirements under limited conditions. EPA expects that manufacturers should have the necessary functioning emission control hardware in place to comply with the NTE, especially given the lead time afforded to the NTE requirements in this final rule. Nonetheless, we recognize that there may be situations where a deficiency(ies) is necessary and appropriate. Deficiencies will be approved on an engine model basis, for a single model year, though a manufacturer may request a deficiency for all models and/or horsepower ratings within an engine family, if appropriate. These limitations are intended to prevent a manufacturer from using the deficiency allowance as a means to avoid compliance or delay implementation of any emission control hardware or to compromise the overall effectiveness of the NTE emission requirements.

In the past, EPA has sometimes established non-conformance penalties (NCPs) as an available alternative for manufacturers who want to sell engines which do not meet an emission standard. Once an NCP is established for an emission standard, the NCP is available to all engine manufacturers, *i.e.,* no approval from EPA is required. The NTE deficiency provisions established in today's rule are significantly different from NCPs. First, the deficiency provision are for minor deviations from the NTE requirements, such as the failure to meet the NTE emission limit under specific engine operation, during limited regions of the engine map, and during limited temperature and/or altitude conditions, for reasons such as lead time or technological feasibility. NCPs apply under all conditions covered by the applicable FTP, the manufacturer determines the level by which they will fail to meet the applicable standard, and they then calculate the per-engine penalty to be paid. Second, the manufacturer must apply for the deficiency, and EPA must then decide whether or not to grant such a deficiency. Once established, NCP's are available to all manufacturers, *i.e.,* EPA cannot deny an NCP request. The fact that we are establishing an NTE deficiency provision in today's action does not foreclose the Agency's ability to establish NCPs for the NTE emission requirements in the future. As discussed in the Response to Comments Document, the Agency will continually monitor the status of technological development towards compliance with the NTE requirements and we will establish appropriate NCPs for the NTE emission standards should the criteria for establishing NCPs be met.

c. Supplemental Steady State Test

We are adding a steady-state test cycle to the current Federal test procedures for HD diesel engines. This steady-state test cycle is consistent with the test cycle found in the European's ''EURO III ESC Test''; however not all aspects are identical to the EURO III ESC Test.[28] Manufacturers are required to meet the standards under this test cycle as well as the standards using the current test procedure (including the current transient test cycle) in 40 CFR part 86, subpart N. This test takes effect starting with the 2007 model year.

The supplemental steady-state test cycle consists of 13 modes of speed and power, primarily covering the typical highway cruise operating range of heavy-duty diesel engines. The cycle concentrates on the engine speed range bounded by 50 percent and 70 percent of rated power. This speed range is then divided into bands (engine speeds A, B and C, as defined in § 86.1360–2007(c)). The ''control area'' is defined by the area between engine speeds A and C, and between 25 to 100 percent load. During the test cycle, the engine is initially run at idle speed, then through a defined sequence of 12 modes at various speeds and engine loads of 25, 50, 75 and 100 percent. Each mode (except idle) is run for two minutes. During each mode of operation, the concentration of the gaseous pollutants is measured and weighted (according to the weighting factors in § 86.1360–2007(b)(1)). The weighted average emissions for each pollutant, as

---

[27] See ''Summary of Conference Call between U.S. EPA and Honeywell Turbocharging Systems on December 22, 1999 regarding 2004 On-highway Heavy-duty Diesel Proposal'', ''Summary of CBI Information regarding proposed HD Supplemental Test Requirements'', both available in EPA Air Docket A–98–32.

[28] ''Draft Proposal for a Directive of the European Parliament and the Council Amending Directive 88/77/EEC of 3 December 1987 on the Approximation of the Laws of the Member States Relating to the Measures to be Taken Against the Emission of Gaseous and Particulate Pollutants from Diesel Engines for Use in Vehicles'', a proposal adopted by the Commission of the European Union on 3 December 1997, for presentation to the European Council and Parliament.

calculated according to this steady-state test procedure, must not be greater than the applicable FTP emission standards. (*See* § 86.005–11(a)(3).) A single, time weighted PM measurement is made for the entire 13 mode test, as specified in § 86.1360–2007(e)(3).

Manufacturers will perform the supplemental steady-state test in the laboratory following all applicable test procedures in 40 CFR part 86, subpart N (*e.g.,* procedures for engine warm-up and exhaust emissions measurement). The test must be conducted with all emission-related engine control variables in the maximum NO_X producing condition which could be encountered for a 30 second or longer averaging period at the given test point.

In addition to the 13 modes of the test cycle, EPA has the opportunity to select an additional three test points as a check to ensure the effectiveness of the engine's gaseous emission controls within the control area (*e.g.,* ensuring that emissions do not ''peak'' outside of the 13-mode test points). During the test, the regulated gaseous pollutants would be measured at each of these EPA-selected test points. PM emissions do not need to be measured during the measurement of emissions for the EPA selected points. The manufacturer also will determine an interpolated value of gaseous pollutant emissions at each EPA-selected test point, using the measured emissions of the closest four adjacent test points. See the illustration in Figure 2 of § 86.1360–2007(g). We are finalizing a four-point linear interpolation procedure that is consistent with that of the European's ''EURO III'', referenced above. (See § 86.1360–2007(g)(2).) The measured emissions value is then compared to the interpolated emissions value. The measured pollutant value must not exceed the interpolated pollutant value by more than ten percent.

d. Maximum Allowable Emission Limits

The emission levels at the 12 non-idle test points and the calculated emissions values from the four-point interpolation procedure for intermediate test points described in the previous section establish an emissions ''surface'' of Maximum Allowable Emission Limits (MAELs), as illustrated in Figure 1 of § 86.1360–2007(f). This surface will limit gaseous emissions levels during all normal steady-state engine operations that occur within the control area defined above, there is no MAEL surface for PM.

Based on comments received and on further analysis of the MAEL concept, we have modified the final regulations such that the MAEL surface is applicable only to steady-state engine operation, and only during standard FTP laboratory conditions. The MAEL is specific to the test engine, and each engine must comply with it's MAEL surface. Each point on this surface will have a MAEL associated with it.[29] The MAEL for each point is calculated using the same four-point linear interpolation procedure used to determine the emission value for the EPA test points discussed above. The MAEL applies throughout the regulatory useful life of the engines.

At certification, manufacturers would be responsible for testing the MAELs by performing the ''check'' described above for the three EPA-selected test points. To determine compliance, test results from operation within the control area must comply with the MAEL generated from running the 12 non-idle points of the supplemental steady state test for the specific test engine. These requirements are effective starting with the 2007 model year.

3. Altitude Requirements and Expanded Temperature and Humidity Conditions for NTE Testing

The FTP, Supplemental Steady State, and MAEL tests are laboratory-based test procedures that would be conducted under standard laboratory conditions defined in the regulations, with emission results corrected according to existing regulations regarding laboratory testing procedures.[30] The NTE could be conducted in the laboratory or during on-the-road driving, and the standards associated with these tests, where applicable, apply under a wide range of conditions. The manufacturer must choose between two options for the range of conditions over which the engine must comply with the NTE requirements. We will briefly outline here these two options, an additional discussion is contained in the Response to Comments document under Issue 8.8.

First, manufacturers can choose to comply with the NTE limits at all altitudes less than or equal to 5,500 feet above sea level, under all temperature conditions. For temperatures outside a range of 55–95 deg. Fahrenheit (F), a correction factor for NO_X and PM is allowed. Inside the 55–95 deg. F range no correction factor for temperature is allowed.

[29] The emissions surface would include all points in the Supplemental Steady-State control area, as defined above.

[30] The acceptable temperature range for FTP testing is defined by regulation as 68–86 degrees Fahrenheit. There is no specified humidity range in the regulations, but NO_X emission results are to be corrected to 75 grains of water per pound of dry air.

Under option two, a manufacturer can choose to comply with the NTE limits at all altitudes less than or equal to 5,500 feet above sea level, for all temperatures less than a specified temperature at each altitude. The upper temperature limit under option two is 100 deg. F at sea-level and 86 deg. F at 5,500 feet above sea-level, with a linear interpolation for altitudes in between. Temperature correction factors for PM and NO_X are allowed for temperatures less than 55 deg. F. However, unlike option one, under option two NTE limits do not apply above the upper temperature limits defined in the regulations. However, the prohibition against defeat devices would apply above the high temperature limits.

Under either operating condition option, emissions of NO_X can be corrected for humidity outside a range from 50 to 75 grains of water per pound of dry air (7.14 to 10.71 grams of water per kilogram of dry air).

Within the specific altitude, temperature and humidity ranges, emissions from heavy-duty diesel engines must meet the requirements described above, without corrections for temperature and humidity. For situations within the specified altitude limits in which the temperature and humidity conditions are outside these ranges, NO_X is corrected for humidity and both NO_X and PM are corrected for temperature. Corrections are to the end of the specified temperature or humidity range nearest the actual conditions. Good engineering judgment is to be used when correcting for humidity and temperature outside of the specified ranges, as specified in the regulations.

4. On-board Diagnostics for Heavy-duty Diesel Engines

Today's final rule ''establishes'' new on-board diagnostic requirements for HD diesel engines used in the 8,500 to 14,000 pound GVWR category. In general, the OBD system must monitor emission-related engine components for deterioration or malfunction causing emissions to exceed 1.5 times the applicable standards. Upon detecting a malfunction, a dashboard malfunction indicator light (MIL) must be illuminated informing the driver of the need for repair. To assist the repair technician in diagnosing and repairing the malfunction, the OBD system must also incorporate standardization features (*e.g.,* the diagnostic data link connector; computer communication protocols; etc.) the intent of which is to allow the technician to diagnose and repair any OBD compliant truck or engine through the use of a ''generic'' hand-held OBD scan tool. We received a number of comments on the proposed OBD requirements and have incorporated those recommendations that we deemed to be appropriate. The summarized comments and our responses can be reviewed in the Response to Comments Document. The following is a summary of the requirements for HD diesel engines between 8,500 and 14,000 pounds GVWR.

a. OBD Malfunction Thresholds and Monitoring Requirements

This final rule requires that, beginning in the 2005 model year, heavy-duty diesel engines used in vehicles less than 14,000 pounds must be equipped with an OBD system capable of detecting and alerting the driver of the following emission-related malfunctions or deterioration as evaluated over the appropriate certification test procedure:[31]

(i) Catalyst deterioration or malfunction—before it results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for $NMHC+NO_X$. This monitoring would not need to be done if the manufacturer can demonstrate that deterioration or malfunction of the system will not result in exceedance of the threshold. The above requirement only applies to reduction catalysts; oxidation catalysts are not required to be monitored.

(ii) Particulate trap malfunction—any particulate trap whose complete failure results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for $NMHC+NO_X$ or PM must be monitored. Particulate trap monitoring must be capable of detecting a catastrophic failure of the device. Monitoring to the precise 1.5 threshold is not necessary. This monitoring would not need to be done if the manufacturer can demonstrate that a catastrophic failure of the system will not result in exceedance of the threshold.

(iii) Engine misfire—lack of combustion must be monitored.

(iv) If the vehicle or engine contains an oxygen sensor, then oxygen sensor deterioration or malfunction before it results in an exhaust emission exceedance of 1.5 times the applicable standard or FEL for $NMHC+NO_X$ or CO.

(v) If the vehicle or engine contains an evaporative emission control system, then any vapor leak in the evaporative and/or refueling system (excluding the tubing and connections between the purge valve and the intake manifold) greater than or equal in magnitude to a leak caused by a 0.040 inch diameter orifice; an absence of evaporative purge air flow from the complete evaporative emission control system. On vehicles with fuel tank capacity greater than 25 gallons, the Administrator would be required to revise the size of the orifice to the feasibility limit, based on test data, if the most reliable monitoring method available was unable to reliably detect a system leak equal to a 0.040 inch diameter orifice.

(vi) Any deterioration or malfunction occurring in an engine system or component directly intended to control emissions, including but not necessarily limited to, the EGR system, if equipped, the secondary air system, if equipped, and the fuel control system, singularly resulting in exhaust emissions exceeding 1.5 times the applicable emission standard or FEL for $NMHC+NO_X$, PM, or CO. For vehicles equipped with a secondary air system, a functional check, as described in paragraph (f) below, may satisfy the requirements of this paragraph provided the manufacturer can demonstrate that deterioration of the flow distribution system is unlikely. This demonstration would be subject to Administrator approval and, if the demonstration and associated functional check are approved, the diagnostic system would be required to indicate a malfunction when some degree of secondary airflow is not detectable in the exhaust system during the check.

(vii) Any other deterioration or malfunction occurring in an electronic emission-related engine system or component not otherwise described above that either provides input to or receives commands from the on-board computer and has a measurable impact on emissions; monitoring of components required by this paragraph would be satisfied by employing electrical circuit continuity checks and, wherever feasible, rationality checks for computer input components (input values within manufacturer specified ranges based on other available operating parameters), and functionality checks for computer output components (proper functional response to computer commands); malfunctions would be defined as a failure of the system or component to meet the electrical circuit continuity checks or the rationality or functionality checks.

Upon detection of a malfunction, the MIL would be required to illuminate and a fault code stored no later than the end of the next driving cycle during which monitoring occurs provided the malfunction is again detected. Alternatively, upon Administrator approval, a manufacturer would be allowed to use a diagnostic strategy that employs statistical algorithms for malfunction determination. Manufacturers would be required to determine the appropriate operating conditions for diagnostic system monitoring with the limitation that monitoring conditions are encountered at least once during the applicable certification test procedure or a similar test cycle as approved by the Administrator. This is not meant to suggest that monitors be designed to operate only under test procedure conditions, as such a design would not encompass the complete operating range required for OBD malfunction detection.

As an option to the above requirements, EPA will allow compliance demonstration according to the California OBDII requirements for HD diesel with one exception. This option allows manufacturers to concentrate on one set of OBD requirements for nationwide implementation (although federal OBD emission malfunction thresholds and monitoring requirements are essentially equivalent to those of the California OBDII regulation) and provides the highest level of OBD system effectiveness toward meeting nationwide clean air goals. However, the exception to this option is the requirement for catalyst and particulate trap monitoring. CARB does not require catalyst or aftertreatment monitoring, but as described above, this final rule does. Therefore, if a manufacturer chooses the California OBDII compliance option for a diesel engine, that manufacturer would still be required to satisfy the catalyst or particulate trap OBD monitoring requirements established in today's final rule.

b. Standardization Requirements

The light-duty OBD regulations contain requirements for standardization of certain critical aspects of the OBD system. These critical aspects include the design of the data link connector, protocols for on-board to off-board computer communication, formats for diagnostic trouble codes, and types of test modes the on-board system and the off-board scan tool must be capable of supporting. Today's action contains similar standards for heavy-duty OBD systems, as detailed in the regulatory requirements under section § 86.1806–05.

c. Deficiency Provisions

Today's action also establishes the same deficiency provisions for heavy-duty diesel OBD systems as currently apply to light-duty OBD systems. This would allow the Administrator to accept an OBD system as compliant even though specific requirements are not fully met. The deficiency provisions were first introduced on March 23, 1995 (60 FR 15242), and were recently revised on December 22, 1998 (63 FR 70681).

[31] The FTP minus the Supplemental FTP for chassis certified systems; the engine certification test procedure minus any supplemental test procedures for engine certified systems. While malfunction thresholds are based on certification test procedure emissions, this does not mean that OBD monitors need operate only during the test procedure. All OBD monitors that operate continuously during the test procedure should operate in a similar manner during non-test procedure conditions. The prohibition against defeat devices in § 86.004–16 applies to these OBD requirements.

To clarify our deficiency provisions, EPA does not expect to certify vehicles with federal OBD systems that have more than one OBD system deficiency, or to allow carryover of any deficiency to the following model year unless it can be demonstrated that correction of the deficiency requires hardware and/or software modifications that cannot be accomplished in the time available, as determined by the Administrator. Nonetheless, we recognize that there may be situations where more than one deficiency is necessary and appropriate, or where carry-over of a deficiency(ies) for more than one year is necessary and appropriate. In such situations, more than one deficiency, or carry-over for more than one year, may be approved, provided the manufacturer has demonstrated an acceptable level of effort toward OBD compliance. These deficiency provisions cannot be used as a means to avoid compliance or delay implementation of any OBD monitors or as a means to compromise the overall effectiveness of the OBD program.

d. Applicability and Waivers

Today's federal HD diesel OBD requirements would be implemented beginning with the 2005 model year. OBD requirements for diesel heavy-duty engines used in vehicles up to 14,000 pounds GVWR would be phased in over a three year period, from 2005 until 2007. The percentage phase-in schedule will be 60/80/100 for the 2005/06/07 model years, respectively, based on projected sales. For those manufacturers with a single heavy-duty engine family (including otto-cycle and diesel), implementation of OBD requirements would not have to occur until the 2007 model year. As discussed in Section II(B)(6) and III(C)(4), this final rule establishes OBD requirements for heavy-duty Otto-cycle engines and vehicles up to 14,000 pounds GVWR which are similar to the requirements for HD diesel, including an identical phase-in schedule. For Otto-cycle manufacturers who choose options 1 or 2, the phase-in schedule is 40/60/80/100 percent for the 2004/05/06/07 model years, respectively. HD manufacturers will be allowed to meet the OBD phase-in requirements by combining their projected sales of HD Otto-cycle and HD diesel engines to meet a combined diesel and Otto-cycle phase-in, at their option.

For heavy-duty vehicles and engines up to 14,000 pounds GVWR operating on alternative fuel, EPA would grant OBD waivers during alternative fuel operation through the 2006 model year to the extent that manufacturers can justify the inability to fully comply with any of today's proposed OBD requirements.[32] Such inability would have to be based upon technological infeasibility, not resource reasons. Further, any heavy-duty vehicles and engines that are subsequently converted for operation on alternative fuel would not be expected to comply with the OBD requirements if the non-converted vehicle or engine does not comply. In other words, if the vehicle or engine never completes any assembly stage in OBD compliance, it need not comply with the OBD requirements while operating on the alternative fuel. If the vehicle or engine does complete any assembly stage with a compliant OBD system, it would have to comply with the OBD requirements while operating on the fuel of original intent and, to the extent feasible, while operating on the alternative fuel. For these latter situations, EPA could grant waivers through the 2006 model year if the manufacturer can show it is infeasible to meet the requirements. Beginning in the 2007 model year, all heavy-duty alternative fueled vehicles and engines up to 14,000 pounds GVWR will have to be fully compliant during both operation on the fuel of original intent and alternative fuel.

e. Certification Provisions

The OBD certification information requirements of today's rule are consistent with the existing requirements for light-duty vehicles. The manufacturers application for certification must include, for each OBD system: a description of the functional operating characteristics of the diagnostic system; the method of detecting malfunctions for each emission-related engine component; and a description of any deficiencies including resolution plans and schedules. Anything certified to the California OBDII regulations would be required to comply with California ARB information requirements. EPA may consider abbreviating the OBD information requirements through rulemaking if it gains confidence that manufacturers are designing OBD systems that are fully compliant with all applicable regulations.

During EPA certification of engines optionally certified to the California OBDII regulation, EPA may conduct audit and confirmatory testing consistent with the provisions of the California OBDII requirements. Therefore, while the Agency will consider California certification in determining whether to grant a federal certificate, EPA may also elect to conduct its own evaluation of that OBDII system. While it is unlikely, EPA may make a compliance determination that is not identical to that of the California Air Resources Board.

Further, the final rule provisions allow for a ''drop-in'' demonstration. This provision allows engine certified and engine demonstrated OBD system to fulfill the demonstration requirements of a chassis certified OBD system, however, the chassis certified system would have to incorporate transmission diagnostics even though the ''dropped-in'' engine system may not have been certified with transmission diagnostics. The drop-in provision also allows a chassis certified and chassis demonstrated OBD system to fulfill any demonstration requirements of an engine certified OBD system. The drop-in provision discussed here requires the manufacturer to rigorously demonstrate its OBD concept and approach on one engine or model, but allows the manufacturer to apply that demonstration via engineering judgement to the different engine and powertrain calibrations used across its fleet. The Agency will accept such a demonstration provided sound engineering judgement is employed.

5. Submission of Load Response Test Data

We are finalizing a new data submission requirement for HD diesel engine manufacturers. Within 180 days after submission of the application for certification, manufacturers of HD diesel engines for the 2004 model year will need to submit laboratory certification data generated during a test procedure referred to as the Load Response Test (LRT). This data submission requirement will remain through model year 2007. This test procedure is intended to provide the Agency with needed information regarding the emission impacts of very short, rapid engine loadings on new emission control technology. We have finalized a LRT data submittal requirement similar to that which was proposed, with minor modifications to reflect our response to the technical test procedure comments received during the comment period. In addition, we have finalized certification data submission requirements which would allow manufacturers to carry across LRT data from one model year to future model years for the same engine family, and we have finalized requirements which will allow manufacturers to carry-across LRT data from one engine family to other engine

[32] Note that this provision currently exists for light-duty vehicles and trucks operating on alternative fuel through the 2004 model year; that existing provision does not change with today's proposal.

families which utilize similar emission control hardware. The use of carry-over and carry-across provisions will provide the Agency with important information on new control technologies, while minimizing the testing and reporting requirements for the manufacturers.

As discussed in more detail in the Response to Comments document, the Load Response Test represents operation not adequately represented by the current FTP or the supplemental test procedures (NTE and SSS), and could eventually be used to ensure effective control of NO_X and PM during this type of operation. We believe that establishing a future Load Response Test with appropriate emission limits may be a valuable addition to EPA's compliance program, and when the process of evaluating the available data is complete we intend to evaluate the addition of specific Load Response Test emission limits to EPA's compliance program in a future proposal. The data submittal requirement will enable a better understanding of the emissions that occur under this type of operation and would ensure that EPA establishes well supported standards in a future action, if we determine it is appropriate to do so. We have established this data submission requirement for a four year period, from model years 2004 through 2007. In this time period the on-highway HD diesel engine industry will be utilizing a range of new emission control technology not previously used on these engines. As discussed throughout this document, in the 2004 time frame all manufacturers will likely be applying cooled EGR and advanced turbochargers in order to comply with the 2004 emission standards. As discussed in the Response to Comments document, the application of EGR systems has the potential to result in high emission rates of PM and NO_X under the type of operation conditions simulated by the LRT. In a recent Agency proposal (June 2, 2000, 65 FR 35430), the Agency proposed to establish new emission standards based on advanced aftertreatment for HD diesel engines in model year 2007. We believe it is important to collect LRT emission data on these new technologies in order for the Agency to make an informed decision regarding the need for a new emission standard based on the LRT.

The four years worth of LRT data should provide the Agency with sufficient information on which to make a determination regarding the appropriateness of establishing an emission standard based on the LRT.

6. EPA Policy and Regulations Regarding Defeat Devices and Auxiliary Emission Control Devices

The NPRM for this final rule proposed to modify the existing defeat device definition for HD diesel engines and vehicles. The NPRM proposed to modify the current definition of defeat device contained in § 86.094–2 by explicitly stating that AECD's which operate under conditions substantially included in the proposed NTE and MAEL test procedures would not be excluded from consideration for a possible defeat device. We discussed in the NPRM our rationale for this proposed change, *i.e.*, the range of vehicle operation covered by the NTE and MAEL procedures is very broad compared to the existing FTP and covers much of the operation which is encountered by many engines.

A number of engine manufacturers expressed concern in their comments with the proposed definition. Some manufacturers commented the proposed definition is unclear and has the potential to be interpreted too broadly.[33] A detailed discussion of these comments and our response is contained in the Response to Comments for this final rule. In light of our further analysis of how best to control for defeat devices, we have decided in this final rule to retain the existing definition of defeat device contained in § 86.094–2, with only a minor change to clarify that the applicable heavy-duty diesel federal emission test procedure includes the supplemental steady-state and not-to-exceed test procedures beginning in model year 2007.

As with the current definition of a defeat device, use of a control strategy during conditions which are substantially included in the existing FTP, the supplemental steady state test, or the not-to-exceed test, would not be considered a defeat device, even where it otherwise would be considered to reduce the effectiveness of the emissions control system during such operation. For example, use of such an AECD during the appropriate FTP, steady state supplemental, or NTE test procedure is not a violation of the defeat device prohibition. However, the engine still must comply with the applicable emission standards. For example, operation of the AECD within the NTE control zone during operation which is applicable to the NTE standard must never cause the engine to exceed 1.25 times any applicable existing FTP standard, except where EPA has approved a manufacturers request for an NTE deficiency under 40 CFR 86.007–11(a)(4)(iv). The fact that operation of the AECD during such condition is not a violation of the defeat device prohibition does not change the obligation to also comply with the applicable emissions standard. The two obligations are separate and distinct, and both must be met. An engine may not have a defeat device and it also must comply with the applicable emissions standards. When an AECD operates under conditions which are not substantially included in the existing FTP, steady state supplemental test, or the NTE test procedure, then the AECD will be considered a defeat device if it reduces the effectiveness of the emissions control system under operations which could reasonably be expected to occur in normal vehicle operation and use, unless it meets one of the other exceptions to the defeat device definition (such as engine start up). EPA will continue to interpret this provision as it has in the past, focusing on changes to the emissions control system that cause emissions to increase above what they would be without the change.

The Agency recognizes that emission control strategies which are employed during the existing FTP and the supplemental test procedures (NTE and supplemental steady state) require the manufacturer to control a complex system of engine hardware. This includes the modulation of engine sub-systems (*e.g.,* EGR temperature, EGR flow rate, turbocharger boost, fuel injection timing and pressure) to maintain emissions performance and also achieve engine performance, with the potential to increase or decrease NO_X, PM and/or other regulated pollutants while keeping all pollutants at or below all applicable emission standards. The Agency's prohibition of the use of defeat devices will continue to protect against the use of illegal emission control strategies, including but not limited to timers or ''cycle sensors'', whose purpose or result is to reduce the effectiveness of the emission control system during conditions which are not substantially included in the applicable federal emission test procedures, and do not meet the other exemptions in the defeat device definition. Strategies that ''reduce effectiveness'' of the emission control system would include those that change the way the emission control system operates during off-cycle conditions and increase emissions from the engine

[33] See EPA Air Docket A–98–32, comments from Navistar International, item IV–D–29; comments from Caterpillar Inc., item IV–D–37; comments from Detroit Diesel Corp., item IV–D–28; and comments from the Engine Manufacturers Association, item IV–D–05.

above what they would be without the change. For example, if a manufacturer operates an EGR system during on-cycle conditions in order to comply with applicable emission standards, it must operate the EGR system in a similar manner during off-cycle conditions, unless, for one of the allowable reasons set forth in the definition of defeat device, it cannot do so.

Moreover, while the definition of defeat device allows as exception strategies needed to protect the engine against accident or damage, EPA intends to continue its policy of closely reviewing the use of this exception. In determining whether a reduction in emissions control effectiveness is ''needed'' for engine protection, EPA would closely evaluate the actual technology employed on the engine family, as well as the use and availability of other emission control technologies across the industry, taking into consideration how widespread the use is, including its use in similar applications.

For example, as discussed throughout this final rule, in the context of the HD diesel 2004 standards we expect to see wide-spread use across all HD applications of advanced electronic fuel injection systems (such as common-rail or second generation unit injectors), advanced turbocharging systems (such as VGT systems), and cooled EGR systems. If, for example, a manufacturer uses hot EGR instead of cooled EGR, and seeks approval to reduce the emissions control system effectiveness to protect against engine damage during operation not substantially included in the FTP, EPA will closely review the request and intends among other things to evaluate the feasibility of cooled EGR in determining whether the reduction in emissions control effectiveness is in fact ''needed'' and appropriate. Under appropriate circumstances, EPA could determine that a reduction in emissions control effectiveness was not needed to protect the engine, based on a choice of a certain technology in the context of the widespread use in similar application of a different technology without the same need for protection.

Manufacturers must continue to comply with the existing certification requirement to fully disclose and describe all AECDs in their certification applications. The Agency will continue to review all AECDs, in particular those which impact emission performance during conditions not substantially included in testing under the applicable federal emission test procedures, including beginning in model year 2007, the supplemental steady-state and not-to-exceed test procedures.

The revised definition of defeat device, in addition to the Agency's existing policy and guidance documents concerning defeat devices, provide engine manufacturers with appropriate guidance on the requirements they need to design and manufacturer their engines to meet, as well as provide the Agency and the environment with the appropriate protection from the use of defeat devices on on-highway HD diesel engines.

B. What Are the Requirements of the Heavy-duty Otto-cycle Vehicle-based Program?

1. Emission Standards

EPA is adopting vehicle-based standards and test procedures for complete Otto-cycle vehicles between 8,500 and 14,000 pounds GVWR. As in the California MDV program, these complete vehicles will be tested on the federal light-duty vehicle and light-duty truck test procedure.[34] We are finalizing as proposed the chassis-based standards contained in Table 6 below. The standards apply to complete vehicles in the weight categories shown. The standards are for emissions over the FTP and vehicles will be tested at adjusted loaded vehicle weight (ALVW), also known as test weight (TW).[35] Manufacturers have some flexibility in meeting these standards with the ABT program applicable to heavy-duty Otto-cycle vehicles contained in today's final rule and described in a subsequent section of this preamble.

Vehicles must meet these standards starting with the 2007 model year under Option 1, the 2004 model year under Option 2, or with the 2005 model year under Option 3, as described in section I of this preamble. As noted in section I of this preamble, manufacturers selecting Option 1 may optionally meet these standards *or* an engine-based standard for the 2003 through 2006 model years.

TABLE 6.—FULL USEFUL LIFE EMISSION STANDARDS FOR OTTO-CYCLE COMPLETE VEHICLES

[Grams per mile]

Vehicle weight category (GVWR)	Nonmethane organic gas (NMOG)	NO_X	CO
8,500—10,000 lbs*	0.28	0.9	7.3
10,001—14,000 lbs	0.33	1.0	8.1

*Excluding Medium-duty Passenger Vehicles covered by the Tier 2 program.

EPA is finalizing a hydrocarbon standard in the form of nonmethane organic gas (NMOG), which is consistent with California's MDV standards. We will also accept hydrocarbon emissions data in the form of NMHC or total hydrocarbons (THC) in lieu of NMOG, which are forms of hydrocarbon standards typically used by EPA under the heavy-duty Otto-cycle control program. Accepting emissions data in these various forms provides manufacturers with additional flexibility since establishing NMOG levels can be more complex than NMHC or total hydrocarbon levels. Manufacturers submitting California certification data would submit NMOG emissions data under the California requirements.

The vehicle manufacturer is responsible for determining whether a vehicle is a complete vehicle and subject to the vehicle-based standards or an incomplete vehicle and subject to engine-based standards. The manufacturer shall make this determination based on the definition of incomplete vehicle described above and in the regulations. The vehicle manufacturer may request a determination from EPA when the status of a specific vehicle model is unclear. Manufacturers of complete vehicles are responsible for vehicle emissions certification, as is the case

[34] Test procedures contained in 40 CFR Part 86 Subpart B, excluding the Supplemental FTP.

[35] ALVW or TW is the actual weight of the vehicle, known as curb weight, plus half pay load. Its also the average of the curb weight the GVWR, which is curb weight plus full pay load.

currently in EPA light-duty vehicle programs.

2. Revision to Vehicle Useful Life

Currently, the useful life mileage interval for Otto-cycle HD engines is 8 years or 110,000 miles, whichever occurs first. The useful life for these vehicles in the California MDV program is 120,000 miles, which is also the useful life of heavy light-duty trucks. We proposed to adopt the useful life mileage interval of 120,000 miles for the HD Otto-cycle vehicles program. This approach allows consistency across the programs and is consistent with the use of the vehicles. No adverse comments were received on this provision, and it is being finalized as proposed.

3. Averaging, Banking, and Trading Provisions

a. Background

An ABT program is an important factor that EPA takes into consideration in setting emission standards that are appropriate under section 202 of the Clean Air Act. ABT allows us to consider a lower emissions standard, or one that otherwise results in greater emissions reductions, compared to a standard that might otherwise be appropriate under section 202(a)(3) of the CAA, since ABT reduces the cost and improves the technological feasibility of achieving the standard. ABT enhances the technological feasibility and cost effectiveness of the proposed standard and allows the standard to be attainable earlier than might otherwise be possible. ABT provides manufacturers with additional product planning flexibility and the opportunity for a more cost effective introduction of product lines. ABT creates incentive for early introduction of new technology, allowing certain engine families to act as trail blazers for new technology.

We view the ABT provisions in today's rule as environmentally neutral because the use of credits by some vehicles is offset by credits generated by other vehicles. However, when coupled with the new standards, ABT will have environmental benefits because it allows the new standards to be implemented earlier than would otherwise be appropriate.

Manufacturers are able to bank credits by certifying some engine families to emissions levels lower than applicable standards. The credits may be banked and then used to certify other engine families to levels higher than the emissions standards. For HD Otto-cycle engines, ABT is available for meeting NO_X standards. Under the current ABT program, banked credits are discounted by 20 percent and have a three year life, after which they expire.[36]

The CAA requires that EPA set emission standards with appropriate consideration to feasibility and cost. EPA is finalizing separate averaging, banking, and trading programs for vehicles certified to the vehicle-based standards and engines certified to the engine-based standards. The engine-based ABT program is discussed in section III.C.3., below. We believe that the ABT programs in today's final rule are appropriate in the context of the technical feasibility and the cost of the emission standards.

b. Final ABT Program for Vehicle-Based Standards

This section addresses the ABT program for the vehicle-based standards. We are finalizing the vehicle-based ABT program as proposed. We are also finalizing options that allow manufacturers to transfer credits between the vehicles and the engines ABT programs. This is discussed below in the following section.

For the vehicles ABT program, we are finalizing the following provisions:

- Beginning in 2000, manufacturers may bank vehicle-based credits by choosing to certify vehicles rather than engines.
- Manufacturers will earn NO_X credits up to the 0.9 g/mile NO_X standard by establishing an FEL below the 0.9 g/mile standard.
- Vehicles with FELs at or below 0.6 g/mile NO_X will earn undiscounted credits, engines with FELs above 0.6 g/mile will earn credits discounted by 10 percent.
- Vehicles using credits may not exceed a NO_X level of 1.53 g/mile.
- Heavy-duty vehicles equipped with Otto-cycle engines and certified to the vehicle-based standards will be a single grouping or averaging set.

The ABT program can help manufacturers certify especially difficult or low volume applications and help manufacturers comply across their full product line without having to restrict vehicle offerings. The Agency believes the above program offers sufficient flexibility in light of the technology and cost requirements associated with the final vehicle standards. Based on current certification data and technological capabilities we believe manufacturers will have opportunities to generate credits to help with meeting the standards in the 2004 time frame. Moreover, because these standards are required in California for several model years prior to 2004, EPA does not expect feasibility issues with the vast majority of vehicle models.

c. Exchanging Credits Between the Vehicle-Based and the Engine-Based ABT Programs

In the proposal, we requested comment on credit exchanges between the separate engine and vehicle-based ABT programs. As described below, we are finalizing provisions allowing manufacturers to transfer credits between the vehicles and the engines program as part of Options 1 and 2 (full 2003 or 2004 model year implementation). We believe that allowing credit transfers under these options provides significant incentive for manufacturers to choose one of these optional programs. Therefore, the provision enhances the likelihood that significantly cleaner technology will be introduced sooner (2003 or 2004) than would otherwise occur. We also believe this temporary flexibility will help address any feasibility concerns manufacturers may have with the shorter lead time associated with the optional programs. However, because this is the first ABT program to allow such credit exchanges, we are proceeding conservatively and constraining the transfer of credits in several respects. However, early implementation of Options 1 and 2 provide clear emission reduction benefits compared to Option 3 and we believe it is appropriate to provide additional incentives to manufacturers to select one of these options. Therefore, we are allowing credit transfers between the vehicles and engines programs as part of Option 1 and Option 2 for a limited time. This flexibility, in addition to the somewhat higher standards, should provide incentive for manufacturers to select one of these early implementation options. To the extent that manufacturers select Options 1 and 2, technology will be introduced earlier (2003 or 2004) than would otherwise occur (2005). The experience gained by EPA in implementing Options 1 and 2, including the development of appropriate credit conversion factors by the manufacturers, will provide a valuable source of information for the Agency in evaluating whether to extend this flexibility more generally in a future rule. Additional discussion can be found in the Response to Comments document.

[36] With ABT, manufacturers are able to establish a Family Emissions Limit (FEL) for an engine family which becomes the standard for that family. Manufacturers earn or use credits based on the difference between the FEL and the applicable standard. A full overview of the ABT program is contained in EPA's 1996 NPRM, 61 FR 33451.

Manufacturers selecting Option 3 will not have the option of transferring credits between the vehicles and the engines ABT programs. For Option 3, manufacturers must use credits within the same averaging set in which they are generated. Providing the additional flexibility only to manufacturers selecting Options 1 or 2 provides further incentive to manufacturers to select one of the early implementation options. We believe the ABT programs provide sufficient flexibility to meet the standards without the ability to transfer credits.

We recognize that under Option 1, vehicle-based certification remains optional through the 2006 model year. While the option to transfer credits during the years preceding 2007 might not be particularly useful under Option 1, we do not believe it is necessary to restrict its use prior to 2007. Manufacturers may choose to voluntarily phase-in chassis-certified vehicles early for product planning reasons.

Manufacturers argued for allowing the transfer of credits between the programs. They were concerned about the stringency of the proposed engine standard and their ability to generate credits with the low volume of engine families that will be subject to the engine-based standards. The pool of engine families is likely to be very small because the majority of Otto-cycle vehicles would be certified to vehicle-based standards. We believe that the structure of the final program, which includes the flexibility of three options and a longer lead time for Option 3 (1.0 g/bhp-hr standard in 2005), addresses feasibility concerns. For Options 1 and 2, the somewhat higher standard of 1.5 g/bhp-hr diminishes the feasibility concerns for the 2003 and 2004 model years. However, there may also be a diminished opportunity for early banking under these early implementation options which the additional flexibility of credit transfers could help offset.

Manufacturers choosing Options 1 or 2 may transfer credits between the vehicle and engine ABT programs for compliance during model years 2003 or 2004, whichever is applicable, through the 2007 model year. We continue to believe that the ability to trade credits between the vehicle and engine-based ABT programs prior to the implementation of the new standards would unnecessarily complicate the ABT programs. Prior to the implementation of the new standards, EPA emission standards for heavy-duty Otto-cycle vehicles are engine-based standards. Absent any credit exchange provisions, manufacturers could still generate vehicle-based credits by voluntarily certifying engines to the vehicle-based program. These provisions already provide the flexibility for manufacturers to decide how many engine-based and vehicle-based credits to generate. Therefore, we are not allowing the transfer of any pre-2004 (or 2003 under Option 1) model year credits between the programs.

We requested comment on several specific concerns, including the derivation of engine and vehicle-specific conversion factors. The chassis-based ABT program is based on emissions in units of grams per mile (g/mi) and the engine ABT program is based on emissions in units of grams per brake horsepower-hour (g/bhp-hr). Consequently, trading credits between the two programs requires a conversion factor. Although the Agency uses conversion factors to estimate g/mi emissions based on g/bhp-hr emissions rates for purposes of emissions inventory modeling, these conversion factors are estimates of a fleet average, not an engine-or vehicle-specific conversion factor. There is considerable variation in the conversion factors from vehicle to vehicle. Also, conversion factors that have been previously derived don't necessarily predict emissions over the specific test cycles. Both the emission standards and the ABT credits are based on emissions over specific test cycles. Conversion factors developed for specific engines and vehicles on specific test cycles could vary widely from an ''average'' conversion factor. EPA believes that vehicle and engine test cycle specific conversion factors would be needed in order to allow transfers of credits between the two Otto-cycle ABT programs.

EMA recommended that we allow individual manufacturers to submit plans prior to the model year for converting credits and that the plans be subject to EPA approval on a case-by-case basis. In general, we are adopting the approach for establishing the conversion factor suggested by the commenter. Manufacturers requesting to transfer credits must submit plans to convert credits between the vehicle-based program and the engine-based program and the plan must be approved by EPA prior to any exchange of credits. Manufacturer plans must include data that supports the specific conversion factor for the vehicle families and engine families involved. Although manufacturers would design their test programs using good engineering judgement, each conversion factor would likely have to be based upon a number of engine and vehicle tests to provide reasonable accuracy. The conversion factors must be developed by testing engines and vehicles expected to generate ''worst-case'' emissions.

The transferred credits must be earned in model year 2004 (or 2003 under Option 1) or later and must be used during the same year in which they are transferred (no banking after transfer). This provision is needed to ensure that vehicle credits that are transferred to the engines program are not used after 2007.

Another issue for credit exchanges in the 2003 or 2004 and later model years is that vehicle credits will be based on NO_X only emissions and the engine credits will be based on NMHC+NO_X emissions. We believe that the NMHC portion of engine emissions compared to NO_X emissions is about 15 percent of total emissions, or between 0.1 and 0.2 g/bhp-hr. We requested comment on allowing credit exchanges without regard to this difference in the standards, or alternatively, requiring the use of an appropriate factor (*e.g.*, the 15 percent factor noted above) to apply to exchanges of NO_X-only and NMHC+NO_X credits. We did not receive any comment on this issue. We do not believe there is a significant difference with regard to air quality from either approach due to the relatively small number of engines likely to be involved in the program. Therefore, in order to simplify the transfer of credits, we will allow the NO_X credits from the vehicles program and NO_X plus NMHC engine-based credits to be exchanged without adjustments to account for NMHC.

4. CAP 2000

On May 4, 1999, we adopted a new compliance assurance program for light-duty vehicles and light-duty trucks known as ''CAP 2000'' (*see* 64 FR 23906, May 4, 1999). In brief, as compared with our traditional chassis-based compliance program, CAP 2000 is designed to redirect manufacturer and Agency efforts towards in-use compliance and give manufacturers more control of certification timing, and yet maintain the integrity of the compliance assurance program. Aspects of the CAP 2000 program include streamlined certification and manufacturer in-use testing.

In today's action, we are requiring that the CAP 2000 program be the compliance assurance program for heavy-duty vehicles certified to chassis-based standards (hereafter referred to as ''chassis-based HDVs''). We are including modifications to Part 86, Subpart S, that would extend the applicability of CAP 2000 to chassis-based HDVs. Key aspects of the CAP 2000 program as it will apply to chassis-based HDVs are described below.

For the certification process, manufacturers will divide their product lines into new units called ''durability groups'', determined according to common emission deterioration elements. A vehicle with the ''worst case'' durability will be chosen from the durability group to establish the rate of emission deterioration expected from that group. The procedures used to determine durability will be developed by the manufacturer, with our approval. Durability groups will then be subdivided into ''test groups'', and a vehicle representative of each test group will be tested to show emission compliance. Once compliance has been demonstrated, certification can proceed. The CAP 2000 program provisions for information collection are streamlined from the traditional light-duty chassis-based compliance regulations. The timing of information submittal has been optimized to provide some flexibility for manufacturers, and the amount of information has been reduced, without compromising our information needs for future compliance or enforcement issues.

A second element of the chassis-based HDV CAP 2000 requirements is manufacturer in-use testing. There are two parts to the program. Part one requires manufacturers to perform in-use emission testing on privately owned vehicles in an ''as-received'' state. This ''in-use verification testing'' will occur on low mileage and high mileage test fleets. The size of the low and high mileage fleets will be dictated by sales categories. Small volume manufacturers and small volume test groups will have little or no testing, depending on sales limits. In-use verification testing data will be used by the manufacturer to improve the predictive quality of its durability program, and by us to target vehicle testing for a recall program. Manufacturers are required to conduct additional testing of a test group when the in-use verification program data for the test group equals or exceeds a mean of 1.3 times the standard, with a 50 percent or greater failure rate for the test group sample at either the low or high mileage test point. The second level of in-use testing, known as ''in-use confirmatory testing'', will be performed on ''properly maintained and used'' vehicles and could be used to determine the need for recall.

The ''heavy-as-light'' provision in the current regulations (*see* 40 CFR 86.001–01(b) and 40 CFR 86.1801(c)(1)) will be available through the 2004 model year; starting with the 2005 model year, the ''heavy-as-light'' provision will no longer be available. For manufacturers choosing the 2003 or 2004 compliance option (Option 1 or 2) discussed previously, the ''heavy-as light'' provision will only be available through the 2002 or 2003 model year, respectively. Our ''heavy-as-light'' provision permits a manufacturer to certify a HDV of 14,000 pounds GVWR or less in accordance with the light-duty truck provisions. In effect, this provision allows manufacturers to certify these HDVs on a chassis dynamometer rather than on an engine dynamometer, as long as the HDVs comply with the more stringent light-duty truck standards. Today's action obviates the ''heavy-as-light'' provision after the 2003 or 2004 model year. We are including in today's action a provision allowing manufacturers to certify incomplete HDVs under the chassis-based HDV program. This provision is similar to the current ''heavy-as light'' provision.

We are including provisions to allow manufacturers to request that vehicles from different weight categories be grouped together in the same test group, as long as the vehicles are then subject to the most stringent standards that would be applicable to any vehicles within that grouping. Voluntary certification to the more stringent emission standards means that the manufacturer would be subject to enforcement against the more stringent standards.

Manufacturers have expressed concerns about potential difficulties in procuring vehicles for testing given the commercial use of many of these vehicles. Thus, if any manufacturer believes it is unable to procure the test vehicles necessary to test the required number of vehicles in a test group, the manufacturer may request a smaller sample size for any test group, subject to our advance approval (*see* 40 CFR 86.1845–01(c)(3)).

The ''AMA'' cycle will not be automatically available as a durability procedure for chassis-based HDVs. (The CAP 2000 program likewise disallows the AMA durability procedure for light-duty, but does allow for the carryover of AMA-based deterioration factors.) Although the AMA cycle will not be automatically available as a durability procedure for chassis-based HDVs, a manufacturer may be able to obtain approval for it. As in the light-duty CAP 2000 program, to obtain approval for a durability process, we will require that manufacturers provide data showing that the aging procedures would predict the deterioration of the significant majority of in-use vehicles over the breadth of their product line that would ultimately be covered by this procedure. This demonstration would be more than simply matching the average in-use deterioration; manufacturers will need to demonstrate to our satisfaction that their durability processes will result in the same or more deterioration than is reflected by the in-use data for a significant majority of their vehicles. This approval process is the same as that already established for our first phase of the light-duty revised durability program (RDP–I).[37]

In order to provide a transition to the in-use confirmatory testing requirements over a period of years, as was available in the light-duty vehicle CAP 2000 program, we are delaying the in-use confirmatory testing requirements in order to allow manufacturers to gain experience with chassis-based certification and in-use verification testing for chassis-based HDVs. Thus, the in-use confirmatory requirements will be applicable to vehicles produced starting with the 2007 model year. While manufacturers will not be required to conduct in-use confirmatory testing for vehicles produced prior to the 2007 model year, we will be fully prepared to investigate any high emissions indicated through manufacturer in-use verification testing or any other means.

Finally, certain aspects of the light-duty CAP 2000 program, as contained in 40 CFR part 86, subpart S, will not apply to chassis-based HDVs, since we are not including requirements for HDVs in these areas at this time. These areas include provisions relating to intermediate useful lives, certification short test, cold temperature CO requirements, fuel economy programs, and supplemental FTP requirements.

In summary, we are extending the light-duty CAP 2000 program to chassis-based HDVs, with the following minor modifications. First, the option to certify HDVs under ''heavy-as-light'' provisions would no longer be available after the 2004 model year (2003 model year if a manufacturer elects the 2004 compliance option, or 2002 model year if a manufacturer elects the 2003 compliance option); instead, manufacturers can request to certify incomplete HDVs under the chassis-based HDV program. Second, manufacturers can request to group vehicles from different weight categories or subject to different standards into the

[37] In RDP–I manufacturers have typically shown that their durability programs cover ninety percent or higher of the distribution of deterioration rates experienced by vehicles in actual use. See EPA's guidance letter CD–94–13 dated July 29, 1994, available for review in the public docket.

same test group, provided that they meet the most stringent standards applicable to vehicles within that test group. Third, the AMA cycle will not automatically be available for HDVs as a durability procedure. Fourth, the in-use confirmatory testing requirement will be delayed for HDVs until the 2007 model year. Fifth, certain elements of the CAP 2000 program will not apply to chassis-based HDVs.

5. Evaporative Emissions and Onboard Refueling Vapor Recovery

a. Enhanced Evaporative Emissions

In 1993, EPA adopted enhanced evaporative test procedures for LDVs, LDTs and HDVs to be phased in beginning with the 1996 model year, with full compliance required by the 1999 model year (*see* 55 FR 16002, March 24, 1993). Under the enhanced evaporative requirements adopted in 1993 the provisions for LDVs and LDTs are essentially the same as those for HDVs with two main differences. The first difference is that the actual levels of the emission limits are higher for HDVs due to their typically larger fuel tanks. The second difference is in the driving cycles used in the test sequence, as described in the next paragraph. We are not making any changes to the levels of the HDV evaporative standards in today's action.

The urban dynamometer driving schedule (UDDS) currently used for HDVs is somewhat shorter than that used for light-duty, both in terms of mileage covered and minutes. What this means in practical terms is that, while the light-duty and heavy-duty procedures generally parallel each other, under the heavy-duty procedure there is considerably less driving time than under the light-duty procedure. This results in considerably less time for canister purge under the heavy-duty procedure than under the light-duty procedure.

We recognize this discrepancy between our light-duty and heavy-duty programs, and have routinely provided waivers under the enhanced evaporative program which allow the use of the light-duty procedures for heavy-duty certification testing. In today's action we are formally adopting this approach for all complete vehicles that are certified according to the provisions of the chassis-based program discussed elsewhere in this notice. Thus, we are not making any changes to the CAP 2000 regulations intended to maintain the heavy-duty UDDS for HDV evaporative testing. Rather, the light-duty UDDS currently in the CAP 2000 regulations will apply to all light-duty and heavy-duty vehicles and trucks certified according to the provisions of CAP 2000. Additionally, we are extending the application of the light-duty UDDS to all heavy-duty evaporative emissions testing upon the effective date of this rule.

b. Onboard Refueling Vapor Recovery

Onboard refueling vapor recovery (ORVR) systems prevent the fuel vapors that are displaced from a vehicle's fuel tank during refueling from entering the atmosphere. Typically, the displaced fuel vapors are routed to a charcoal canister where they are subsequently routed to the engine to be burned as fuel. We previously adopted ORVR requirements applicable to light-duty vehicles and light-duty trucks (*see* 59 FR 16262, April 6, 1994). These requirements are being phased in beginning with the 1998 model year for LDVs, the 2001 model year for light LDTs (6,000 lb and under GVWR), and 2004 for heavy LDTs (6,001 through 8,500 lb GVWR).

We are today requiring ORVR controls on all complete HDVs up to 10,000 lb GVWR in the same manner and generally on the same schedule as heavy LDTs. Thus, complete HDVs will be required to meet a refueling emission standard of 0.20 grams per gallon of fuel dispensed. For purposes of ORVR applicability, complete vehicle means a vehicle that leaves the primary manufacturer's control with its primary load carrying device or container attached.

The ORVR standard will be phased in with 80 percent compliance in the 2005 model year and 100 percent compliance in the 2006 model year. This phase-in is the same as that currently in place for heavy LDTs except that no compliance is required in the 2004 model year. For those manufacturers choosing the 2003 or 2004 compliance option discussed previously (Option 1 or 2), the ORVR standard will be phased in with 40 percent compliance required in the 2004 model year, 80 percent compliance in the 2005 model year, and 100 percent compliance in the 2006 model year. Heavy LDTs and HDVs will be considered a single category for the purposes of the phase in. In other words, the percent compliance requirements for a given model year apply to heavy LDTs and HDVs as a single group, rather than to each group separately. We are including an exception to this phase-in approach to allow additional lead time for complete HDVs that do not have light-duty counterparts and those whose fuel tank capacity is greater than 35 gallons. Thus, for those complete HDVs up to 10,000 lb GVWR that do not share an identical fuel system with a light-duty counterpart, and for those whose fuel tank(s) have a total capacity of more than 35 gallons, the ORVR requirements take effect with the 2006 model year. This additional lead time is appropriate for these vehicles because ORVR systems will have to be developed specifically for them, whereas for those heavy-duty vehicles that have light-duty counterparts the required ORVR development work is already underway in order to comply with the heavy light-duty truck ORVR requirements.

Currently, in the review of certification applications for ORVR-equipped LDVs and LDTs, we study the design of the vehicle's ORVR system, its on-vehicle configuration and operation, and consult directly with the National Highway Traffic Safety Administration (NHTSA) on these applications. We will extend this practice of consulting with NHTSA in the review of certification applications for ORVR-equipped HDVs as well.

6. On-board Diagnostics Requirements for Otto-cycle Vehicles

Today's final rule establishes new on-board diagnostic requirements for complete HD Otto-cycle vehicles in the 8,500 to 14,000 pound GVWR category. The new OBD requirements for heavy-duty Otto-cycle vehicles are identical to those already in place for light-duty Otto-cycle vehicles and trucks. In general, the OBD system must monitor emission-related powertrain components for deterioration or malfunction causing emissions to exceed 1.5 times the applicable standards. Upon detecting a malfunction, a dashboard MIL must be illuminated informing the driver of the need for repair. To assist the repair technician in diagnosing and repairing the malfunction, the OBD system must also incorporate standardization features (*e.g.,* the diagnostic data link connector; computer communication protocols; etc.) the intent of which is to allow the technician to diagnose and repair any OBD compliant truck or engine through the use of a ''generic'' hand-held OBD scan tool. The following is a summary of the requirements for HD Otto-cycle vehicles.

a. Federal OBD Malfunction Thresholds and Monitoring Requirements

This final rule requires that, beginning in the 2005 model year (or 2004 under Option 1), complete heavy-duty Otto-cycle vehicles must be equipped with an OBD system capable of detecting and alerting the driver of the following emission-related malfunctions or deterioration as evaluated over the appropriate certification test procedure: [38]

(i) Catalyst deterioration or malfunction before it results in an increase in NMHC [39] emissions equal to or greater than 1.5 times the NMHC standard or FEL, as compared to the NMHC emission level measured using a representative 4,000 mile catalyst system.

(ii) Engine misfire before it results in an exhaust emission exceedance of 1.5 times the applicable standard or FEL for NMHC, CO or NO_X.

(iii) If the vehicle or engine contains an oxygen sensor, then oxygen sensor deterioration or malfunction before it results in an exhaust emission exceedance of 1.5 times the applicable standard or FEL for NMHC, CO or NO_X.

(iv) If the vehicle or engine contains an evaporative emission control system, then any vapor leak in the evaporative and/or refueling system (excluding the tubing and connections between the purge valve and the intake manifold) greater than or equal in magnitude to a leak caused by a 0.040 inch diameter orifice; an absence of evaporative purge air flow from the complete evaporative emission control system. On vehicles with fuel tank capacity greater than 25 gallons, the Administrator will revise the size of the orifice to the feasibility limit, based on test data, if the most reliable monitoring method available is unable to reliably detect a system leak equal to a 0.040 inch diameter orifice.

(v) Any deterioration or malfunction occurring in a powertrain system or component directly intended to control emissions, including but not necessarily limited to, the EGR system, if equipped, the secondary air system, if equipped, and the fuel control system, singularly resulting in exhaust emissions exceeding 1.5 times the applicable emission standard or FEL for NMHC, CO, NO_X. For vehicles equipped with a secondary air system, a functional check, as described in paragraph (vi) below, may satisfy the requirements of this paragraph provided the manufacturer demonstrates that deterioration of the flow distribution system is unlikely. This demonstration is subject to Administrator approval and, if the demonstration and associated functional check are approved, the diagnostic system is required to indicate a malfunction when some degree of secondary airflow is not detectable in the exhaust system during the check.

(vi) Any other deterioration or malfunction occurring in an electronic emission-related powertrain system or component not otherwise described above that either provides input to or receives commands from the on-board computer and has a measurable impact on emissions; monitoring of components required by this paragraph may be satisfied by employing electrical circuit continuity checks and, wherever feasible, rationality checks for computer input components (input values within manufacturer specified ranges based on other available operating parameters), and functionality checks for computer output components (proper functional response to computer commands); malfunctions are defined as a failure of the system or component to meet the electrical circuit continuity checks or the rationality or functionality checks.

Upon detection of a malfunction, the MIL is required to illuminate and a fault code stored no later than the end of the next driving cycle during which monitoring occurs provided the malfunction is again detected. Alternatively, upon EPA approval, a manufacturer is allowed to use a diagnostic strategy that employs statistical algorithms for malfunction determination. Manufacturers are required to determine the appropriate operating conditions for diagnostic system monitoring with the limitation that monitoring conditions are encountered at least once during the applicable certification test procedure or a similar test cycle as approved by EPA. This is not meant to suggest that monitors be designed to operate only under test procedure conditions, as such a design would not encompass the complete operating range required for OBD malfunction detection.

As an option to the above requirements, EPA will allow compliance demonstration according to the California OBDII requirements for HD Otto-cycle vehicles. This option allows manufacturers to concentrate on one set of OBD requirements for nationwide implementation (although federal OBD emission malfunction thresholds and monitoring requirements are essentially equivalent to those of the California OBDII regulation) and provides the highest level of OBD system effectiveness toward meeting nationwide clean air goals.

b. Standardization Requirements

The light-duty OBD regulations contain requirements for standardization of certain critical aspects of the OBD system. These critical aspects include the design of the data link connector, protocols for on-board to off-board computer communication, formats for diagnostic trouble codes, and types of test modes the on-board system and the off-board scan tool must be capable of supporting. Today's action contains similar standards for heavy-duty OBD systems, as detailed in the regulatory requirements under section § 86.1806–05.

c. Deficiency Provisions

Today's action also establishes the same deficiency provisions for HD Otto-cycle vehicle OBD systems as currently apply to light-duty OBD systems. This will allow the Administrator to accept an OBD system as compliant even though specific requirements are not fully met. The deficiency provisions were first introduced on March 23, 1995 (60 FR 15242), and were revised on December 22, 1998 (63 FR 70681).

To clarify our deficiency provisions, EPA does not expect to certify vehicles with federal OBD systems that have more than one OBD system deficiency, or to allow carryover of any deficiency to the following model year unless it can be demonstrated that correction of the deficiency requires hardware and/or software modifications that cannot be accomplished in the time available, as determined by the Administrator. Nonetheless, we recognize that there may be situations where more than one deficiency is necessary and appropriate, or where carry-over of a deficiency(ies) for more than one year is necessary and appropriate. EPA may approve such deficiencies provided the manufacturer has demonstrated an acceptable level of effort toward OBD compliance. These deficiency provisions cannot be used as a means to avoid compliance or delay implementation of any OBD monitors or as a means to compromise the overall effectiveness of the OBD program.

d. Applicability and Waivers

The federal HD Otto-cycle vehicle OBD requirements finalized in today's action will be implemented beginning with the 2005 model year. OBD requirements for HD Otto-cycle vehicles up to 14,000 pounds GVWR will be phased in over a three year period, from 2005 until 2007. The percentage phase-in schedule will be 60/80/100 for the 2005/06/07 model years, respectively, based on projected sales. For those manufacturers who choose the optional 2003 or 2004 compliance path for HD Otto-cycle engines and vehicles (Option 1 or 2), the OBD phase-in schedule will be 40/60/80/100 percent for the 2004/05/06/07 model years respectively. For those manufacturers with a single heavy-duty engine family (including otto-cycle and diesel), implementation of OBD requirements would not have to occur until the 2007 model year. As discussed in Section III.A.4 and III.C.4,

[38] The FTP minus the Supplemental FTP for chassis certified systems; the engine certification test procedure minus any supplemental test procedures for engine certified systems. While malfunction thresholds are based on certification test procedure emissions, this does not mean that OBD monitors need operate only during the test procedure. All OBD monitors that operate continuously during the test procedure should operate in a similar manner during non-test procedure conditions. The prohibition against defeat devices in § 86.004–16 applies to these OBD requirements.

[39] As a point of clarification, federal emissions standards are expressed in terms of NMHC. Therefore, in order to remain consistent, all references to HC will be referred to as NMHC.

this final rule also establishes OBD requirements for heavy-duty diesel engines used in vehicles up to 14,000 pounds GVWR, and for HD Otto-cycle engines used in incomplete vehicles up to 14,000 pounds GVWR that are similar to the requirements for HD complete Otto-cycle vehicles, including an identical phase-in schedule. HD manufacturers will be allowed to meet the OBD phase-in requirements by combining their projected sales of HD Otto-cycle engines and vehicles and HD diesel engines to meet a combined diesel and Otto-cycle phase-in, at their option.

For heavy-duty vehicles and engines up to 14,000 pounds GVWR operating on alternative fuel, EPA may grant OBD waivers during alternative fuel operation through the 2006 model year to the extent that manufacturers can justify the inability to fully comply with any of the OBD requirements.[40] Such inability must be based upon technological infeasibility, not resource reasons. Further, any heavy-duty vehicles and engines that are subsequently converted for operation on alternative fuel are not expected to comply with these OBD requirements if the non-converted vehicle or engine does not comply. In other words, if the vehicle or engine never completes any assembly stage in OBD compliance, it need not comply with the OBD requirements while operating on the alternative fuel. If the vehicle or engine does complete any assembly stage with a compliant OBD system, it must comply with the OBD requirements while operating on the fuel of original intent and, to the extent feasible, while operating on the alternative fuel. For these latter situations, EPA may grant waivers through the 2006 model year if the manufacturer shows it is infeasible to meet the requirements. Beginning in the 2007 model year, all heavy-duty alternative fueled vehicles and engines up to 14,000 pounds GVWR must be fully compliant during both operation on the original fuel and the alternative fuel.

e. Certification Provisions

The OBD certification information requirements of today's action are consistent with the Compliance Assurance Programs 2000 (CAP 2000) rulemaking discussed above. The Part 1 Application must include, for each OBD system: a description of the functional operating characteristics of the diagnostic system; the method of detecting malfunctions for each emission-related powertrain component; and a description of any deficiencies including resolution plans and schedules. Anything certified to the California OBDII regulations is required to comply with California ARB information requirements. EPA may consider abbreviating the OBD information requirements through rulemaking if it gains confidence that manufacturers are designing OBD systems that are fully compliant with all applicable regulations.

During EPA certification of vehicles optionally certified to the California OBDII regulation, EPA may conduct audit and confirmatory testing consistent with the provisions of the California OBDII requirements. Therefore, while the Agency will consider California certification in determining whether to grant a federal certificate, EPA may also elect to conduct its own evaluation of that OBDII system. While it is unlikely, EPA may make a compliance determination that is not identical to that of the California Air Resources Board.

Further, this final rule establishes "drop-in" demonstration provisions for HD Otto-cycle OBD systems similar to those discussed under the HD diesel OBD requirements. This provision allows engine-certified and engine-demonstrated OBD system to fulfill the demonstration requirements of a chassis-certified OBD system, however, the chassis-certified system would have to incorporate transmission diagnostics even though the "dropped-in" engine system may not have been certified with transmission diagnostics. The drop-in provision also allows a chassis-certified and chassis-demonstrated OBD system to fulfill any demonstration requirements of an engine-certified OBD system. The drop-in provision discussed here requires the manufacturer to rigorously demonstrate its OBD concept and approach on one engine or model, but allows the manufacturer to apply that demonstration via engineering judgement to the different engine and powertrain calibrations used across its fleet. The Agency will accept such a demonstration provided sound engineering judgement is employed.

C. What Are the Requirements of the Heavy-duty Otto-cycle Engine-based Program?

1. Emission Standards

We are finalizing an $NMHC+NO_X$ standard for Otto-cycle engines, applicable to engines used in vehicles over 14,000 pounds GVWR and in incomplete vehicles, of 1.0 g/bhp-hr.[41] Existing CO standards for these engines and vehicles will continue to remain in place. This approach is consistent with California which allows engine-based testing for these vehicles in its Medium-duty Vehicle program. This standard will take effect starting with the 2005 model year. As discussed in the proposal, and after consideration of comments received on the proposal, we continue to believe that this standard, implemented in the 2005 model year, represents the most stringent standard reasonably achievable for these engines, in keeping with the requirements of the CAA (including the four-year lead time requirement). We also believe that the ABT program for engines (described below) provides manufacturers with desirable flexibility to meet the new standard as their product lines become subject to the new engine standards. However, as noted earlier, we are also providing options to allow manufacturers to achieve lower levels of emissions starting with the 2003 or 2004 model year. Under these options (Options 1 and 2 for the 2003 and 2004 model years, respectively), manufacturers have to meet an engine-based standard of 1.5 g/bhp-hr until the 2008 model year, when the standard becomes 1.0 g/bhp-hr. (As noted earlier, EPA has recently proposed new standards for on-highway heavy-duty vehicles and engines. Thus, the 2008 standard finalized in today's rule serves only as a "placeholder" for standards resulting from future EPA action affecting the 2007, 2008, and later model years. The standards in EPA's recent proposal would supercede the standards finalized in today's action. See EPA's recent proposal at 65 FR 35430, June 2, 2000.) Option 1 provides more flexibility than Option 2 by allowing manufacturers to choose chassis-based or engine-based standards for their complete vehicles for the 2003 through 2006 model years.

2. Durability Procedures

Under the current certification regulations, manufacturers develop deterioration factors based on testing of development engines and emissions control systems. Because emissions control efficiency generally decreases with the accumulation of service on the engine, the regulations require that a deterioration factor (DF) be used in conjunction with engine test results as the basis for determining compliance with the standards. The regulations

[40] Note that this provision currently exists for light-duty vehicles and trucks operating on alternative fuel through the 2004 model year; that existing provision does not change with today's rule.

[41] Incomplete vehicles less than 14,000 lbs GVWR could optionally certify to the new vehicle-based standards, as discussed in a later section.

require that the manufacturer develop an appropriate DF, which is then subject to review by EPA in the certification process. These deterioration factors are applied to low mileage emissions levels of certification engines in order to predict emissions at the end of the engines' useful life. The emissions level after the deterioration factor is applied is the engine certification level, which must be below the standard for the engine to be certified. For engines equipped with aftertreatment (*e.g.,* catalysts), the DF must be ''multiplicative'' (*i.e.,* a factor that can be multiplied by the low mileage emissions level of the certification engine to project emissions at the end of the engine useful life). For engines lacking aftertreatment (*e.g.,* most current diesels), the DF must be ''additive'' (*i.e.*, a factor that can be added to the low mileage emissions level of the certification engine to project emissions at the end of the engine useful life).

Manufacturers provided comments indicating that their current deterioration factors are based on 50th percentile in-use deterioration rates, or average in-use deterioration. They also commented that they account for more severe deterioration than average by certifying with certification levels well below the standards.

EPA believes that the manufacturer's durability process should result in the same or greater level of deterioration than is observed in-use for a significant majority of their vehicles, rather than simply matching the average in-use deterioration. This is especially important considering that incomplete vehicles and vehicles over 14,000 pounds GVWR are more likely to be work vehicles and operated under more severe conditions a greater percentage of their useful lives. EPA believes that it is important for certification levels (emissions tests adjusted by the DF) to represent anticipated in-use emissions levels of a significant majority of in-use engines. As the standards are reduced, this will continue to be a key aspect of EPA's compliance programs. Deterioration factors are also used during production line testing to verify the emissions performance of production engines. Finally, the ABT program relies on certification data as the basis for determining credits. Although Otto-cycle engine manufacturers have not made wide use of the ABT program to date, EPA expects more use of the program in future years due to the new more stringent emissions standards and new ABT flexibilities.

EPA is finalizing today, as proposed, that the compliance provisions for heavy-duty engines contained in 40 CFR part 86, subpart A would continue to apply to HDVs subject to the engine-based standards, with modifications designed to ensure that the durability demonstration procedures used by manufacturers in the certification process, and deterioration factors calculated by means of these procedures, predict the emission deterioration of a significant majority of in-use engines to be covered by the procedure.

The deterioration factor determination procedures in the regulations are modified to specify that emission control component aging procedures will predict the deterioration of the significant majority of in-use engines over the breadth of their product line that would ultimately be covered by this procedure (manufacturers would be expected to show that their durability programs cover on the order of ninety percent or higher of the distribution of deterioration rates experienced by vehicles in actual use). In addition, manufacturers are required to calculate multiplicative DFs by dividing high mileage exhaust emissions by the low milage exhaust emissions (*e.g.,* emissions at the useful life mileage by exhaust emissions at 4,000 miles).[42] This change only adds specificity to the regulations so that DFs are calculated using a consistent and credible methodology. These modifications to the engine-based HDV compliance procedures would also be effective for any engine family generating ABT credits prior to the 2004 model year.

Manufacturers commented that multiplicative deterioration factors are becoming less accurate and reliable as low mileage emissions durability levels become very low resulting in increased test-to-test variability.[43] The low mileage levels, when divided into the 120,000 mile emissions level, produce DFs that are highly variable and inaccurate. Manufacturers recommended allowing the optional use of additive deterioration factors for engines equipped with aftertreatment. We have analyzed this issue and believe that in some cases additive DFs may be appropriate. Consequently, we have included a provision in this final rule that enables manufacturers to use additive DFs under certain conditions. Manufacturers need prior approval from EPA to use an additive deterioration factor and would be required to conduct in-use verification testing to ensure that the additive DF reasonably predicted in-use emissions performance.

3. Averaging, Banking, and Trading for Otto-Cycle Engines

As part of finalizing more stringent engine-based standards, EPA is finalizing a modified ABT program for these engines. The program is similar in design to the program adopted for diesel engines. EPA is finalizing ABT modifications to allow more flexibility within the ABT framework to help meet the more stringent standards. ABT credits can help manufacturers with engine configurations that are more difficult to modify, where more time would help reduce costs. Credits can also allow manufacturers to continue with product plans that might call for the retirement of an engine family at some point shortly after the implementation of the new standards. By banking credits manufacturers can also reduce the uncertainty or risk associated with the new standards. EPA believes that the modified ABT program contained in this rule will not decrease emissions reductions associated with the new standards.

For the 1999 model year, the ABT program was used for only one Otto-cycle engine family to meet the current 4.0 g/bhp-hr NO_X standard which went into effect in the 1998 model year. For the 2000 model year, no engine families were certified using the ABT program. Advances in catalyst technology and engine/fuel system improvements have allowed manufacturers to meet the standard across their product line. Most engine families have certification levels of less than half the standard. However, with the new more stringent engine-based standards, EPA expects that ABT may become a more important tool for Otto-cycle engine manufacturers.

An ABT program allows the Agency to consider lower emissions standard, or one that otherwise results in greater emissions reductions, compared to a standard that might otherwise be appropriate under section 202(a)(3) of the CAA, since ABT reduces the cost and improves the technological feasibility of achieving the standard. EPA is finalizing changes to the ABT program with the intent that the changes would enhance the technological feasibility and cost-effectiveness of the new standard, and thereby help to ensure the new standard would be attainable earlier than would otherwise be possible. The changes would provide

[42] Manufacturers are not required to accumulate actual mileage on vehicles or engines in order to determine a deterioration rate. In many cases, the accumulation of mileage (or ''service'') is simulated by various ''bench aging'' techniques that allow the process to consume less time and resources than accumulating actual mileage.

[43] High mileage emissions levels are divided by the low mileage emissions levels to calculate the multiplicative deterioration factor.

manufacturers with additional product planning flexibility and the opportunity for a more cost effective introduction of product lines meeting the new standard. Also, EPA believes that ABT creates an incentive for early introduction of new technology, which allows certain engine families to act as trail blazers for new technology. This can help provide valuable information to manufacturers on the technology prior to manufacturers applying the technology throughout their product line. This further improves the feasibility of achieving the standard. This early introduction can also provide valuable information for use in other regulatory programs that may benefit from similar technologies (*e.g.,* nonroad programs). EPA views the effect of the ABT program itself as environmentally neutral because the use of credits by some engines is offset by the generation of credits by other engines. However, when coupled with the new standards, the ABT program would be environmentally beneficial because it would allow the new standards to be implemented earlier than would otherwise be appropriate under the Act.

EPA is finalizing the following provisions for the modified ABT program for Otto-cycle engines. The provisions are being finalized essentially as proposed except for minor adjustments to account for the three program options.

Early Credits

- Manufacturers may bank NO_X credits beginning in MY 2000 for use in meeting the more stringent standards (MYs 2003/2004/2005 and later).
- Early credits may be earned up to a NO_X level of 2.0 g/bhp-hr.
- Early credits will be discounted by 10 percent for engine families with FELs above the 1.0 g/bhp-hr NMHC+NO_X level and undiscounted for engine families with FELs at or below the 1.0 g cut point.
- Engine families generating credits must meet the revised requirements for deterioration factors contained in this rule (See Section 2 above)
- Early NO_X credits may be used to meet the new combined NMHC+NO_X standard

Regular Credits

For credits earned after the implementation of the new standard (2003/2004/2005, as applicable):

- Credits will be earned on a NO_X plus NMHC basis
- Engine families with FELs above 0.5 g/bhp-hr NMHC+NO_X will be discounted by 10 percent. Engine families with FELs at or below 0.5 g/bhp-hr will earn undiscounted credits.
- Credits will be earned up to the level of the standard (1.5 g/bhp-hr or 1.0 g/bhp-hr, as applicable)

Credit Use

- Credits banked under the modified program have unlimited credit life
- Engine families using credits may not exceed the previous NO_X standard of 4.0 g/bhp-hr
- Credits generated under the modified program may not be used to meet the current 4.0 g/bhp-hr standard

Manufacturers may continue to use the current ABT program for engines certified to the current 4.0 g/bhphr NO_X standard. The current program will not be available for engines certified to the new NO_X plus NMHC standards finalized in this rule. Credits generated in the current program cannot be used to meet the new standards. The modified program outlined above is effective for these engines. Therefore, the current program will be phased out in 2003, 2004, or 2005 depending on the option chosen by the manufacturer. EPA is ending the current program because of concern that manufacturers could generate enough credits under the current program to significantly delay the new standards. The current program allows manufacturers to earn credits up to the current NO_X standard of 4.0 g/bhp-hr. With most engines currently certified with NO_X levels below 2.0 g/bhp-hr, there is potential for substantial credit generation without the application of improved technology under the current ABT program. If manufacturers were to bank these credits, they could potentially use them to delay the introduction of engines meeting the new standards for a large majority of their sales for up to three years.

EPA received comments from manufacturers that the ceiling of 2.0 g/bhp-hr for early credit generation is too restrictive because manufacturers must account for compliance margin and more severe deterioration when establishing FELs and therefore would not set FELs at their certification level. Manufacturers recommended a ceiling of 3.0 g/bhp-hr. EPA is concerned that even after accounting for more severe deterioration and compliance cushion manufacturers would still have the ability to generate a large pool of credits prior to the implementation of the new standards if the ceiling were revised to 3.0 g/bhp-hr. EPA's concerns are increased with Option 3 which allows an additional model year (2004 model year) for early banking.

The 2.0 g/bhp-hr ceiling for credit generation in the modified program provides opportunity for manufacturers to earn credits through the use of emissions controls that are superior to the average controls currently being used. It helps ensure that the credits represent a pull-ahead of technology and are not windfall credits. The changes to credit life and discounting in the modified program provide manufacturers with more flexibility in the way they use those credits once they are earned. EPA believes this approach is consistent with the goals of ABT. For these reasons, we are finalizing the 2.0 g/bhp-hr ceiling for credit generation, as well as the changes to credit life and discounting (discussed below), as proposed.

EPA is finalizing the requirement that engines families generating early credits for use in the modified program be certified using the revised durability procedures described above in section III.C.2. These new procedures are necessary to ensure that the certification level reflects a significant majority of in-use engines within the engine family. The revised procedures are important for the ABT program because the program allows manufacturers to establish their FEL at the certification level for purposes of generating or using credits. As discussed in the Response to Comments document, the requirement to use revised durability procedures also helps address windfall credits issues with regard to the program.

We received comments that we should not require revised durability procedures for engines generating early credits because it will take manufacturer's up to three years to develop the new DFs, thus delaying their ability to generate early credits. While we anticipate some time being needed to generate new deterioration factors, we do not expect a long delay due to the new requirements in most cases. Comments from manufacturers that they currently consider more severe deterioration during the certification process suggest that the manufacturers have data on more severe deterioration. Also, there are accelerated aging methods available for use in deriving deterioration factors that can significantly decrease the amount of time required to derive new deterioration factors. These available methods generally require less than a year to carry out.

Nevertheless, in cases where manufacturers do not currently have adequate data on which to base a revised deterioration factor, the generation of new data will take time and may delay the manufacturer's ability to generate credits in the earliest years of the ABT program. There will, however, still be at least a few years for manufacturers to generate and bank early credits even if new data must be generated, especially for Option 3 (1.0 g/bhp-hr in MY 2005). Options 1 and 2 do not provide as much lead time for early credit generation but they contain a somewhat less stringent standard so early credits may be less important for manufacturers selecting one of these options. Also, Options 1 and 2 contain provisions within the ABT program for manufacturers to exchange credits between the vehicles and engines programs. For these reasons, we do not expect the requirements for using a revised DF to significantly impact the feasibility of the standards.

The changes to credit life and discounting being finalized for Otto-cycle engines are conceptually consistent with the modifications finalized for diesel engines. We are finalizing our proposal to discount credits by 10 percent if the engine has an FEL above a certain value or cut-point. We adopted cut points in the diesel program in order to identify the introduction of new technology as opposed to recalibrating or enhancing existing technology. We believe that adoption of cut points in the HD Otto-cycle engine program will provide similar technology forcing incentives. We selected cut-point levels which represent a clear step in emissions control rather than a marginal emissions reduction. The 10 percent discount selected for the HD Otto-cycle engine ABT program is consistent with the program finalized for diesel engines. In that final rule, we noted that a 10 percent discount strikes a balance between zero (which significantly reduces the incentive to develop and implement significantly cleaner technology) and 20 percent (which manufacturers indicated in comments was far too large and would create a disincentive for the introduction of cleaner technology). (*See* 62 FR 54708, October 21, 1997.)

For diesels, EPA removed the three year credit life limit that allows manufacturers to earn credits to be used in 2004 and later as early as the 1998 model year. For Otto-cycle engines, MY 2000 will be the earliest model year that the rule would be effective due to the timing of the rulemaking. Removing the credit life limit will provide an additional year of potential credit banking and allows manufacturers to retain credits after 2004 rather than having them expire after a certain year. We believe that having credits expire would simply encourage manufacturers to use the credits rather than save them; thus, removing the credit life limit should provide a net environmental benefit.[44]

We believe the program effectively balances the manufacturer's needs for flexibility given the stringency of the standards being adopted with the environmental goals of the ABT program. We believe that our ABT program detailed above will encourage the early use of cleaner technologies and provide manufacturers with valuable flexibility in transitioning to more stringent standards. EPA is finalizing the modification to the ABT program in conjunction with the engine-based standards to provide the flexibility necessary to enable manufacturers to meet the standard across their product line.

4. On-Board Diagnostics for Otto-Cycle Engines

Today's final rule establishes new on-board diagnostic requirements for HD Otto-cycle engines used in incomplete vehicles in the 8,500 to 14,000 pound GVWR category. The new OBD requirements for heavy-duty Otto-cycle engines are essentially identical to those already in place for light-duty Otto-cycle vehicles and trucks. In general, the OBD system must monitor emission-related engine components for deterioration or malfunction causing emissions to exceed 1.5 times the applicable standards. Upon detecting a malfunction, a dashboard MIL must be illuminated informing the driver of the need for repair. To assist the repair technician in diagnosing and repairing the malfunction, the OBD system must also incorporate standardization features (*e.g.,* the diagnostic data link connector; computer communication protocols; etc.) the intent of which is to allow the technician to diagnose and repair any OBD compliant truck or engine through the use of a ''generic'' hand-held OBD scan tool.

The provisions for HD Otto-cycle engines used in incomplete vehicles are identical to the provisions discussed in Section III.B.6 in almost every respect. The differences for the HD Otto-cycle engines used in incomplete vehicles, as specified in the regulatory language, are: (1) Engine emission related components must be monitored, not powertrain related components, and (2) $NMHC+NO_X$ thresholds must be monitored, not NO_X and NMHC separately. In all other respects the regulatory requirements for HD Otto-cycle engines used in incomplete vehicles are the same as those for complete HD Otto-cycle vehicles.

5. Evaporative Emissions Test Procedures

We are not making any changes to the levels of the HD Otto-cycle engine evaporative emission standards in today's action. However, we are allowing, upon the effective date of this rule, manufacturers to use the light-duty urban dynamometer driving schedule (UDDS) in place of the heavy-duty UDDS for evaporative testing of HD Otto-cycle engines. A more complete discussion of this issue can be found in section III.B.5.a.

D. What Are the New On-Board Diagnostics Requirements for Light-Duty Diesel Vehicles?

Today's final rule establishes new on-board diagnostic requirements for LD diesel vehicles. OBD requirements for LD diesel vehicles have existed for many years. However, LD diesel vehicles have not been required to monitor aftertreatment devices, such as diesel oxidation catalysts or particulate traps. Similar to the new requirements for HD diesel OBD aftertreatment monitoring, today's action requires LD diesel vehicles to monitor aftertreatment devices. We received a number of comments on the proposed OBD requirements and have incorporated those recommendations that we deemed to be appropriate. The summarized comments and our responses can be reviewed in the Summary and Analysis of Comments Document. The following is a summary of the new requirements for LD diesel vehicles.

1. Federal OBD Malfunction Thresholds and Monitoring Requirements

This final rule requires that, beginning in the 2004 model year for LD diesel vehicles less than 6,000 pounds GVWR, and the 2005 model year for LD diesel vehicles between 6,000 pounds and 8,500 pounds GVWR must be equipped with an OBD system capable of detecting and alerting the driver of the following emission-related malfunctions or deterioration as evaluated over the appropriate certification test procedure:[45]

[44] EPA presented a detailed analysis of its ABT program in the Response to Comments for the Diesel Final Rule, Docket A–95–27, document no. V–C–01.

[45] The FTP minus the Supplemental FTP. While malfunction thresholds are based on certification test procedure emissions, this does not mean that OBD monitors need operate only during the test procedure. All OBD monitors that operate continuously during the test procedure should operate in a similar manner during non-test procedure conditions. The prohibition against

Continued

(i) Catalyst deterioration or malfunction—before it results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NO_X or PM, as compared to the NO_X or PM emission level measured using a representative 4,000 mile catalyst system. The above requirement only applies to reduction catalysts; oxidation catalysts are not required to be monitored.

(ii) Particulate trap malfunction—any particulate trap whose complete failure results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NO_X or PM, as compared to the NO_X or PM emission level measured using a representative 4,000 mile particulate trap system must be monitored. Particulate trap monitoring must be capable of detecting a catastrophic failure of the device, monitoring to the precise 1.5 threshold is not necessary. This monitoring would not need to be done if the manufacturer can demonstrate that a catastrophic failure of the system will not result in exceedance of the threshold.

2. Applicability and Waivers

The federal LD diesel vehicle OBD requirements finalized in today's action would be fully implemented (100%) in the 2004 model year for vehicles less than 6,000 pounds GVWR . The federal OBD requirements for LD diesel vehicles between 6,000 pounds and 8,500 pounds GVWR and diesel MDPVs would be fully implemented (100%) in the 2005 model year.

E. Access to On-Board Computer Information

We are finalizing the proposed requirement that manufacturers be required to provide to us information and hardware that we request to read and interpret emission control information broadcast by an engine's electronic control module. Specifically, we proposed:

Upon request from EPA, a manufacturer must provide to EPA hardware (including scan tools), passwords, and/or documentation necessary for EPA to read and interpret (in engineering units if applicable) any information broadcast by an engine's on-board computers and electronic control modules which relates in anyway to emission control devices and auxiliary emission control devices. Passwords include any information necessary to enable generic scan tools or personal computers access to proprietary emission related information broadcast by an engine's on-board computer, if such passwords exist. This requirement includes access by EPA to any proprietary code information which may be broadcast by an engine's on-board computer and electronic control modules. Information which is confidential business information must be marked as such. Engineering units refers to the ability to read and interpret information in commonly understood engineering units, for example, engine speed in revolutions per minute or per second, injection timing parameters such as start of injection in degree's before top-dead center, fueling rates in cubic centimeters per stroke, vehicle speed in miles per hour or kilometers per hour.

In response to a comment that manufacturers should not be required to provide EPA with a commercially available scantool, we are revising this language to clarify that manufacturers are not required to provide hardware that is otherwise commercially available. This new regulatory requirement is not intended to limit our authority under section 208 of the Clean Air Act to require manufacturers to provide us with commercially available tools and other information.

We believe that this requirement is necessary to ensure in-use compliance. We recognize manufacturers' concern regarding the potential burden of this requirement; however, it should be noted that this requirement does not mean that manufacturers will need to submit all of this information with each application for certification. We intend to require this information only to the extent that is necessary. Moreover, we are willing to work with the manufacturers in implementing this regulatory provision to find ways to minimize the burden while enabling us to ensure in-use compliance. Thus, we may revise this provision in a later rulemaking. This section is not intended to limit our authority under section 208 of the Clean Air Act to require manufacturers to provide us with commercially available tools and other information.

IV. The Heavy-Duty Requirements Are Technologically Feasible

A. Emission Standards for Heavy-Duty Diesel Engines

Today's final rule contains a reaffirmation of the 2004 NMHC+NO_X standards as well as several supplemental standards and test cycles for 2007 model year HDDE;

—2004—2.4 g/bhp-hr NMHC + NO_X or 2.5 g/bhp NMHC + NO_X with a limit of 0.5 g/bhp-hr on NMHC on the existing Federal Test Procedure
—2007—Emission requirements of 1.0 times the FTP standards on the new Supplemental Steady-State Test cycle and compliance under steady-state conditions with Maximum Allowable Emission Limits
—2007—Emission requirements of 1.25 times the FTP standards under the new Not-to-Exceed test zone

EPA has determined these standards and new test procedures are feasible in this time frame based on a number of factors. First, as detailed in the proposal and in the final rule, enormous progress has been made in the last few years regarding HD diesel emission control technology, principally in the areas of: Second generation full authority fuel injection systems; cooled EGR for HD diesels, advanced turbocharging systems (such as VGT), and advanced electronic control systems. Second, data published in the scientific literature has shown that individually and in combination, these emission control technologies can produce substantial emission reductions in NO_X, PM and hydrocarbons, over a broad range of engine operating conditions. As detailed in the RIA for this final rule, emission reductions on the order of 50 to 90 percent from current generation HD diesel engines have been demonstrated using combinations of these technologies. Third, with respect to the new supplemental requirements, a number of manufacturers have requested and received certificates of conformity for a large number of HD diesel engine families which meet NTE limits, Supplemental Steady-state limits, and MAEL limits using existing HD diesel engine technology (*i.e.,* engines certified to the 4.0g/bhp-hr NO_X standard, the 0.10 g/bhp-hr PM standard (0.05 for urban buses), and the 0.13 g/bhp-hr HC standard). These engine families are certified to NTE limits between 1.25 and 1.75 times the current NO_X standard of 4.0 g/bhp-hr. In addition, they have certified to Supplemental Steady-state (SSS) limits between 1.0 and 1.5 times the current NO_X standard, and 1.0 times the current standard for all other regulated emissions, including THC, PM, CO. While these engine families are not certified to the 2004 standards, they have used existing technology (*i.e.,* without the use of cooled EGR, VGT or Second generation electronic fuel injection systems) to meet NTE and SSS requirements similar to the requirements for 2007 HDDEs. As discussed previously, the application of cooled EGR systems (in combination with advanced fuel injection, turbomachinery, and electronic controls), can produce substantial emission reductions on current technology HD diesel engines over a broad range of operating conditions and therefore can be used to bring future engines into compliance with the supplemental requirements.

Fourth, in response to EPA's proposal, several manufacturers provided EPA with confidential business information (CBI) data regarding testing and development work they have performed

defeat devices in § 86.004–16 applies to these OBD requirements.

in their attempt to meet the NTE at the standard levels contained in today's final rule. This CBI information has been summarized by EPA, and the summary information can be found in a technical memorandum to the docket.[46] This technical memorandum shows that some HD diesel engine manufacturers have been able to achieve the 2007 NTE limit over a broad range of the NTE control area, and over a range of temperatures and altitudes, though not over the entire expanded conditions established in today's action. The memorandum also highlights a number of technical issues manufacturers have encountered in their attempts to meet NTE limits at the levels contained in today's final rule over the entire NTE control area, and at the limits of the expanded conditions. The RIA and the Response to Comments document for this final rule contains EPA's analysis of these issues, including our assessment of the technologies which manufacturers will be able to use to overcome the technical issues they have encountered within the time frame provided by the rule.

In addition, we have determined the 2004 NMHC+NO_X standard, and the 2007 supplemental requirements, are appropriate and feasible without changes in current on-highway diesel fuel formulation. The RIA for this final rule contains the information we have analyzed in making this decision, and the Response to Comments document contains our analysis of the comments we received on this issue. Only a brief summary will be presented here. The most detailed and relevant test program which examined the impact of diesel fuel formulation on 2004 technology engines was discussed in our proposal, and is repeated in the final RIA. The test program, a joint program sponsored by EPA, the American Petroleum Institute, and the Engine Manufacturers Association, showed that large changes in several key fuel parameters resulted in only modest improvements in NMHC+NO_X emissions from a 2004 technology HD diesel engine. In addition, as discussed above, engine control technology alone can result in NMHC+NO_X emission reductions sufficient to meet the 2004 and 2007 requirements. In response to our proposal, a number of engine manufacturers raised engine durability issues associated with the level of the proposed standards and current diesel fuel sulfur levels. As discussed in the RIA and the Response to Comments document, we believe these durability issues can be resolved thru cooled EGR temperature management combined with the selection of corrosive resistant material and bonding processes for the cooled EGR system.

[46] Memorandum to EPA Air Docket A–98–32, ''Summary of CBI Information regarding proposed HD Supplemental Test Requirements''

B. Emission Standards for Heavy-Duty Otto-cycle Vehicles and Engines

We believe that the new standards contained in this final rule are the most stringent standards technologically feasible in the 2004/2005 time frame. We are finalizing three program options for Otto-cycle engines and vehicles, increasing the flexibility of the program and further enhancing program feasibility. Manufacturers may select the option that best fits with their product line and product planning.

This section discusses the current technologies being used by manufacturers and the key technology changes we believe will be available to meet the new vehicle and engine emission standards. Technological feasibility of the exhaust emission standards is presented first, followed by analyses for ORVR controls. Manufacturers will ultimately decide what is best for their individual product lines. It is likely, however, that manufacturers will employ technologies developed first for light-duty vehicles such as improved catalysts. Further information on the various available technologies and EPA's technological feasibility assessment is contained in the Technological Feasibility section of the Regulatory Impact Analysis and the Response to Comments.

1. Current Technologies

Gasoline engine manufacturers are already producing heavy-duty engines that achieve a level of emission control better than the control required by current standards. Table 7 provides a list of some key technologies currently being used for HD engine emissions control. Manufacturers have introduced improved systems as they have introduced new or revised engine models. These systems can provide very good emissions control and many engines are being certified to levels of less than half the current standards. Many of the technologies have been carried over from light-duty applications.

TABLE 7.—KEY TECHNOLOGIES FOR CURRENT HEAVY-DUTY OTTO-CYCLE ENGINES

Sequential fuel injection/electronic control
3 way catalyst
pre and post catalyst heated oxygen sensors
Electronic EGR
Secondary air injection
Improved electronic control modules

Improving fuel injection has been proven to be an effective and durable strategy for controlling emissions and reducing fuel consumption from gasoline engines. Improved fuel injection will result in better fuel atomization and a more homogeneous charge with less cylinder-to-cylinder and cycle-to-cycle variation of the air-fuel ratio. These engine performance benefits will increase as technology advances allow fuel to be injected with better atomization. Increased atomization of fuel promotes more rapid evaporation by increasing the surface area to mass ratio of the injected fuel. This results in a more homogeneous charge to the combustion chamber and more complete combustion. Currently, sequential multi-port fuel injection (SFI) is used in most, if not all, applications under the new standards because of its proven effectiveness.

One of the most effective means of reducing engine-out NO_X emissions is EGR. By recirculating spent exhaust gases into the combustion chamber, the overall air-fuel mixture is diluted, lowering peak combustion temperatures and reducing NO_X. Exhaust gas recirculation is currently used on heavy-duty Otto-cycle engines as a NO_X control strategy. Many manufacturers now use electronic EGR in place of mechanical back-pressure designs. By using electronic solenoids to open and close the EGR valve, the flow of EGR can be more precisely controlled.

EPA believes that the most promising overall emission control strategy for heavy-duty Otto-cycle engines is the combination of a three-way catalyst and closed loop electronic control of the air-fuel ratio. Control of the air-fuel ratio is important because the three-way catalyst is effective only if the air-fuel ratio is at a narrow band near stoichiometry. For example, for an 80 percent conversion efficiency of HC, CO, and NO_X with a typical three-way catalyst, the air-fuel ratio must be maintained within a fraction of one percent of stoichiometry. During transient operation, this minimal variation cannot be maintained with open-loop control. For closed-loop control, the air-fuel ratio in the exhaust is measured by an oxygen sensor and used in a feedback loop. The throttle position, fuel injection, and spark timing can then be adjusted for given operating conditions to result in the proper air-fuel ratio in the exhaust. Most if not all engines have already been equipped with closed loop controls. Some engines have been equipped with catalysts that achieve efficiencies in excess of 90 percent. This is one key reason engine and vehicle certification levels are very low. In addition, electronic control can be used to adjust the air-fuel ratio and spark timing to adapt to lower engine temperatures, therefore controlling HC emissions during cold start operation.

All HD Otto-cycle engines are already equipped with three-way catalysts. Engines may be equipped with a variety of different catalyst sizes and configurations. Manufacturers choose catalysts to fit their needs for particular vehicles. Typically, catalyst systems are a single converter or two converters in series or in parallel. A converter is constructed of a substrate, washcoat, and catalytic material. The substrate may be metallic or ceramic with a flow-through design similar to a honeycomb. A high surface area coating, or washcoat, is used to provide a suitable surface for the catalytic material. Under high temperatures, the catalytic material will increase the rate of chemical reaction of the exhaust gas constituents.

Significant changes in catalyst formulation have been made in recent years and additional advances in these areas are still possible. Platinum, Palladium and Rhodium (Pt, Pd, and Rh) are the precious metals typically used in catalysts. Historically, platinum has been widely used. Today, palladium is being used much more widely due to its ability to withstand very high exhaust temperatures. In fact, some HD vehicles currently are equipped with palladium-only catalysts. Other catalysts contain all three metals or contain both palladium and rhodium. Some manufacturers have suggested that they will use Pd/Rh in lieu of tri-metal or conventional Pt/Rh catalysts for underfloor applications. Improvements in substrate and washcoat materials and technology have also significantly improved catalyst performance.

2. Chassis-Based Standards

We are finalizing standards that effectively extend nationwide the California LEV–I MDV standards in place prior to 2004. California began requiring some vehicles to meet LEV standards in 1998 and the phase-in will be complete in 2001. The technological feasibility assessment and technology projections are based primarily on the mix of technologies being used to achieve California LEV emission levels.

Of the anticipated changes, enhancements to the catalyst systems are expected to be most critical. Catalyst configurations are likely to continue to vary widely among the manufacturers because manufacturers must design the catalyst configurations to fit the vehicles. One potential change is that manufacturers may move the catalyst closer to the engine (close-coupled) or may place a small catalyst close to the engine followed by a larger underfloor catalyst. These designs provide lower cold start emissions because the catalyst is closer to the engine and warms up more quickly. Typically, the catalyst systems used in HD applications have a large total volume but with lower precious metal content per liter compared to light-duty catalyst systems. To meet the chassis-based standards, EPA projects an increase in overall catalyst system precious metal loading with no expected significant increases in total catalyst volume.

Calibration changes will also be important. The engine and catalyst systems must be calibrated to optimize the performance of the systems as a whole. Post catalyst oxygen sensors will allow further air fuel control. Manufacturers are moving to more powerful computer systems and EPA expects this trend to continue. Other technologies such as insulated exhaust systems may also be used in some cases to reduce cold start emissions.

HD vehicles in California have typically been certified with full life emission levels in the 0.3–0.5 g/mile range for NO_X and the 0.1–0.3 g/mile range for NMOG. These levels are well within the LEV standards and provide manufacturers with a compliance cushion. EPA expects manufacturers to sell these vehicles or very similar vehicles nationwide to meet the new vehicle standards.

3. Engine-Based Standards

EPA believes that the engine standards contained in the three options are appropriate standards for HD Otto-cycle engines in the 2003–2005 time frame. Manufacturers may select the option that is the best fit for their product line and planning. Certification levels below 1.0 g/bhp-hr NMHC+NO_X have been achieved on recently introduced engines of varied sizes. EPA believes that the standards being adopted are feasible and provide sufficient opportunity for manufacturers to maintain a reasonable compliance margin. Options 1 and 2 contain a standard of 1.5 g/bhp-hr which we believe is reasonably achievable in the 2003/2004 time frame. With the lead-time available for Option 3 (1.0 g/bhp-hr in 2005), we believe manufacturers will be able to modify systems to improve their performance and durability so that manufacturers can retain necessary compliance margins.

Currently, most engine families are certified with emission levels of less than half the standard. Manufacturers have begun to apply advanced system designs to their heavy-duty applications. Recently introduced engine families have been certified with emission levels below 1.0 g/bhp-hr combined NMHC+NO_X. These engines and systems feature precise air/fuel control and superior catalyst designs comparable to the catalyst systems being used in the California LEV I program. Based on industry input, we believe that manufacturers will continue the process of replacing their old engine families with advanced engines over the next several years. As new and more advanced engines and catalyst systems are introduced, EPA anticipates that they will be capable of achieving the engine standards finalized today.

Manufacturers commented that their current certification data represents average deterioration and therefore EPA cannot base the level of the new standards on current certification data. Manufacturers have stated on several occasions that they target emission certification levels of about half the standard, due to the potential for in-use deterioration of catalysts and oxygen sensors. Catalysts experience wide variations in exhaust temperature due to the wide and varied usage of vehicles in the field. Some vehicles may experience more severe in-use operation than is represented by the durability testing currently conducted for engine certification. Manufacturers have argued that EPA should not set new standards based on certification data because certification levels do not account for severe in-use deterioration.

We proposed standards not at the lowest current certification levels but at twice the lowest current certification levels in order to accommodate the need for compliance margins. EPA continues to believe that with the lead-time available (2005 model year implementation for Option 3, 2008 model year implementation for Options 1 and 2) and the flexibility provided by the ABT program manufacturers will be able to meet the 1.0 g/bhp-hr standard cost effectively. We understand that manufacturers in many cases will have to modify their emission control systems to provide necessary system durability and compliance margins. We believe the technologies are available and can be incorporated into current emission control systems in the time available. The RIA and Response to Comments document provide detailed information about Technological Feasibility.

We are finalizing early implementation options (Options 1 and 2) which allow manufacturers to meet an engine standard of 1.5 g/bhp-hr standard through model year 2007 if they sign up to meet the standard starting in either model year 2003 or 2004 (Manufacturers also must meet the vehicle-based standards for complete vehicles starting in 2004 model year under Option 2. These vehicle-based standards are optional under Option 1). We proposed a standard of 1.0 g/bhp-hr to begin in the 2004 model year but are not finalizing the 1.0 g/bhp-hr standards for the 2004 model year due to the lead time requirements of the Clean Air Act. We expected that the 1.0 g/bhp-hr standard would be technologically feasible for the 2004 model year for the reasons described in the proposed rule. Therefore, we also believe the optional 1.5 g/bhp-hr standard will be feasible in the 2004 model year. Any potential feasibility concerns for the 2004 model year are diminished relative to the proposal by the higher level of the standard (1.5 g compared to 1.0 g) and the potential opportunities for credit transfers from the vehicles to the engine ABT programs. Also, the 1.5 g/bhp-hr standard level is consistent with the recommendations of two manufacturers (Ford and Daimler Chrysler) providing comments on the rule. For these reasons, we expect that Option 2 is technologically feasible and that manufacturers will consider selecting the option.

Option 1 provides incentive for further acceleration of the new standards to the 2003 model year. We believe manufacturers may find this attractive for product planning reasons. The option provides further flexibility for manufacturers to choose between engine and chassis-based testing for the initial years of the program. Based on certification data and the availability of advanced technology, we believe Option 1 would be within reach for manufacturers even though manufacturers would have less lead time if they chose this option.

Catalyst systems with increased precious metal loading will be a critical hardware change for meeting the new engine standards. Optimizing and calibrating the catalyst and engine systems as a whole will also be important in achieving the standards. Increased use of air injection to control cold start emissions may also be needed, especially to reduce NMHC emissions during cold start operation. Also, improved EGR systems and retarded spark timing may be needed to reduce engine out NO_X emission levels.

Catalyst system durability is a key issue in the feasibility of the standards. Historically, catalysts have deteriorated when exposed to very high temperatures and this has long been a concern for heavy-duty work vehicles. Manufacturers have often taken steps to protect catalysts by ensuring exhaust temperatures remain in an acceptable range. Catalyst technologies in use currently are much improved over the catalysts used only a few years ago. The improvements have come with the use of palladium, which has superior thermal stability, and through much improved washcoat technology. The catalysts have been shown to withstand temperatures typically experienced in HD applications. Manufacturers also continue to limit exhaust temperature extremes not only to protect catalyst systems but also to protect the engine.

To help address phase in concerns that could arise for manufacturers, EPA is finalizing a modified ABT program for engines, as described above. The ABT program can be an important tool for manufacturers in implementing a new standard. The program allows manufacturers to comply with the more stringent standards by introducing emission controls over a longer period of time, as opposed to during a single model year. Manufacturers plan their product introductions well in advance. With ABT, manufacturers can better manage their product lines so that the new standards don't interrupt their product introduction plans. Also, the program allows manufacturers to focus on higher sales volume vehicles first and use credits for low sales volume vehicles. EPA believes manufacturers have significant opportunity to earn credits in the pre-2004 (pre-2005 for Option 2) time frame.

We are finalizing three options that we believe will be viable for manufacturers to choose among. The three options provide a range of choices and offer manufacturers flexibility to fit the program with their product planning. As manufacturers continue with normal product plans between now and the start of the new standards, improved engines will continue to replace older models. The ABT program is available for manufacturers who have not completely changed over to new engine models by 2003/2004/2005. ABT provides manufacturers with the opportunity to earn credits prior to implementation and use the credits to continue to offer older engine models that have not yet been redesigned or retired by the start of the program.

4. Onboard Refueling Vapor Recovery

We believe that today's ORVR requirements are technologically feasible. In our previous ORVR rulemaking, we elected to apply ORVR requirements only to LDVs and LDTs (*see* 59 FR 16262, April 6, 1994). We chose at the time of the original rulemaking not to apply ORVR to HDVs because of concerns over secondary manufacturers, different fuel tank designs for larger HDVs than for LDVs and LDTs, and the fact that HDVs are certified under an engine-based testing program. These three issues are addressed in today's requirements by limiting ORVR to complete vehicles under 10,000 lbs GVWR. In the original ORVR rule we analyzed the potential application of ORVR to all HDVs. In that analysis we concluded that ORVR is technologically feasible for application to HDVs. We concluded that the systems which would be required for the covered subset of HDVs would be essentially the same as those for LDVs and LDTs. Such systems have already been successfully implemented on a portion of the LDV fleet. We are aware of no information on fundamental changes to HDV fuel system design which would cause it to believe that the original analysis is no longer valid.

ORVR systems must meet certain basic requirements in order to be effective at controlling refueling emissions. In general, they must provide for the routing of displaced vapors from the fuel tank to the engine rather than allowing them to escape uncontrolled to the atmosphere. This will likely be accomplished through the use of (1) a fillneck seal which prevents the vapors from escaping out the fillneck, (2) a fuel tank vent mechanism, to allow for the controlled routing of the vapors from the fuel tank, (3) vapor lines for transporting vapors, (4) a canister containing activated carbon to temporarily store the vapors, and 5) a purge system to regenerate the canister and route the vapors to the engine.

The major components of an ORVR system are already in place on HDVs in response to EPA's enhanced evaporative emission requirements (*see* 58 FR 16002, March 24, 1993). The primary differences between an enhanced evaporative control system and an ORVR system lie in the need to prevent vapors from escaping via the fillneck during a refueling event, and the fact that the vapor flow rates out of the fuel tank are much higher during refueling than during vehicle operation and diurnal events that enhanced evaporative systems are designed to control.

C. On-Board Diagnostics

For Otto-cycle vehicles and engines, the most difficult monitors to implement are those for the catalyst system, the evaporative emission control system, and engine misfire. While each of these monitors poses technological challenges, none of them pose technological feasibility concerns. Rather than concerns over technological feasibility, EPA expects concerns, where today's rule applies to Otto-cycle vehicles and engines, over resource constraints for OBD calibration and associated verification testing.

EPA does not consider resource constraints a feasibility issue, nor does EPA believe the manufacturers will be constrained by today's OBD provisions. EPA believes this is true for both the Otto-cycle and the diesel OBD requirements. Since the 1996 model year, manufacturers have been equipping their vehicles and engines with OBD systems essentially identical to those being finalized today. This is true federally for all vehicles below 8500 pounds GVWR, and in California for all vehicles and engines below 14,000 pounds GVWR. The Agency believes that the four year lead time within today's final rulemaking matched with the OBD phase-in of 60/80/100 or 40/60/80/100 for the optional 2005 path, provides adequate lead time to apply the real world tested OBD system technology to their new sales fleet below 14,000 pounds GVWR without resource difficulties.

The transmission represents an area of potential concern for engine certified as opposed to chassis certified Otto-cycle and diesel engines. Typically, the engine manufacturer certifies and sells its engine, without an associated transmission, to a chassis manufacturer. The chassis manufacturer then ''mates'' the engine to a transmission purchased from a transmission manufacturer representing a third industry party. The final regulations require that chassis certified systems employ transmission diagnostics, but would not require that engine certified systems employ transmission diagnostics.

EPA believes that it is reasonable to expect that electronically controlled transmissions will be designed with some level of diagnostics to ensure proper operation. In addition, the Agency expects that those transmissions will utilize industry standard communication protocols allowing the transmission and the engine control computers to communicate, and allowing any transmission-related OBD codes to be downloaded via the standard diagnostic data link connector without engine manufacturer involvement.

Specific to diesel vehicles and engines, the Agency believes there are three areas of concern associated with technological feasibility: EGR monitoring; misfire monitoring; and, aftertreatment monitoring. With respect to EGR monitoring, the primary concern is expected to be the cooling componentry of a cooled EGR system. Other aspects of the EGR system, such as activation of the EGR valve, verification of proper flow, etc., can be accomplished as is already being done on Otto-cycle and diesel vehicles and engines under 14,000 pounds GVWR.[47] However, the cooling system presents a new challenge. The Agency believes monitoring of the cooling system is feasible by employing temperature sensors to ensure proper EGR cooling (heat transfer) given existing engine conditions, and coolant flow. If the cooling system becomes fouled, its ability to transfer heat from the exhaust gases to the coolant will be diminished and a resultant temperature inconsistency should be observed. Likewise, if coolant ceases to flow through the cooling system, a resultant temperature inconsistency should be observed. In fact, EPA believes that manufacturers will monitor EGR cooling system performance absent a requirement to do so. As discussed in Chapter 3 of the Regulatory Impact Analysis for today's final rule, manufacturers will be designing their EGR systems to cool the EGR to specific design targets to optimize engine performance and to minimize condensation of sulfuric acid. The only way to ensure that engine performance is being optimized is to monitor the performance of the EGR system and compare it to the specific design targets.

As for diesel misfire monitoring, the Agency believes that the final requirement is technologically feasible. In fact, manufacturers are certifying compliant diesel misfire monitors for sale in California on vehicles and engines under 14,000 pounds GVWR. We believe, like CARB, that diesel misfire is an air quality concern. Also, we believe that most users of diesel vehicles and engines under 14,000 pounds GVWR, particularly vehicles and engines less than 10,000 pounds GVWR, will not notice or may ignore diesel misfires. In contrast, we believe that most users of engines above 14,000 pounds GVWR will notice and not ignore misfires. We believe this is true because most of these engines are driven by professionals for whom minimizing fuel consumption and maximizing engine performance is a primary business concern. Conversely, most vehicles and engines under 14,000 pounds GVWR, particularly vehicles and engines under 10,000 pounds GVWR, are driven by individuals as personal transportation or for small business use. Such drivers are probably less familiar with the day-to-day operating characteristics of their engines and are probably less concerned with fuel consumption and engine performance.

With respect to diesel catalyst monitoring, we stated in the NPRM that we expected such monitoring to be conducted using temperature sensing devices to detect an exotherm within the aftertreatment device. We received several comments stating that diesel catalyst monitoring, especially for oxidation catalysts, is less critical to ensuring in-use compliance than monitoring of otto-cycle catalysts. They stated that diesel catalysts are relied upon to reduce emissions much less than their otto-cycle counterparts. They also stated that diesel catalysts have much lower conversion efficiencies and even complete failure of the catalyst is unlikely to result in emission levels in excess of the emissions threshold. They point out that diesel catalysts encounter much lower exhaust temperatures than otto-cycle engines and, as a result diesel catalysts are very durable, exhibiting very good catalyst performance at and beyond useful life. Limited data presented to the Agency from an engine manufacturer[48] supports these comments. The data suggests that for diesel oxidation catalysts, there is essentially no deterioration up to 120,000 miles. Therefore, in light of these comments and the above mentioned data, we feel it is appropriate at this time to not require diesel oxidation catalysts to be monitored.

There was also several comments expressing concern about the ability to monitor diesel reduction catalysts by the 2004 model year. We believe that diesel reduction catalysts may play an important role for future light-duty vehicle applications, especially in meeting Tier 2 emission standards. Information from catalyst technology literature[49] indicates that diesel

[47] Current EGR monitoring systems may use the existing intake air temperature sensor—opening the EGR valve should result in an increased intake air temperature. Systems may also use an intake air pressure sensor—opening the EGR valve will change the intake air pressure.

[48] Memo to EPA Air Docket A–98–32 from William Charmley dated October 12, 1999. A–98–32, II–B–06.

[49] Discussion on diesel lean NO_X catalysts from www.DieselNet.com.

reduction catalysts are not nearly as durable as diesel oxidation catalysts. Thus, if a manufacturer were to rely on a reduction catalyst to meet today's final standards, it is imperative that they be monitored. We disagree with comments suggesting that technology needed to monitor diesel reduction catalysts will not be ready by the 2004 model year. We believe that manufacturers will be capable of monitoring diesel reduction catalysts to the required emissions threshold by using NO_X sensor technology. Direct emission measurement has been identified as an important technology to achieve diesel engine closed-loop feedback control and to achieve after-treatment OBD. Researchers already have achieved promising results on a compact NO_X sensor that is capable of measuring real-time NO_X within 10% accuracy of laboratory-grade instruments under a wide range of operating conditions, including the temperature, pressure, and oxygen concentration typical of diesel engine exhaust. This breakthrough technology could be used for closed-loop control, and, because it can accurately measure NO_X in the 100 ppm range, it would enable monitoring of NO_X aftertreatment technologies.[50] The most recent of these papers (Kato *et al.,* 1999) provides an in depth discussion of the accuracy, repeatability, and durability of an on-board NO_X sensor, as well as strategies for using the sensor for closed loop control and OBD monitoring of an active lean NO_X absorber.

We also received several comments on the feasibility of monitoring diesel particulate traps. All of the commenters agreed that the sensor technology needed to measure PM concentrations in particulate traps does not exist. They also stated that back-pressure measurement is not capable of monitoring to an emissions threshold. However, it was generally agreed that back-pressure measurement could be used to determine significant failures in the trap, such as a crack. We believe these comments to be reasonable and have decided that for the final rule, manufacturers will not be required to monitor the particulate trap to an emission threshold, rather they must monitor for the complete failure of the device. We define complete failure as a sudden drop in exhaust back-pressure below that of a clean or unloaded trap under monitoring conditions specified by the manufacturer.

Note that, for diesel vehicles and engines, the Agency considers the EGR system to be the primary emission control system that will be used to meet the 2004 standards. This makes the EGR system somewhat analogous to the catalyst in an Otto-cycle emission control system. Because the Otto-cycle catalyst is responsible for roughly 90 percent of emission control, the Agency considers it imperative that the catalyst be monitored via OBD to ensure its continued performance. Likewise, the diesel EGR system is expected to account for roughly 50 percent of the emission control, making it perhaps the single largest contributor to emission control on a diesel engine. Therefore, the Agency considers it imperative that the EGR system be monitored on a diesel vehicle or engine. This is especially true given what the Agency considers to be a rather low cost associated with the requirement in this rule for monitoring this critical emission control system.[51] The Agency fully expects that manufacturers will employ OBD techniques on their diesel EGR systems to ensure satisfactory engine performance for their customers. Today's final rule simply ensures that the monitoring will occur, and it ensures that the monitoring will consider not only engine performance, but also emission performance.

V. What Is the Economic Impact and Cost-Effectiveness for These Requirements?

A. Emission Standards for Heavy-Duty Diesel Engines

1. Expected Technologies

In assessing the economic impact of the 2004 emission standards and the 2007 supplemental requirements (including the standards finalized in 1997 and the standards finalized today), EPA has used a current best judgement of the combination of technologies that an engine manufacturer might use to meet the new standards at an acceptable cost. Full details of EPA's cost analysis, including information not presented here, can be found in the Regulatory Impact Analysis in the public docket. The costs presented here were developed assuming that heavy-duty diesel engines would need high-flow cooled EGR, combustion chamber optimization, improved electronic fuel injection, and variable geometry turbochargers (except for light heavy-duty engines). The costs also include testing costs necessary to comply with the OBD and not-to-exceed requirements. As was done in the proposal, EPA is projecting costs assuming that this testing to be completed in time for the 2004 model, even though the new requirements will not be mandatory until the 2007 model year. We believe that many manufacturers will choose (as a convenience) to incorporate the calibration changes necessary to comply with these requirements during the 2004 model year, rather than to modify their 2004 designs for the 2007 model year. Since this assumption means that manufacturers would incur the testing costs three years earlier than required, it results in a slight increase in the net present value of the costs, and is thus somewhat conservative.

The analysis also assumes that manufacturers would introduce the improved electronic fuel injection systems and variable geometry turbochargers for some engine models even without the more stringent standard in 2004. Both of these technologies will provide significant performance benefits both directly, and by allowing manufacturers to reduce the use of injection timing retard to comply with the current 4.0 g/bhp–hr NO_X standard. The Agency believes that manufacturers may draw similar conclusions for using EGR on some of these same engines, however, as a conservative assumption, EPA is assuming that no EGR would be used to comply with the current 4.0 g/bhp-hr NO_X standard. For this analysis EPA is also assuming that only 50 percent of the costs for the improved electronic fuel injection and the use of variable geometry turbochargers are attributable to emission control. This is because EPA believes that manufacturers would make these improvements for many of their engines, even in the absence of these emission standards, to reduce fuel consumption and improve engine performance, a similar approach was used in the 1997 final rule. The docket for this rulemaking contains additional information on this aspect of the Agency's cost analysis, including a cost sensitivity analysis regarding the fifty percent assumption.[52] In addition, the RIA contains an estimate of the impact this 50 percent assumption has on the

[50] *See* Kato N., H. Kurachi, Y. Hamada: ''Thick Film ZrO2 NO_X Sensor for the Measurement of Low NO_X Concentration'', SAE paper 980170, pp. 76–77, 1998, and Kato N., N. Kokune, B. Lemire, T. Walde: ''Long term stable NO_X sensor with integrated in-connector control electronics'', SAE paper 1999–01–0202, also see memorandum from Mr. Linc Wehrly to EPA Air Docket A–98–32 summarizing this paper.

[51] The Agency estimates $3 to $7 per vehicle/engine for the OBD requirements in today's rule, primarily for development and demonstration testing given that most of the diesel monitoring will be done by the manufacturer absent any requirement to do so.

[52] See EPA Air Docket A–98–32, ''Analysis of Costs and Benefits of VGT and Improved Fuel Injection'', EPA Memorandum from Charles Moulis

HD diesel cost-effectiveness. We recognize this 50 percent assumption is not a precise approach to characterizing the costs which could otherwise be attributed to our baseline assumptions. However, developing a more precise estimate is problematic due to the complexity of market demand as well as other uncertainties.

2. Per Engine Costs

Estimated per engine cost increases are broken into purchase price and total life-cycle operating costs. The incremental purchase price for new engines is comprised of variable costs (for hardware and assembly time) and fixed costs (for R&D, retooling, and certification). Total operating costs include expected increases in maintenance. Cost estimates based on these projected technology packages represent an expected incremental cost of engines in the 2004 model year. Costs in subsequent years would be reduced by several factors, as described below. Separate projected costs were derived for engines used in three service classes of heavy-duty diesel engines. All costs are presented in 1999 dollars. Life-cycle costs have been discounted to the year of sale.

For the long term, EPA has identified various factors that would cause cost impacts to decrease over time. First, the analysis incorporates the expectation that manufacturers will apply ongoing research to making emission controls more effective and less costly over time. This expectation is similar to manufacturers' stated goal of decreasing their reliance on catalysts to meet emission standards in the future. Second, research in the costs of manufacturing has consistently shown that as manufacturers gain experience in production, they are able to apply innovations to simplify machining and assembly operations, use lower cost materials, and reduce the number or complexity of component parts. The analysis incorporates the effects of this learning curve by projecting that the variable costs of producing the low-emitting engines decreases by 20 percent starting with the third year of production (2006 model year) and by reducing variable costs again by 20 percent starting with the sixth year of production. Chapter 4, Section III in the RIA for this rule, as well as Chapter V, Section IV of the final RIA for the 1997 final rulemaking (*see* Docket A–95–27, Docket Item # V–B–01) contain additional discussion of the application of this learning curve. The 2004 HD diesel standards will require a fundamental change in technology for the engine manufacturers. Considering this change, we believe the learning curve concept is appropriate for this rulemaking.

Finally, since fixed costs (excluding in-use testing costs) are assumed to be recovered over a five-year period, these costs are not included in the analysis after the first five model years. Table 8 lists the projected schedule of costs for each category of vehicle over time.

TABLE 8.—PROJECTED DIESEL ENGINE COST AND PRICE INCREASES

[1999 dollars discounted to year of sale]

Vehicle class	Model year	Purchase price increase	Life-cycle operating cost
Light heavy-duty	2004	$ 485	$ 8
	2009 and later	241	8
Medium heavy-duty	2004	657	49
	2009 and later	275	49
Heavy heavy-duty	2004	803	104
	2009 and later	368	104

3. Aggregate Costs to Society

The above analysis develops per-vehicle cost estimates for each vehicle class. Using current data for the size and characteristics of the heavy-duty vehicle fleet and making projections for the future, these costs can be used to estimate the total cost to the nation for the new emission standards in any year. The result of this analysis is a projected total cost starting at $479 million in 2004. Per-vehicle costs savings over time reduce projected costs to a minimum value of $248 million in 2009, after which the growth in truck population leads to an increase in costs to $325 million in 2020. Total costs for these years are presented by vehicle class in Table 9. The calculated total costs represent a combined estimate of fixed costs as they are allocated over fleet sales, variable costs assessed at the point of sale, and operating costs as they are incurred in each calendar year. Future sales are projected for years beyond 1995, sales are projected to increase each year by a constant value equal to 2 percent of the number of engines sold in 1995.

TABLE 9.—ESTIMATED ANNUAL COSTS FOR IMPROVED HEAVY-DUTY VEHICLES

[Millions of dollars]

Category	2004	2009	2020
Light heavy-duty	161	89	105
Medium heavy-duty	109	50	67
Heavy heavy-duty	210	110	153
Total	479	248	325

4. Cost-Effectiveness

EPA has estimated the per-vehicle cost-effectiveness (*i.e.,* the cost per ton of emission reduction) of the model year 2004 NMHC+NO_X standards over the typical lifetime of heavy-duty diesel vehicles covered by today's rule. The RIA contains a more detailed discussion of the cost-effectiveness analyses. As described above in the cost section, the cost of complying with the standards will vary by model year. Therefore, the cost-effectiveness will also vary from model year to model year. For comparison purposes, the discounted costs, emission reductions and cost-effectiveness of the standards are shown in Table 10 for the same model years discussed above in the cost section. The cost-effectiveness results contained in Table 10 present the range in cost-effectiveness resulting from the two cost-effectiveness scenarios described above.

TABLE 10.—DISCOUNTED PER-VEHICLE COSTS, EMISSION REDUCTIONS AND COST-EFFECTIVENESS OF THE NMHC+NO_X STANDARD

Vehicle class	Model year	Discounted lifecycle costs	Discounted lifetime reductions (tons)		Discounted cost effectiveness ($/ton)
			NO_X	NMHC	
Light Heavy-Duty Diesel vehicles	2004	$493	0.232	0.018	$1969
	2009 and later	249			995
Medium Heavy-Duty Diesel vehicles	2004	706	0.764	0.067	849
	2009 and later	323			389
Heavy Heavy-Duty Diesel Vehicles	2004	907	3.189	0.151	272
	2009 and later	472			141
Overall (For All Heavy-Duty Diesel Vehicles)	2004	....	....	....	474
	2009 and later				238

In addition to the benefits of reducing ozone within and transported into urban ozone nonattainment areas, the NO_X reductions from the new engine standards are expected to have beneficial impacts with respect to crop damage, secondary particulate, acid deposition, eutrophication, visibility, and forest health. Due to the difficulty in accurately quantifying the monetary value of these societal benefits, the cost-effectiveness values presented do not assign any numerical value to these additional benefits.

B. Emission Standards for Heavy-duty Otto-Cycle Vehicles and Engines

This section contains a summary of our comprehensive analyses of the economic impacts of today's regulations for heavy-duty Otto-cycle vehicles and engines. The following separate factors are analyzed: (1) The technologies expected to be used and their projected rates of application; (2) the costs of these technology packages incremental to today's vehicle designs (presented on a per-vehicle basis separately for chassis and engine certified configurations); (3) the aggregate cost to society of the requirements and; (4) the cost-effectiveness of the regulations. More information on these analyses can be found in the Regulatory Impact Analysis contained in the docket for this rule.

1. Expected Technologies

The various technologies that could be used to comply with today's regulations were previously discussed in the section on technological feasibility. In developing costs for the associated technologies we looked at the current technology used on HDVs and compared that to the technology expected to be used to meet these regulations. The incremental costs difference was then calculated based on the differences between the current (*i.e.,* baseline) technology packages and those expected to be used in 2005. Table 11 shows both the current baseline and expected technologies for complete vehicles. Table 12 shows the current baseline and expected technologies for the engine-based standards. These tables only show the technologies which are expected to change in some way from their current design or be applied to different percentages of the fleet than they are currently. Technologies such as sequential multi-port fuel injection and EGR, while important to meeting the standards in this rule, are not expected to be fundamentally changed in their design, or be utilized in different percentages of the fleet than they currently are. Thus, such technologies are not included in these tables. However, in some cases the cost of optimizing such technologies is included in the cost estimates.

TABLE 11.—CURRENT AND EXPECTED TECHNOLOGY PACKAGES FOR COMPLETE VEHICLE STANDARDS

Technology	Baseline Federal	Estimated 2005
Catalysts	60% single underfloor 40% dual underfloor	13% single enhanced underfloor. 50% dual enhanced underfloor. 37% dual close-coupled and dual enhanced underfloor.
Oxygen sensors	70% dual heated 10% triple heated 20% quadruple heated	13% dual heated. 87% quadruple heated.
ECM	50% 32 bit computers 50% 16 bit computers	100% 32 bit computers.
Adaptive learning	0%	80%.
Individual cylinder A/F control	0%	10%.
Leak free exhaust	90%	100%.
Insulated exhaust	0%	40%.
Secondary air injection	20%	30%.

TABLE 11.—CURRENT AND EXPECTED TECHNOLOGY PACKAGES FOR COMPLETE VEHICLE STANDARDS—Continued

Technology	Baseline Federal	Estimated 2005
ORVR	0%	100%.[1]

[1] ORVR only applies to complete vehicles 10,000 lbs GVWR and under, and is phased in, with 100% application to those vehicles in 2006.

TABLE 12.—CURRENT AND EXPECTED TECHNOLOGY PACKAGES FOR ENGINE-BASED STANDARDS

Technology	Baseline Federal	Estimated 2005
Catalysts	60% single underfloor 40% dual underfloor	13% single enhanced underfloor. 87% dual enhanced underfloor.
Oxygen sensors[1]	70% dual heated 10% triple heated 20% four heated	13% triple heated. 87% quadruple heated.
ECM	50% 32 bit computers 50% 16 bit computers	100% 32 bit computers.
Improved fuel control	50%	100%.
Secondary air injection	20%	50%.

[1] OBD only applies to HDGEs under 14,000 lbs GVWR (approximately 60 percent of HDGEs).

2. Per Vehicle Costs

The costs of the projected technologies presented in the previous section are itemized and discussed in detail in the RIA. On a per-vehicle basis these costs are summarized in Table 13 They are presented in two components: Purchase price and operating cost. The operating costs only apply to ORVR-equipped vehicles and include the combined effects of a small fuel economy penalty due to the increased weight of the ORVR hardware, and a larger fuel economy benefit resulting from the vehicle being able to utilize fuel vapors that would otherwise escape to the atmosphere in the absence of ORVR.

We believe that the manufacturers will recover the fixed costs associated with research and development, tooling and certification over the first five years of production. Thus, these fixed costs are not included in the analysis after the first five model years. The fixed costs associated with the in-use testing programs will continue indefinitely. The projected per vehicle costs impacts are summarized in Table 13.

TABLE 13.—PROJECTED HDV PRICE AND OPERATING COST INCREASES

Class	Model year	Purchase price increase	Lifetime operating cost
Complete Vehicles	2005[1]	$285	−$6
	2010 and later	281	−6
Engines	2005[2]	296	
	2010 and later	256	

[1] This cost includes both ORVR and OBD, which are phased in, but which are not required on all complete vehicles until the 2006 model year for ORVR and the 2007 model year for OBD.

[2] This cost includes an OBD hardware cost. OBD requirements are phased in, but are not required on all engines under 14,000 lbs GVWR until the 2007 model year.

3. Aggregate Costs to Society

In addition to the per vehicle costs just described, we also calculated the aggregate cost to society. This was done by combining the per vehicle costs with assumed future sales of HDVs. The results of this analysis are summarized in Table 14. The recovery of most fixed costs results in slightly reduced costs beginning in 2010, after which costs begin to rise in accordance with projected increased sales. The aggregate costs represent a combined estimate of the fixed costs for research and development, tooling and certification as they are allocated over the first five years of sales, variable costs assessed at the point of sale, and operating costs (primarily in the form of fuel cost savings) for ORVR-equipped vehicles (calculated to net present value and applied at the point of sale). Future sales are projected for years beyond 1996, sales are projected to increase each year by a constant value equal to 2 percent of the number of engines sold in 1996.

TABLE 14.—AGGREGATE COST TO SOCIETY OF THE HEAVY-DUTY OTTO-CYCLE REQUIREMENTS

Year	Cost ($million)
2005	$110
2010	124
2020	146

4. Cost-effectiveness

We estimated the per-vehicle cost-effectiveness (i.e., the cost per ton of emission reduction) of the NMHC plus NO_X exhaust emission standards over the lifetime of typical heavy-duty gasoline vehicles. The RIA contains a more detailed discussion of the cost-effectiveness analysis.

The cost of complying with the standards will vary by vehicle category (*i.e.,* a complete Class 2b heavy-duty gasoline vehicle, a complete Class 3 heavy-duty gasoline vehicle, or an incomplete heavy-duty gasoline vehicle) and model year. Therefore, the lifetime cost-effectiveness of the standards will vary by model year. For comparison purposes, the discounted lifetime costs, emission reductions (in short tons), and cost-effectiveness of the standards are shown in Table 15 for the same model years discussed in the per vehicle costs section. This table does not contain the costs and benefits of the ORVR requirements, which are analyzed separately.

TABLE 15.—COST-EFFECTIVENESS OF THE STANDARDS FOR HEAVY-DUTY GASOLINE VEHICLES

HDGV	Year of production	Discounted lifetime cost	Discounted lifetime $NMHC+NO_X$ reduction	Discounted lifetime cost-effectiveness
Class 2B Complete	1	$274	0.43 tons	$635/ton
	6 and later	273		633/ton
Class 3 Complete	1	274	0.46 tons	596/ton
	6 and later	273		594/ton
Incomplete HDGV	1	296	0.52 tons	565/ton
	6 and later	256		489/ton
All HDGVs	1	280	0.46 tons	612/ton
	6 and later	268		586/ton

We also separately estimated the cost-effectiveness of the ORVR requirements for Class 2B heavy-duty gasoline vehicles. Table 16 contains the discounted lifetime cost-effectiveness of the ORVR requirements.

TABLE 16.—DISCOUNTED, LIFETIME COST-EFFECTIVENESS OF THE ORVR REQUIREMENTS FOR CLASS 2B HEAVY-DUTY GASOLINE VEHICLES

Year of production	Discounted lifetime cost	Discounted lifetime NMHC + NO_X emission reductions	Discounted lifetime cost-effectiveness
1	$5	0.035 tons	$141/ton
6	2	0.035 tons	56/ton

In addition to the benefits of reducing ozone within and transported into urban ozone nonattainment areas, the NO_X emission reductions from the heavy-duty gasoline vehicle and engine standards are expected to have beneficial impacts with respect to crop damage, secondary particulate, acid deposition, eutrophication, visibility, and forest health. The cost-effectiveness values presented above do not assign any numerical value to these additional benefits. Based on existing studies that have estimated the value of such benefits in the past, we believe that the actual monetary value of the multiple environmental and public health benefits that would be produced by the NO_X reductions under this rule will be greater than the estimated compliance costs.

VI. How Has EPA Responded to Input From the Public?

A wide variety of interested parties participated in the rulemaking process that culminates with this final rule. The formal comment period and public hearing associated with the NPRM provided additional opportunities for public input. EPA also met with a variety of stakeholders, including environmental and public health organizations, auto and heavy-duty engine and vehicle company representatives, emission control equipment manufacturers, and states at various points in the process.

We have prepared a detailed Response to Comments document that describes the comments received on the NPRM and presents our response to each of these comments. The Response to Comments document is available in the docket for this rule and from the Office of Mobile Sources internet home page. Comments and our responses are also included throughout this preamble for several key issues where relevant to the discussion of the final rule provisions.

VII. What Administrative Requirements Apply to This Final Rule?

A. Compliance With Executive Order 12866

Under Executive Order 12866 (58 FR 51735, Oct. 4, 1993), the Agency is required to determine whether this regulatory action would be ''significant'' and therefore subject to review by the Office of Management and Budget (OMB) and the requirements of the Executive Order. The order defines a ''significant regulatory action'' as any regulatory action that is likely to result in a rule that may:

• Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

• Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

• Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or,

• Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, EPA has determined that this final rule is a ''significant regulatory action'' because the engine and vehicle standards, supplemental test requirements, on-board diagnostic requirements, and other regulatory provisions, if implemented, would have an annual effect on the economy in excess of $100 million. Accordingly, a Final Regulatory Impact Analysis (RIA) has been prepared and is available in the docket for this rulemaking and at the internet address listed under **ADDRESSES** above. This action was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12866. Any written comments from OMB on today's action and any responses from EPA to OMB comments are in the public docket for this rulemaking.

B. Compliance With the Regulatory Flexibility Act: Impact on Small Entities

The Regulatory Flexibility Act (5 U.S.C. 601) requires federal agencies to consider potential impacts of federal regulations upon small entities. If a preliminary analysis indicates that a regulation would have a significant adverse economic impact on a substantial number of small entities, then EPA must prepare a regulatory flexibility analysis.

The Agency has determined that this action would not have a significant adverse impact on a substantial number of small entities, and thus it is not necessary to prepare a regulatory flexibility analysis in connection with this rule. Only two small entities are known to be affected by this rule. The entities are small businesses that certify alternative fuel engines or vehicles, either newly manufactured or modified from previously certified gasoline versions. EPA contacted these businesses and discussed the proposed rule with them, identifying their concerns. The concerns they expressed prompted revisions to the rule, which are addressed elsewhere in the preamble. Rule revisions finalized by EPA are intended to minimize adverse impacts on the small entities affected by the rule.

C. Compliance With the Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104–4, establishes requirements for federal agencies to assess the effects of their regulatory actions on state, local, and tribal governments, and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with ''federal mandates'' that may result in expenditures to state, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more for any single year. Before promulgating a rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative that is not the least costly, most cost-effective, or least burdensome alternative if EPA provides an explanation in the final rule of why such an alternative was adopted.

Before we establish any regulatory requirement that may significantly or uniquely affect small governments, including tribal governments, we must develop a small government plan pursuant to section 203 of the UMRA. Such a plan must provide for notifying potentially affected small governments, and enabling officials of affected small governments to have meaningful and timely input in the development of our regulatory proposals with significant federal intergovernmental mandates. The plan must also provide for informing, educating, and advising small governments on compliance with the regulatory requirements.

This rule contains no federal mandates for state, local, or tribal governments as defined by the provisions of Title II of the UMRA. The rule imposes no enforceable duties on any of these governmental entities. Nothing in the rule would significantly or uniquely affect small governments.

EPA has determined that this rule contains federal mandates that may result in expenditures of more than $100 million to the private sector in any single year. EPA believes that today's final rule represents the least costly, most cost-effective approach to achieve the air quality goals of the rule. The cost-benefit analysis required by the UMRA is discussed in Section IV.D. above and in the Draft RIA. See the ''Compliance with Executive Order 12866'' section in today's preamble (VII.A) for further information regarding these analyses.

As explained in section III.A.1 of this preamble, the 2004 heavy-duty diesel FTP standards reaffirmed in this final rule were established in the Agency's 1997 final rulemaking for heavy-duty diesels, and the 1997 rulemaking laid the ground work for this proposal. Today's final rule for HD diesel engines is simply a review of the appropriateness under the Clean Air Act of the standard finalized in 1997, including the need for and technical and economic feasibility of the standard based on information available in 1999. Therefore, today's final rule does not contain any further analysis of other, alternative FTP standards for heavy-duty diesel engines. The reader is directed to the rulemaking record for the 1997 rule, contained in EPA Air Docket A–95–27, for information on alternatives the Agency considered during that rulemaking.

The goal of EPA's heavy-duty compliance program is to ensure real-world emissions control over a broad range of in-use conditions, rather than just controlling emissions under certain laboratory conditions. The 1997 final rule that put new standards in place for heavy-duty diesel engines was based on the expectation that emission benefits would accrue from a broad range of driving conditions. The 1997 rule's projected emissions benefit, expected control technology, cost, and cost-effectiveness were derived with the belief that the engines would be meeting the standards in-use under typical operating conditions. Since 1997 it has become clear that manufacturers have substantially increased emissions during operation outside the bounds of the current federal test procedure.

In order to adequately control these ''off-cycle'' emissions, EPA evaluated whether new standards and test procedures were necessary or whether such emissions could be adequately addressed by continued reliance on the defeat device prohibition in addition to the FTP to ensure the emission reductions predicted by the standards are met during actual in-use operation. We evaluate in this final rule the necessity of the new supplemental requirements and explain the many significant drawbacks to relying wholly on the defeat device definition. In addition, given the level of emissions from heavy-duty diesel emissions prior to the consent decrees, the supplemental requirements achieve very large emission reductions and are very cost-effective requirements.

In addition, we considered and requested comment on alternatives for several aspects of the supplemental requirements, and in response to comments we have made a number of changes in this rule. For example, we requested comment on the appropriate ambient conditions (temperature, humidity, altitude) which should apply to the supplemental requirements, and in this rule we establish more limited conditions than were proposed.

Section 202(a)(3) of the Clean Air Act requires that EPA must set emission standards for heavy-duty engines to reflect the greatest degree of emission reduction achievable through the application of technology which EPA determines will be available for the model year to which the standards apply, giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology. As indicated above, EPA believes the standards reflect the greatest degree of emission reduction achievable by HD Otto-cycle engines in the 2004 model year and are cost-effective. EPA requested comment on the standards and alternatives.

The proposed rule included an analysis of alternative standards for HD Otto-cycle engines. We requested comment on a range of standards for HD Otto-cycle engines, and described in detail the alternative standard proposed by the engine manufacturers (see Chapter 3, Section III(H) of the RIA). As a consequence of discussions with engine manufacturers the final rule contains several options that manufacturers may select from, based on their own corporate requirements and issues. These options allow greater emission reductions to be achieved while providing a menu of emission reduction programs, thus allowing each manufacturer to select the least costly set of requirements based on their own individualized set of needs.

D. Compliance With the Paperwork Reduction Act

The information collection requirements in this final rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* An Information Collection Request (ICR) document has been prepared by EPA (ICR No. 1851.02) and a copy may be obtained from Sandy Farmer by mail at U.S. Environmental Protection Agency (2822), Office of Environmental Information, Collection Strategies Division, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, by email at farmer.sandy@epamail.epa.gov, or by calling (202) 260–2740. A copy may also be downloaded off the internet at *http://www.epa.gov/icr.* The following ICR document has been prepared by EPA:

EPA ICR # 1851.02.	Title: Non-road Compression-Ignition Engine At or Above 50 Kilowatts and On-road Heavy Duty Engine Application for Emission Certification, and Participation in the Averaging, Banking and Trading Program

The Agency will collect information related to certification results. This information will be used to ensure compliance with and enforce the provisions in this rule. Responses will be mandatory in order to complete the certification process. Section 208(a) of the Clean Air Act requires that manufacturers provide information the Administrator may reasonably require to determine compliance with the regulations; submission of the information is therefore mandatory. EPA will consider confidential all information meeting the requirements of section 208(c) of the Clean Air Act.

This collection of information affects an estimated 66 respondents with a total of 459 responses per year and a total hour burden of 65,859 hours, for an estimated 143 hours per response, with estimated total annualized costs of $1,599,684 per year. The hours and annual cost of information collection activities by a given manufacturer depends on manufacturer-specific variables, such as the number of engine families, production changes, emissions defects, and so forth. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

Comments are requested on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, Collection Strategies Division, Office of Environmental Information, U.S. Environmental Protection Agency (2822); 1200 Pennsylvania Ave., NW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th St., NW., Washington, DC 20503, marked ''Attention: Desk Officer for EPA.'' Include the ICR number in any correspondence. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after October 6, 2000, a comment to OMB is best assured of having its full effect if OMB receives it by November 6, 2000.

E. Compliance With Executive Order 13045: Children's Health Protection

Executive Order 13045: ''Protection of Children from Environmental Health Risks and Safety Risks'' (62 FR 19885, April 23, 1997) applies to any rule that: (1) is determined to be ''economically significant'' as defined under E.O. 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

EPA interprets E.O. 13045 as applying only to those regulatory actions that are based on health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. Today's final rule falls into that category only in part: risk considerations may be taken into account only to the extent the Agency may consider the inherent toxicity of a regulated pollutant, and any differential impacts such a pollutant may have on children's health, in deciding how to take cost and other relevant factors into consideration.

This rulemaking will achieve important reductions of various emissions from heavy-duty trucks, primarily emissions of NO_X. The rulemaking also addresses NMHC and PM. These pollutants raise concerns about a disproportionately greater effect on children's health, such as impacts from ozone, PM, and certain toxic air pollutants. See section II of this rule and the RIA for a further discussion of these issues.

The effects of ozone and PM on children's health was addressed in detail in EPA's rulemaking to establish these NAAQS, and we are not revisiting those issues here. We also believe the emissions reductions from the strategies in today's rule will reduce air toxics and the related impacts on children's health. We are addressing the issues raised by air toxics from motor vehicles and their fuels in a separate rulemaking, pursuant to section 202(l)(2) of the Act. Our proposed rule, which was signed July 14, 2000, proposes a list of 21 mobile source air toxics as well as standards to limit the amount of benzene in gasoline. It also sets out a Technical Analysis Plan whereby EPA will continue to conduct research and analysis and to revisit the need for and appropriateness of additional controls on toxic emissions from motor vehicles and fuels in a 2004 rulemaking.

In this final rule we have evaluated several regulatory strategies for reductions in these emissions from heavy-duty engines. For the reasons described in this preamble, we believe that the strategies in today's rule are preferable under the Clean Air Act to other potentially effective and reasonably feasible alternatives considered by the Agency, for purposes of reducing emissions from these sources as a way of helping areas achieve and maintain the NAAQS for ozone and PM. Moreover, consistent with the Clean Air Act, the levels of control in today's rule are designed to achieve the greatest degree of reduction of emissions of these pollutants achievable through technology that will be available, taking cost and other factors into consideration.

F. Compliance With Executive Order 13084: Consultation and Coordination With Indian Tribal Governments

Under Executive Order 13084, EPA may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian Tribal governments, and that imposes substantial direct compliance costs on those communities, unless the federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or EPA consults with those governments. If EPA complies by consulting, Executive Order 13084 requires EPA to provide to the Office of Management and Budget, in a separately identified section of the preamble to the rule, a description of the extent of EPA's prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires EPA to develop an effective process permitting elected officials and other representatives of Indian tribal governments ''to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.''

Today's rule does not significantly or uniquely affect the communities of Indian Tribal governments. The engine and vehicle standards, supplemental test requirements, on-board diagnostic requirements, and other related requirements for private businesses in today's rule would have national applicability, and thus would not uniquely affect the communities of Indian Tribal Governments. Further, no circumstances specific to such communities exist that would cause an impact on these communities beyond those discussed in the other sections of today's document. Thus, EPA's conclusions regarding the impacts from the implementation of today's rule discussed in the other sections of this preamble are equally applicable to the communities of Indian Tribal governments. Accordingly, the requirements of section 3(b) of Executive Order 13084 do not apply to this rule.

G. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Section 12(d) of Public Law 104–113, directs EPA to use voluntary consensus standards in its regulatory activities unless it would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices) developed or adopted by voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This rule references technical standards adopted by the Agency through previous rulemakings. No new technical standards are established in today's rule. The standards referenced in today's rule involve the measurement of gasoline fuel parameters and motor vehicle emissions. The measurement standards for gasoline fuel parameters referenced in today's rule are all voluntary consensus standards. The motor vehicle emissions measurement standards referenced in today's rule are government-unique standards that were developed by the Agency through previous rulemakings. These standards have served the Agency's emissions control goals well since their implementation and have been well accepted by industry. EPA is not aware of any voluntary consensus standards for the measurement of motor vehicle emissions. Therefore, the Agency is using the existing EPA-developed standards found in 40 CFR Part 86 for the measurement of motor vehicle emissions.

H. Compliance With Executive Order 13132 (Federalism)

Executive Order 13132, entitled ''Federalism'' (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure ''meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ''Policies that have federalism implications'' is defined in the Executive Order to include regulations that have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

Under Section 6 of Executive Order 13132, EPA may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

Section 4 of the Executive Order contains additional requirements for rules that preempt State or local law, even if those rules do not have federalism implications (*i.e.*, the rules will not have substantial direct effects on the States, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government). Those requirements include providing all affected State and local officials notice and an opportunity for appropriate participation in the development of the regulation. If the preemption is not based on express or implied statutory authority, EPA also must consult, to the extent practicable, with appropriate State and local officials regarding the conflict between State law and Federally protected interests within the agency's area of regulatory responsibility.

This final rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. This rule adopts national emissions standards for certain categories of motor vehicles. The requirements of the rule will be enforced by the federal government at the national level. Thus, the requirements of section 6 of the Executive Order do not apply to this rule. Although section 6 of Executive Order 13132 does not apply to this rule, EPA did consult with State and local officials in developing this rule. In addition, EPA provided state and local officials an opportunity to comment on the proposed regulations. A summary of concerns raised by commenters, including state and local commenters, and EPA's response to those concerns, is found in the Response to Comments document for this rulemaking.

Although this rule was proposed before the November 2, 1999 effective date of Executive Order 13132, EPA provided State and local officials notice and an opportunity for appropriate participation when it published the proposed rule, as described above. Thus, EPA has complied with the requirements of section 4 of the Executive Order.

I. Compliance With the Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. This rule is a ''major rule'' as defined by 5 U.S.C. 804(2).

VIII. What Is EPA's Statutory Authority for This Action?

Section 202(a)(3) authorizes EPA to establish emission standards for heavy duty vehicles and engines.[53] These standards are to reflect the greatest degree of emission reduction achievable through the application of technology which EPA determines will be available for the model year to which the standards apply. EPA is to give appropriate consideration to cost, energy, and safety factors associated with the application of such technology. EPA may revise such regulations on the basis of information concerning the effects of emissions from these engines and vehicles and from other sources of mobile source related pollutants on the public health and welfare. Section 202(a)(3)(C) requires that promulgated standards apply for no less than three years and go into effect no less than 4 years after promulgation. Section 202(m) authorizes regulations requiring installation of on-board diagnostics systems for light-duty and heavy-duty vehicles and engines. Pursuant to sections 202(a)(1) and 202(d), these emission standards must be met throughout the entire useful life of the engine or vehicle as determined by EPA's regulations. If the Administrator determines that a substantial number of vehicles do not conform to emission standards when in actual use throughout their useful lives, section 207(c) of the Act requires EPA to make a determination of nonconformity. Section 208 of the Act requires manufacturers to perform tests (where not otherwise reasonably available), make reports and provide information the Administrator may reasonably require to determine whether the manufacturer is acting in compliance with the Act and regulations thereunder. The remainder of section 202, as well as sections 203, 206, 207, 208, and 301, provide additional authority for promulgation of these regulations.

[53] 42 U.S.C. 7521(a)(3).

List of Subjects

40 CFR Part 85

Environmental projection, Administrative practice and procedure, Confidential business information, Imports, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements, Research, Warranties.

40 CFR Part 86

Administrative practice and procedure, Confidential business information, Incorporation by reference, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements.

Dated: July 31, 2000.

Carol M. Browner,

Administrator.

For the reasons set forth in the preamble, chapter I, title 40 of the Code of Federal Regulations is amended as follows:

PART 85—CONTROL OF AIR POLLUTION FROM MOBILE SOURCES

1. The authority citation for part 85 is revised to read as follows:

Authority: 42 U.S.C. 7521, 7522, 7524, 7525, 7541, 7542, 7543, 7547, 7554, and 7601(a).

Subpart F—[Amended]

2. Section 85.501 is revised to read as follows:

§ 85.501 General applicability.

(a) Sections 85.502 through 85.505 are applicable to aftermarket conversion systems for which an enforcement exemption is sought from the tampering prohibitions contained in section 203 of the Act.

(b) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and Otto-cycle complete heavy-duty vehicles under the provisions of 40 CFR part 86, subpart S.

Subpart P—[Amended]

3. Section 85.1501 is amended by revising paragraph (c), to read as follows:

§ 85.1501 Applicability.

* * * * *

(c) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and Otto-cycle complete heavy-duty vehicles under the provisions of 40 CFR part 86, subpart S.

Subpart R—[Amended]

4. Section 85.1701 is amended by revising paragraph (c), to read as follows:

§ 85.1701 General applicability.

* * * * *

(c) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and Otto-cycle complete heavy-duty vehicles under the provisions of 40 CFR part 86, subpart S.

PART 86—CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

5. The authority citation for part 86 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

6. Section 86.1 is amended by adding entries in alphanumeric order to the table in paragraphs (b)(2) and (b)(5), to read as follows:

§ 86.1 Reference materials.

* * * * *

(b) * * *

(2) * * *

Document No. and name	40 CFR part 86 reference
* * * * * *	*
SAE J1939–11, December 1994, Physical Layer-250K bits/s, Shielded Twisted Pair	86.005–17; 86.1806–05
SAE J1939–13, July 1999, Off-Board Diagnostic Connector	86.005–17; 86.1806–05
SAE J1939–21, July 1994, Data Link Layer	86.005–17; 86.1806–05
* * * * * *	*
SAE J1939–31, December 1997, Network Layer	86.005–17; 86.1806–05
SAE J1939–71, May 1996, Vehicle Application Layer	86.005–17; 86.1806–05
SAE J1939–73, February 1996, Application Layer-Diagnostics	86.005–17; 86.1806–05
* * * * * *	*
SAE J1939–81, July 1997, Recommended Practice for Serial Control and Communications Vehicle Network—Part 81—Network Management.	86.005–17; 86.1806–05
* * * * * *	*

* * * * * * *

(5) * * *

Document No. and name	40 CFR part 86 reference
* * * * * *	*
ISO 14230–4:2000(E), June 1, 2000 Road Vehicles—Diagnostic Systems—Keyword Protocol 2000—Part 4: Requirements for emission-related systems.	86.005–17; 86.1806–05

Subpart A—[Amended]

7. A new § 86.000–15 is added to subpart A to read as follows:

§ 86.000–15 NO_X and particulate averaging, trading, and banking for heavy-duty engines.

Section 86.000–15 includes text that specifies requirements that differ from § 86.094–15 or § 86.098–15. Where a paragraph in § 86.094–15 or § 86.098–15 is identical and applicable to § 86.000–15, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–15.'' or ''[Reserved]. For guidance see § 86.098–15.''.

(a)(1) Heavy-duty engines eligible for NO_X and particulate averaging, trading and banking programs are described in the applicable emission standards sections in this subpart. All heavy-duty engine families which include any engines labeled for use in clean-fuel vehicles as specified in 40 CFR part 88 are not eligible for these programs. For manufacturers selecting Option 1 Otto-cycle engine standards contained in § 86.005–10(f)(1), the ABT program requirements in § 86.004–15 apply for 2003 model year Otto-cycle engines, rather than the provisions contained in this § 86.000–15. Participation in these programs is voluntary.

(a)(2) through (b) [Reserved] For guidance see § 86.094–15.

(c) [Reserved] For guidance see § 86.098–15.

(d) through (i) [Reserved] For guidance see § 86.094–15.

(j) *Optional program for early banking for diesel engines.* Provisions set forth in §§ 86.094–15 (a), (b), (d) through (i), and 86.098–15 (c) apply except as specifically stated otherwise in § 86.098–15 (j)(1) through (j)(3)(iii).

(j)(1) through (j)(3)(iii) [Reserved] For guidance see § 86.098–15.

(k) *Optional program for early banking for Otto-cycle engines.* Provisions set forth in §§ 86.094–15(a), (b), (d) through (i), and 86.098–15(c) apply except as specifically stated otherwise in this paragraph (k).

(1) To be eligible for the optional program described in this paragraph (k), the following must apply:

(i) Credits are generated from Otto-cycle heavy-duty engines which have been certified using certification durability demonstration procedures which meet the criteria contained in § 86.004–26 and with deterioration factors calculated in accordance with § 86.004–28.

(ii) During certification, the manufacturer shall declare its intent to include specific engine families in the program described in this paragraph. Separate declarations are required for each program and no engine families may be included in both programs in the same model year.

(2) *Credit generation and use.* (i) Credits shall only be generated by 2000 and later model year engine families.

(ii) Except as provided in paragraph (k)(2)(iii) of this section, credits generated under this paragraph (k) may only be used for 2003 and later model year heavy-duty Otto-cycle engines subject to NO_X or NO_X plus NMHC standards more stringent than 4.0 g/bhp-hr. When used with 2003 and later model year engines, NO_X credits may be used to meet an applicable NO_X plus NMHC standard, except as otherwise provided in § 86.004–10(a)(1)(i)(C).

(iii) If a manufacturer chooses to use credits generated under this paragraph (k) for engine families subject to the NO_X standard contained in § 86.098–10 (4.0 g/bhp-hr) the averaging, trading, and banking of such credits shall be governed by the program provided in §§ 86.094–15(a), (b), (d) through (i) and 86.098–15(c) and shall be subject to all discounting, credit life limits and all other provisions contained in §§ 86.094–15(a), (b), (d) through (i) and 86.098–15(c). In the case where the manufacturer can demonstrate that the credits were discounted under the program provided in this paragraph (k), that discount may be accounted for in the calculation of credits described in § 86.098–15(c).

(iv) For NO_X credits generated under this paragraph (k), a Std value of 2.0 grams per brake horsepower-hour shall be used in place of the current and applicable NO_X standard in the credit availability equation in § 86.098–15(c)(1).

(3) *Program flexibilities.* (i) NO_X credits that are banked under this paragraph (k) and not used as provided by paragraph (k)(2)(iii) of this section may be used without being forfeited due to credit age. The requirement in this paragraph (k)(3) applies instead of the requirements in § 86.094–15(f)(2)(i).

(ii) There are no regional category restraints for averaging, trading, and banking of credits generated under the program described in this paragraph (k) except if they are used under paragraph (k)(2)(iii) of this section. This applies instead of the regional category provisions described in the introductory text of § 86.094–15(d) and (e).

(iii) *Credit discounting.* (A) For NO_X credits generated under this paragraph (k) from engine families with NO_X FELs greater than 1.0 grams per brake horsepower-hour for oxides of nitrogen, a Discount value of 0.9 shall be used instead of 0.8 in the credit availability equation in § 86.098–15(c)(1).

(B) For NO_X credits generated under this paragraph (k) from engine families with NO_X FELs less than or equal to 1.0 grams per brake horsepower-hour for oxides of nitrogen, a Discount value of 1.0 shall be used in place of 0.8 in the credit availability equation in § 86.098–15 (c)(1).

(4) *2003 model year.* Manufacturers selecting Option 1, described in § 86.005–10(f)(1), may not generate or bank early credits under this paragraph (k) for the 2003 model year. Credit generation and banking provisions contained in § 86.004–15 apply for the 2003 model year.

(l) *Credit apportionment.* At the manufacturer's option, credits generated under the provisions described in paragraph (j) or (k) of this section may be sold to or otherwise provided to another party for use in programs other than the averaging, trading and banking program described in this section.

(1) The manufacturer shall pre-identify two emission levels per engine family for the purposes of credit apportionment. One emission level shall be the FEL and the other shall be the level of the standard that the engine family is required to certify to under § 86.098–10 or § 86.098–11, as applicable. For each engine family, the manufacturer may report engine sales in two categories, ''ABT-only credits'' and ''non-manufacturer-owned credits.''

(i) For engine sales reported as ''ABT-only credits'', the credits generated must be used solely in the ABT program described in this section.

(ii) The engine manufacturer may declare a portion of engine sales ''non-manufacturer-owned credits'' and this portion of the credits generated between the standard and the FEL, based on the calculation in § 86.098–15(c)(1), would belong to another party. For ABT, the manufacturer may not generate any credits for the engine sales reported as ''non-manufacturer-owned credits.'' Engines reported as ''non-manufacturer-owned credits'' shall comply with the FEL and the requirements of the ABT program in all other respects.

(2) Only manufacturer-owned credits reported as ''ABT-only credits'' shall be used in the averaging, trading, and banking provisions described in this section.

(3) Credits shall not be double-counted. Credits used in the ABT program may not be provided to an engine purchaser for use in another program.

(4) Manufacturers shall determine and state the number of engines sold as ''ABT-only credits'' and ''non-manufacturer-owned credits'' in the end-of-model year reports required under § 86.098–23.

8. Section 86.000–16 is amended by removing paragraphs (a) through (d) introductory text, adding paragraphs (a), (b), (c), and (d) introductory text, and revising paragraph (d)(1), to read as follows:

§ 86.000–16 Prohibition of defeat devices.

* * * * *

(a) No new light-duty vehicle, light-duty truck, heavy-duty vehicle, or heavy-duty engine shall be equipped with a defeat device.

(b) The Administrator may test or require testing on any vehicle or engine at a designated location, using driving cycles and conditions which may reasonably be expected to be encountered in normal operation and use, for the purpose of investigating a potential defeat device.

(c) [Reserved]. For guidance see § 86.094–16.

(d) For vehicle and engine designs designated by the Administrator to be investigated for possible defeat devices:

(1) The manufacturer must show to the satisfaction of the Administrator that the vehicle or engine design does not incorporate strategies that unnecessarily reduce emission control effectiveness exhibited during the Federal emissions test procedure when the vehicle or engine is operated under conditions which may reasonably be expected to be encountered in normal operation and use.

* * * * *

9. Section 86.001–1 is amended by revising paragraph (b) to read as follows:

§ 86.001–1 General applicability.

* * * * *

(b) *Optional applicability.* (1) A manufacturer may request to certify any heavy-duty vehicle of 14,000 pounds Gross Vehicle Weight Rating or less in accordance with the light-duty truck provisions located in subpart S of this part through the 2004 model year (through the 2003 model year for manufacturers choosing Otto-cycle HDE Option 2 in § 86.005–1(c)(2), or through the 2002 model year for manufacturers choosing Otto-cycle HDE Option 1 in § 86.005–1(c)(1)). Heavy-duty engine or vehicle provisions of this subpart A do not apply to such a vehicle.

(2) Beginning with the 2000 model year, a manufacturer may certify any Otto-cycle heavy-duty vehicle of 14,000 pounds Gross Vehicle Weight Rating or less in accordance with the provisions for Otto-cycle complete heavy-duty vehicles located in subpart S of this part for purposes of generating credits in the heavy-duty vehicle averaging, banking, and trading program contained in § 86.1817–05. Heavy-duty engine or heavy-duty vehicle provisions of this subpart A do not apply to such a vehicle.

* * * * *

10. Section 86.004–2 is amended by adding a new definition in alphabetical order, to read as follows:

§ 86.004–2 Definitions.

* * * * *

Defeat device means an auxiliary emission control device (AECD) that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use, unless:

(1) Such conditions are substantially included in the applicable Federal emission test procedure for heavy-duty vehicles and heavy-duty engines described in subpart N of this part;

(2) The need for the AECD is justified in terms of protecting the vehicle against damage or accident; or

(3) The AECD does not go beyond the requirements of engine starting.

* * * * *

11. Section 86.004–11 is amended by adding introductory text, removing and reserving paragraph (a)(1)(i)(E), and revising paragraph (d), to read as follows:

§ 86.004–11 Emission standards for 2004 and later model year diesel heavy-duty engines and vehicles.

This section applies to 2004 and later model year diesel HDEs.

(a) * * *

(1) * * *

(i) * * *

(E) [Reserved]

* * * * *

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in subpart I or N of this part to ascertain that such test engines meet the requirements of this section.

* * * * *

12. Section 86.004–15 is amended by:

a. Revising the section heading

b. Revising paragraph (a)(1).

c. Removing paragraph (a)(2)(iii).

d. Revising paragraphs (b) introductory text, (b)(1)(i), and (b)(1)(ii).

e. Revising paragraphs (c)(1) introductory text and (c)(1)(iii).

f. Revising paragraphs (d) heading, (d) introductory text and (d)(1).

g. Revising the heading for paragraph (f), and revising paragraphs (f)(1)(i), (f)(2)(i), (f)(2)(ii), (f)(3)(ii), and (f)(3)(iii).

h. Adding paragraph (f)(3)(iv).

i. Revising paragraphs (g)(1), (g)(2), and(g)(4).

j. Revising paragraphs (j) introductory text and (j)(1) introductory text.

k. Revising the heading and introductory text of paragraph (k).

l. Adding paragraph (l).

The revisions and additions read as follows:

§ 86.004–15 NO_X plus NMHC and particulate averaging, trading, and banking for heavy-duty engines.

(a)(1) Heavy-duty engines eligible for NO_X plus NMHC and particulate averaging, trading and banking programs are described in the applicable emission standards sections in this subpart. All heavy-duty engine families which include any engines labeled for use in clean-fuel vehicles as specified in 40 CFR part 88 are not eligible for these programs. For manufacturers not selecting Options 1 or 2 contained in § 86.005–10(f), the ABT program requirements contained in § 86.000–15 apply for 2004 model year Otto-cycle engines, rather than the provisions contained in this § 86.004–15. Participation in these programs is voluntary.

* * * * *

(b) Participation in the NO_X plus NMHC and/or particulate averaging, trading, and banking programs shall be done as follows:

(1) * * *

(i) Declare its intent to include specific engine families in the averaging, trading and/or banking programs. Separate declarations are required for each program and for each pollutant (*i.e.*, NO_X plus NMHC, and particulate).

(ii) Declare an FEL for each engine family participating in one or more of these two programs.

(A) The FEL must be to the same level of significant digits as the emission standard (one-tenth of a gram per brake horsepower-hour for NO_X plus NMHC emissions and one-hundredth of a gram per brake horsepower-hour for particulate emissions).

(B) In no case may the FEL exceed the upper limit prescribed in the section concerning the applicable heavy-duty engine NO_X plus NMHC and particulate emission standards.

* * * * *

(c)(1) For each participating engine family, NO_X plus NMHC, and particulate emission credits (positive or negative) are to be calculated according to one of the following equations and rounded, in accordance with ASTM E29–93a (incorporated by reference at § 86.1), to the nearest one-tenth of a Megagram (Mg). Consistent units are to be used throughout the equation.

* * * * *

(iii) For purposes of the equation in paragraphs (c)(1)(i) and (ii) of this section:

Std = the current and applicable heavy-duty engine NO_X plus NMHC or particulate emission standard in grams per brake horsepower hour or grams per Megajoule.

FEL = the NO_X plus NMHC, or particulate family emission limit for the engine family in grams per brake horsepower hour or grams per Megajoule.

CF = a transient cycle conversion factor in BHP-hr/mi or MJ/mi, as given in paragraph (c)(2) of this section.

UL = the useful life described in § 86.004–2, or alternative life as described in § 86.004–21(f), for the given engine family in miles.

Production = the number of engines produced for U.S. sales within the given engine family during the model year. Quarterly production projections are used for initial certification. Actual production is used for end-of-year compliance determination.

Discount = a one-time discount applied to all credits to be banked or traded within the model year generated. Except as otherwise allowed in paragraphs (k) and (l) of this section, the discount applied here is 0.9. Banked credits traded in a subsequent model year will not be subject to an additional discount. Banked credits used in a subsequent model year's averaging program will not have the discount restored.

* * * * *

(d) *Averaging sets for NO_X plus NMHC emission credits.* The averaging and trading of NO_X plus NMHC emission credits will only be allowed between heavy-duty engine families in the same averaging set. The averaging sets for the averaging and trading of NO_X plus NMHC emission credits for heavy-duty engines are defined as follows:

(1) For NO_X+NMHC credits from Otto-cycle heavy-duty engines:

(i) Otto-cycle heavy-duty engines constitute an averaging set. Averaging and trading among all Otto-cycle heavy-duty engine families is allowed. There are no subclass restrictions.

(ii) Otto-cycle heavy-duty vehicles certified under the chassis-based provisions of Subpart S of this Part may not average or trade with heavy-duty Otto-cycle engines except as allowed in § 86.1817–05(o).

* * * * *

(f) *Banking of NO_X plus NMHC, and particulate emission credits.* (1) * * * (i) NO_X plus NMHC, and particulate emission credits may be banked from engine families produced in any model year.

* * * * *

(2) * * * (i) NO_X plus NMHC and particulate credits generated in 2004 and later model years do not expire. NO_X plus NMHC credits generated by Otto-cycle engines in the 2003 model year for manufacturers selecting Option 1 contained in § 86.005–10(f)(1) also do not expire.

(ii) Manufacturers withdrawing banked NO_X plus NMHC, and/or particulate credits shall indicate so during certification and in their credit reports, as described in § 86.091–23.

(3) * * *

(ii) Banked credits may not be used for NO_X plus NMHC or particulate averaging and trading to offset emissions that exceed an FEL. Banked credits may not be used to remedy an in-use nonconformity determined by a Selective Enforcement Audit or by recall testing. However, banked credits may be used for subsequent production of the engine family if the manufacturer elects to recertify to a higher FEL.

(iii) NO_X credits banked under paragraph § 86.098–15(j) or § 86.000–15(k) may be used in place of NO_X plus NMHC credits in 2004 and later model years provided that they are used in the correct averaging set. NO_X credits banked under paragraph § 86.000–15(k) may also be used in place of NO_X plus NMHC credits in the 2003 model year for manufacturers selecting Option 1 contained in § 86.005–10(f)(1), provided that they are used in the correct averaging set.

(iv) Except for early credits banked under § 86.000–15(k), NO_X credits banked in accordance with § 86.000–15 may not be used to meet the Otto-cycle engine standards contained in § 86.005–10.

(g)(1) This paragraph (g) assumes NO_X plus NMHC, and particulate nonconformance penalties (NCPs) will be available for the 2004 and later model year HDEs.

(2) Engine families using NO_X plus NMHC and/or particulate NCPs but not involved in averaging:

(i) May not generate NO_X plus NMHC or particulate credits for banking and trading.

(ii) May not use NO_X plus NMHC or particulate credits from banking and trading.

* * * * *

(4) If a manufacturer has any engine family in a given averaging set which is using NO_X plus NMHC and/or particulate NCPs, none of that manufacturer's engine families in that averaging set may generate credits for banking and trading.

* * * * *

(j) *Credit apportionment.* At the manufacturer's option, credits generated under the provisions described in this section may be sold to or otherwise provided to another party for use in programs other than the averaging, trading and banking program described in this section.

(1) The manufacturer shall pre-identify two emission levels per engine family for the purposes of credit apportionment. One emission level shall be the FEL and the other shall be the level of the standard that the engine family is required to certify to under § 86.005–10 or § 86.004–11. For each engine family, the manufacturer may report engine sales in two categories, ''ABT-only credits'' and ''nonmanufacturer-owned credits''.

* * * * *

(k) *Additional flexibility for diesel-cycle engines.* If a diesel-cycle engine family meets the conditions of either paragraph (k)(1) or (2) of this section, a Discount of 1.0 may be used in the trading and banking calculation, for both NO_X plus NMHC and for particulate, described in paragraph (c)(1) of this section.

* * * * *

(l) *Additional flexibility for Otto-cycle engines.* If an Otto-cycle engine family meets the conditions of paragraph (l)(1) or (2) of this section, a discount of 1.0 may be used in the trading and banking credits calculation for NO_X plus NMHC described in paragraph (c)(1) of this section, as follows:

(1) The engine family has a FEL of 0.5 g/bhp-hr NO_X plus NMHC or lower;

(2) All of the following conditions are met:

(i) For first three consecutive model years that the engine family is certified to a NO_X plus NMHC standard contained in § 86.005–10;

(ii) The engine family is certified using carry-over data from an engine family which was used to generate early NO_X credits per § 86.000–15(k) where the sum of the NO_X FEL plus the HC (or hydrocarbon equivalent where applicable) certification level is below 1.0 g/bhp–hr.

13. Section 86.004–16 is added to subpart A to read as follows:

§ 86.004–16 Prohibition of defeat devices.

(a) No new heavy-duty vehicle or heavy-duty engine shall be equipped with a defeat device.

(b) The Administrator may test or require testing on any vehicle or engine at a designated location, using driving cycles and conditions which may reasonably be expected to be encountered in normal operation and use, for the purpose of investigating a potential defeat device.

(c) [Reserved].

(d) For vehicle and engine designs designated by the Administrator to be investigated for possible defeat devices:

(1) *General.* The manufacturer must show to the satisfaction of the Administrator that the vehicle or engine design does not incorporate strategies that reduce emission control effectiveness exhibited during the Federal emissions test procedures, described in subpart N of this part, when the vehicle or engine is operated under conditions which may reasonably be expected to be encountered in normal operation and use, unless one of the specific exceptions set forth in the definition of ''defeat device'' in § 86.004–2 has been met.

(2) *Information submissions required.* The manufacturer will provide an explanation containing detailed information (including information which the Administrator may request to be submitted) regarding test programs, engineering evaluations, design specifications, calibrations, on-board computer algorithms, and design strategies incorporated for operation both during and outside of the Federal emission test procedure described in subpart N of this part.

14. Section 86.004–21 is amended by adding paragraphs (m) and (n), to read as follows:

§ 86.004–21 Application for certification.

* * * * *

(m) For model years 2004 through 2007, within 180 days after submission of the application for certification of a heavy-duty diesel engine, the manufacturer must provide emission test results from the Load Response Test conducted according to § 86.1380–2004, including, at a minimum, test results conducted at each of the speeds identified in § 86.1380–2004. Load Response Test data submissions are not necessary for carry-over engine families for which Load Response Test data has been previously submitted. In addition, upon approval of the Administrator, manufacturers may carry Load Response Test data across from one engine family to other engine families, provided that the carry-across engine families use similar emission control technology hardware which would be expected to result in the generation of similar emission data when run over the Load Response Test.

(n) Upon request from EPA, a manufacturer must provide to EPA any hardware (including scan tools), passwords, and/or documentation necessary for EPA to read, interpret, and store (in engineering units if applicable) any information broadcast by an engine's on-board computers and electronic control modules which relates in any way to emission control devices and auxiliary emission control devices, provided that such hardware, passwords, or documentation exists and is not otherwise commercially available. Passwords include any information necessary to enable generic scan tools or personal computers access to proprietary emission related information broadcast by an engine's on-board computer, if such passwords exist. This requirement includes access by EPA to any proprietary code information which may be broadcast by an engine's on-board computer and electronic control modules. Information which is confidential business information must be marked as such. Engineering units refers to the ability to read, interpret, and store information in commonly understood engineering units, for example, engine speed in revolutions per minute or per second, injection timing parameters such as start of injection in degree's before top-dead center, fueling rates in cubic centimeters per stroke, vehicle speed in miles per hour or kilometers per hour. This paragraph (n) does not restrict EPA authority to take any action authorized by section 208 of the Clean Air Act.

15. A new § 86.004–26 is added to Subpart A, to read as follows:

§ 86.004–26 Mileage and service accumulation; emission measurements.

Section 86.004–26 includes text that specifies requirements that differ from

§ 86.094–26, § 86.095–26, § 86.096–26, § 86.098–26, § 86.000–26, or § 86.001–26. Where a paragraph in § 86.094–26, § 86.095–26, § 86.096–26, § 86.098–26, § 86.000–26 or § 86.001–26 is identical and applicable to § 86.004–26, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–26.'' or [Reserved]. For guidance see § 86.095–26.'' or ''[Reserved]. For guidance see § 86.096–26.'' or ''[Reserved]. For guidance see § 86.098–26.'' or ''[Reserved]. For guidance see § 86.000–26.'' or ''[Reserved]. For guidance see § 86.001–26.''.

(a)(1) [Reserved]. For guidance see § 86.094–26.

(a)(2) through (a)(3)(i)(A) [Reserved]. For guidance see § 86.000–26.

(a)(3)(i)(B) [Reserved]. For guidance see § 86.094–26.

(a)(3)(i)(C) [Reserved]. For guidance see § 86.098–26.

(a)(3)(i)(D) through (a)(3)(ii)(B) [Reserved]. For guidance see § 86.094–26.

(a)(3)(ii)(C) [Reserved]. For guidance see § 86.098–26.

(a)(3)(ii)(D) through (a)(4)(i)(B)(*4*) [Reserved]. For guidance see § 86.094–26.

(a)(4)(i)(C) [Reserved]. For guidance see § 86.000–26.

(a)(4)(i)(D) through (a)(6)(ii) [Reserved]. For guidance see § 86.094–26.

(a)(6)(iii) [Reserved]. For guidance see § 86.000–26.

(a)(7) through (a)(9)(i) [Reserved]. For guidance see § 86.094–26.

(a)(9)(ii) [Reserved]. For guidance see § 86.000–26.

(a)(9)(iii) through (b)(2) introductory text [Reserved]. For guidance see § 86.094–26.

(b)(2)(i) through (b)(2)(ii) [Reserved]. For guidance see § 86.000–26.

(b)(2)(iii) [Reserved]. For guidance see § 86.094–26.

(b)(2)(iv) [Reserved]. For guidance see § 86.001–26.

(b)(3) through (b)(4)(i)(B) [Reserved]. For guidance see § 86.094–26.

(b)(4)(i)(C) [Reserved]. For guidance see § 86.001–26.

(b)(4)(i)(D) through (b)(4)(ii)(B) [Reserved]. For guidance see § 86.095–26.

(b)(4)(ii)(C) [Reserved]. For guidance see § 86.001–26.

(b)(4)(ii)(D) [Reserved]. For guidance see § 86.095–26.

(b)(4)(iii) [Reserved]

(b)(4)(iv) [Reserved]. For guidance see § 86.094–26.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) Two types of service accumulation are applicable to heavy-duty engines, as described in paragraphs (c)(2)(i) and (ii) of this section. For Otto-cycle heavy-duty engines exhaust emissions, the service accumulation method used by a manufacturer must be designed to effectively predict the deterioration of emissions in actual use over the full useful life of the of the candidate in-use vehicles and must cover the breadth of the manufacturer's product line that will be covered by the durability procedure. Manufacturers not selecting Options 1 or 2 described in § 86.005–10(f) may certify Otto-cycle engines using the provisions contained in § 86.094–26(c)(2) rather than those contained in this paragraph (c)(2) for 2004 model year engine families certified using carry-over durability data, except for those engines used for early credit banking as allowed in § 86.000–15(k).

(i) Service accumulation on engines, subsystems, or components selected by the manufacturer under § 86.094–24(c)(3)(i). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Dynamometer service accumulation on emission data engines selected under § 86.094–24(b)(2) or (3). The manufacturer determines the engine operating schedule to be used for dynamometer service accumulation, consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family-control system combination. Operating schedules may be different for different combinations.

(3) Exhaust emission deterioration factors will be determined on the basis of the service accumulation described in § 86.000–26(b)(2)(i) and related testing, according to the manufacturer's procedures.

(c)(4) [Reserved]. For guidance see § 86.096–26.

(d)(1) through (d)(2)(i) [Reserved]. For guidance see § 86.094–26.

(d)(2)(ii) [Reserved]. For guidance see § 86.000–26.

(d)(3) [Reserved]. For guidance see § 86.094–26.

(d)(4) and (5) [Reserved].

(d)(6) [Reserved]. For guidance see § 86.094–26.

16. Section 86.004–28 is amended by revising paragraph (c)(4)(iii)(A)(*2*) and adding paragraph (c)(4)(iii)(A)(*3*) to read as follows:

§ 86.004–28 Compliance with emissions standards.

* * * * *

(c) * * *

(4) * * *

(iii) * * *

(A) * * *

(*2*) Otto-cycle HDEs utilizing aftertreatment technology (*e.g.*, catalytic converters). For transient NMHC (NMHCE), CO, NO_X, and for idle CO, the official exhaust emission results for each emission data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor, except as otherwise provided in paragraph (c)(4)(iii)(A)(*3*) of this section. The deterioration factor must be calculated by dividing the exhaust emissions at full useful life by the stabilized mileage emission level (reference § 86.096–26(c)(4), *e.g.*, 125 hours). However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for purposes of this paragraph (c)(4)(iii)(A)(*2*).

(*3*) An Otto-cycle heavy-duty engine manufacturer who believes that a deterioration factor derived using the calculation methodology described in paragraph (c)(4)(iii)(4)(A)(*2*) of this section are significantly unrepresentative for one or more engine families (either too high or too low) may petition the Administrator to allow for the use of an additive rather than a multiplicative deterioration factor. This petition must include full rationale behind the request together with any supporting data or other evidence. Based on this or other information the Administration may allow for an alternative procedure. Any petition should be submitted in a timely manner, to allow adequate time for a thorough evaluation. Manufacturers using an additive deterioration factor under this paragraph (c)(4)(iii)(A)(*3*) must perform in-use verification testing to determine if the additive deterioration factor reasonably predicts actual in-use emissions. The plan for the in-use verification testing must be approved by the Administrator as part of the approval process described in this paragraph (c)(4)(iii)(4)(A)(*3*) prior to the use of the additive deterioration factor. The Administrator may consider the results of the in-use verification testing both in certification and in-use compliance programs.

* * * * *

17. Section 86.004–30 is amended by removing paragraphs (f) introductory text through (f)(3) and (f)(4) and by adding new paragraph (f), to read as follows:

§ 86.004–30 Certification.

* * * * *

(f) For engine families required to have an OBD system, certification will not be granted if, for any test vehicle approved by the Administrator in consultation with the manufacturer, the malfunction indicator light does not illuminate under any of the following circumstances, unless the manufacturer can demonstrate that any identified OBD problems discovered during the Administrator's evaluation will be corrected on production vehicles.

(1)(i) *Otto-cycle.* A catalyst is replaced with a deteriorated or defective catalyst, or an electronic simulation of such, resulting in an increase of 1.5 times the $NMHC+NO_X$ standard or FEL above the $NMHC+NO_X$ emission level measured using a representative 4000 mile catalyst system.

(ii) *Diesel.* (A) If monitored for emissions performance—a catalyst is replaced with a deteriorated or defective catalyst, or an electronic simulation of such, resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for $NMHC+NO_X$ or PM.

(B) If monitored for performance—a particulate trap is replaced with a trap that has catastrophically failed, or an electronic simulation of such.

(2)(i) *Otto-cycle.* An engine misfire condition is induced resulting in exhaust emissions exceeding 1.5 times the applicable standards or FEL for $NMHC+NO_X$ or CO.

(ii) *Diesel.* An engine misfire condition is induced and is not detected.

(3) If so equipped, any oxygen sensor is replaced with a deteriorated or defective oxygen sensor, or an electronic simulation of such, resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for $NMHC+NO_X$ or CO.

(4) If so equipped, a vapor leak is introduced in the evaporative and/or refueling system (excluding the tubing and connections between the purge valve and the intake manifold) greater than or equal in magnitude to a leak caused by a 0.040 inch diameter orifice, or the evaporative purge air flow is blocked or otherwise eliminated from the complete evaporative emission control system.

(5) A malfunction condition is induced in any emission-related engine system or component, including but not necessarily limited to, the exhaust gas recirculation (EGR) system, if equipped, the secondary air system, if equipped, and the fuel control system, singularly resulting in exhaust emissions exceeding 1.5 times the applicable emission standard or FEL for $NMHC+NO_X$, CO or PM.

(6) A malfunction condition is induced in an electronic emission-related engine system or component not otherwise described above that either provides input to or receives commands from the on-board computer resulting in a measurable impact on emissions.

18. A new § 86.005–1 is added to subpart A to read as follows:

§ 86.005–1 General applicability.

Section 86.005–1 includes text that specifies requirements that differ from § 86.001–1. Where a paragraph in § 86.001–1 is identical and applicable to § 86.005–1, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.001–1.''.

(a) *Applicability.* The provisions of this subpart generally apply to 2005 and later model year new Otto-cycle heavy-duty engines used in incomplete vehicles and vehicles above 14,000 pounds GVWR and 2005 and later model year new diesel-cycle heavy-duty engines. In cases where a provision applies only to a certain vehicle group based on its model year, vehicle class, motor fuel, engine type, or other distinguishing characteristics, the limited applicability is cited in the appropriate section or paragraph. The provisions of this subpart continue to generally apply to 2000 and earlier model year new Otto-cycle and diesel-cycle light-duty vehicles, 2000 and earlier model year new Otto-cycle and diesel-cycle light-duty trucks, and 2004 and earlier model year new Otto-cycle complete heavy-duty vehicles at or below 14,000 pounds GVWR. Provisions generally applicable to 2001 and later model year new Otto-cycle and diesel-cycle light-duty vehicles, 2001 and later model year new Otto-cycle and diesel-cycle light-duty trucks, and 2005 and later model year Otto-cycle complete heavy-duty vehicles at or below 14,000 pounds GVWR are located in subpart S of this part.

(b) *Optional applicability.* (1) A manufacturer may request to certify any 2003 or 2004 model year heavy-duty vehicle of 14,000 pounds Gross Vehicle Weight Rating or less in accordance with the light-duty truck provisions located in subpart S of this part. Heavy-duty engine or vehicle provisions of this subpart A do not apply to such a vehicle. This option is not available in the 2003 model year for manufacturers choosing Otto-cycle HDE option 1 in paragraph (c)(1) of this section, or in the 2004 model year for manufacturers choosing Otto-cycle HDE option 2 in paragraph (c)(2) of this section.

(2) For 2005 and later model years, a manufacturer may request to certify any incomplete Otto-cycle heavy-duty vehicle of 14,000 pounds Gross Vehicle Weight Rating or less in accordance with the provisions for Otto-cycle complete heavy-duty vehicles located in subpart S of this part. Heavy-duty engine or heavy-duty vehicle provisions of this subpart A do not apply to such a vehicle. This option is available starting with the 2003 model year to manufacturers choosing Otto-cycle HDE option 1 in paragraph (c)(1) of this section. This option is available starting with the 2004 model year to manufacturers choosing Otto-cycle HDE option 2 in paragraph (c)(1) of this section.

(c) *Otto-cycle heavy-duty engines and vehicles.* The manufacturer must select one of the three options for Otto-cycle heavy-duty engines and vehicles in paragraphs (c)(1) through (c)(3) of this section. The emission standards and other requirements that apply under a given option shall apply to all Otto-cycle heavy-duty engines and vehicles certified by the manufacturer (*e.g.*, a manufacturer may not select one option for certain engine families and the other option for other engine families). The requirements under each option shall remain effective, once selected, for subsequent model years, until superceded or otherwise revised by the Administrator (*e.g.*, a manufacturer may not select one option prior to the 2004 model year and change to another option in the 2006 model year). The complete requirements under each option are contained in subparts A and S of this part.

(1) *Otto-cycle HDE Option 1.* The following requirements apply to Otto-cycle heavy-duty engines and vehicles certified by manufacturers selecting this option:

(i) Emission standards for 2003 and later model year Otto-cycle heavy-duty engines, according to the provisions of § 86.005–10(f)(1).

(ii) Emission standards for 2003 and later model year Otto-cycle complete heavy-duty vehicles, according to the provisions of § 86.1816–05, except that, for 2003 through 2006 model year Otto-cycle complete heavy-duty vehicles, manufacturers may optionally comply with the standards in either 86.005–10 or 86.1816–05.

(iii) Averaging, banking, and trading provisions that allow transfer of credits between a manufacturer's complete vehicle averaging set and their heavy-duty Otto-cycle engine averaging set, according to the provisions of § 86.1817–05(o).

(iv) On-board diagnostics requirements effective starting with the 2004 model year for Otto-cycle engines and complete vehicles, according to the provisions of §§ 86.005–17 and 86.1806–05.

(v) Refueling emissions requirements effective starting with the 2004 model year for Otto-cycle complete vehicles, according to the provisions of §§ 86.1810–01 and 86.1816–05.

(2) *Otto-cycle HDE Option 2.* The following requirements apply to Otto-cycle heavy-duty engines and vehicles certified by manufacturers selecting this option:

(i) Emission standards for 2004 and later model year Otto-cycle heavy-duty engines, according to the provisions of § 86.005–10(f)(2).

(ii) Emission standards for 2004 and later model year Otto-cycle complete heavy-duty vehicles, according to the provisions of § 86.1816–05.

(iii) Averaging, banking, and trading provisions that allow transfer of credits between a manufacturer's complete vehicle averaging set and their heavy-duty Otto-cycle engine averaging set, according to the provisions of § 86.1817–05(o).

(iv) On-board diagnostics requirements effective starting with the 2004 model year for Otto-cycle engines and complete vehicles, according to the provisions of §§ 86.005–17 and 86.1806–05.

(v) Refueling emissions requirements effective starting with the 2004 model year for Otto-cycle complete vehicles, according to the provisions of §§ 86.1810–01 and 86.1816–05.

(3) *Otto-cycle HDE Option 3.* The following requirements apply to Otto-cycle heavy-duty engines and vehicles certified by manufacturers that do not select one of the options for 2003 or 2004 model year compliance in paragraph (c)(1) or (c)(2) of this section:

(i) Emission standards for 2005 and later model year Otto-cycle heavy-duty engines, according to the provisions of § 86.005–10.

(ii) Emission standards for 2005 and later model year Otto-cycle complete heavy-duty vehicles, according to the provisions of § 86.1816–05.

(iii) On-board diagnostics requirements effective starting with the 2005 model year for Otto-cycle engines and complete vehicles, according to the provisions of §§ 86.005–17 and 86.1806–05.

(iv) Refueling emissions requirements effective starting with the 2005 model year for Otto-cycle complete vehicles, according to the provisions of §§ 86.1810–01 and 86.1816–05.

(v) Manufacturers selecting this option may exempt 2005 model year Otto-cycle heavy-duty engines and vehicles whose model year commences before July 31, 2004 from the requirements in paragraphs (c)(3)(i) through (iv) of this section.

(vi) For 2005 model year engines or vehicles exempted under paragraph (c)(3)(v) of this section, a manufacturer shall certify such Otto-cycle heavy-duty engines and vehicles to all requirements in this subpart applicable to 2004 model year Otto-cycle heavy-duty engines. The averaging, banking, and trading provisions contained in § 86.000–15 remain effective for these engines.

(d) [Reserved].

(e) through (f) [Reserved]. For guidance see § 86.001–1.

19. A new § 86.005–10 is added to subpart A to read as follows:

§ 86.005–10 Emission standards for 2005 and later model year Otto-cycle heavy-duty engines and vehicles.

Section 86.005–10 includes text that specifies requirements that differ from § 86.098–10 or § 86.099–10. Where a paragraph in § 86.098–10 or § 86.099–10 is identical and applicable to § 86.005–10, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.098–10.'' or ''[Reserved]. For guidance see § 86.099–10.''.

(a)(1) Exhaust emissions from new 2005 and later model year Otto-cycle HDEs, except for Otto-cycle HDEs subject to the alternative standards in paragraph (f) of this section, shall not exceed:

(i)(A) *Oxides of Nitrogen plus Non-methane Hydrocarbons (NO_X + NMHC) for engines fueled with either gasoline, natural gas, or liquefied petroleum gas.* 1.0 grams per brake horsepower-hour (0.37 grams per megajoule).

(B) *Oxides of Nitrogen plus Non-methane HydrocarbonEquivalent (NO_X + NMHCE) for engines fueled with methanol.* 1.0 grams per brake horsepower-hour (0.37 grams per megajoule).

(C) A manufacturer may elect to include any or all of its Otto-cycle HDE families in any or all of the emissions ABT programs for HDEs, within the restrictions described in § 86.098–15. If the manufacturer elects to include engine families in any of these programs, the NO_X plus NMHC (or NO_X plus NMHCE for methanol-fueled engines) FELs may not exceed 4.5 grams per brake horsepower-hour (1.7 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, banking, or trading programs.

(ii)(A) *Carbon monoxide for engines intended for use in all vehicles, except as provided in paragraph (a)(3) of this section.* 14.4 grams per brake horsepower-hour (5.36 grams per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide for engines intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds.* 37.1 grams per brake horsepower-hour (13.8 grams per megajoule), as measured under transient operating conditions.

(C) *Idle carbon monoxide.* For all Otto-cycle HDEs utilizing aftertreatment technology: 0.50 percent of exhaust gas flow at curb idle.

(2) The standards set forth in paragraphs (a)(1) and (f) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of appendix I to this part, and measured and calculated in accordance with the procedures set forth in subpart N or P of this part.

(3)(i) A manufacturer may certify one or more Otto-cycle HDE configurations intended for use in all vehicles to the emission standard set forth in paragraph (a)(1)(ii)(B) of this section: Provided, that the total model year sales of such configuration(s), segregated by fuel type, being certified to the emission standard in paragraph (a)(1)(ii)(B) of this section represent no more than five percent of total model year sales of each fuel type Otto-cycle HDE intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(ii) The configurations certified to the emission standards of paragraph (a)(1)(ii)(B) of this section under the provisions of paragraph (a)(3)(i) of this section shall still be required to meet the evaporative emission standards set forth in § 86.099–10(b)(1)(i), (b)(2)(i) and (b)(3)(i).

(4) The manufacturer may exempt 2005 model year HDE engine families whose model year begins before July, 31, 2004 from the requirements in this paragraph (a). Exempted engine families shall be subject to the requirements in § 86.099–10.

(b) [Reserved]. For guidance see § 86.099–10.

(c) [Reserved]. For guidance see § 86.098–10.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in subpart N or P of this part to ascertain that such test engines meet the requirements of this section.

(e) [Reserved]. For guidance see § 86.099–10.

(f) *Alternative exhaust emission standards.* In lieu of the exhaust emission standards in paragraph (a)(1)(i)(A) or (B) of this section, the manufacturer may select the standards and provisions in either paragraph (f)(1) or (f)(2) of this section.

(1) *Otto-cycle HDE Option 1.* The alternative exhaust emission standards in this paragraph (f)(1) shall apply to new 2003 through 2007 model year Otto-cycle HDEs and, at the manufacturers option, to new 2003 through 2006 model year Otto-cycle complete heavy-duty vehicles less than or equal to 14,000 pounds GVWR.

(i) *Oxides of Nitrogen plus Non-methane Hydrocarbons (NO_X + NMHC) for engines fueled with either gasoline, natural gas, or liquefied petroleum gas.* 1.5 grams per brake horsepower-hour (0.55 grams per megajoule).

(ii) *Oxides of Nitrogen plus Non-methane Hydrocarbon Equivalent (NO_X + NMHCE) for engines fueled with methanol.* 1.5 grams per brake horsepower-hour (0.55 grams per megajoule).

(2) *Otto-cycle HDE Option 2.* The alternative exhaust emission standards in this paragraph (f)(2) shall apply to new 2004 through 2007 model year Otto-cycle HDEs.

(i) *Oxides of Nitrogen plus Non-methane Hydrocarbons ($NO,_X$ + NMHC) for engines fueled with either gasoline, natural gas, or liquefied petroleum gas.* 1.5 grams per brake horsepower-hour (0.55 grams per megajoule).

(ii) *Oxides of Nitrogen plus Non-methane Hydrocarbon Equivalent (NO_X + NMHCE) for engines fueled with methanol.* 1.5 grams per brake horsepower-hour (0.55 grams per megajoule).

20. Section 86.005–17 is added to subpart A, to read as follows:

§ 86.005–17 On-board diagnostics.

(a) *General.* (1) All heavy-duty engines intended for use in a heavy-duty vehicle weighing 14,000 pounds GVWR or less must be equipped with an on-board diagnostic (OBD) system capable of monitoring all emission-related engine systems or components during the applicable useful life. Heavy-duty engines intended for use in a heavy-duty vehicle weighing 14,000 pounds GVWR or less must meet the OBD requirements of this section according to the phase-in schedule in paragraph (k) of this section. All monitored systems and components must be evaluated periodically, but no less frequently than once per applicable certification test cycle as defined in Appendix I, paragraph (f), of this part, or similar trip as approved by the Administrator.

(2) An OBD system demonstrated to fully meet the requirements in § 86.1806–05 may be used to meet the requirements of this section, provided that the Administrator finds that a manufacturer's decision to use the flexibility in this paragraph (a)(2) is based on good engineering judgement.

(b) *Malfunction descriptions.* The OBD system must detect and identify malfunctions in all monitored emission-related engine systems or components according to the following malfunction definitions as measured and calculated in accordance with test procedures set forth in subpart N of this part (engine-based test procedures) excluding the test procedure referred to as the ''Supplemental steady-state test; test cycle and procedures'' contained in § 86.1360–2007, and excluding the test procedure referred to as the ''Not-To-Exceed Test Procedure'' contained in § 86.1370–2007, and excluding the test procedure referred to as the ''Load Response Test'' contained in § 86.1380–2004.

(1) *Catalysts and particulate traps.* (i) *Otto-cycle.* Catalyst deterioration or malfunction before it results in an increase in NMHC emissions 1.5 times the NMHC+NO_X standard or FEL, as compared to the NMHC+NO_X emission level measured using a representative 4000 mile catalyst system.

(ii) *Diesel.* (A) If equipped, catalyst deterioration or malfunction before it results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NMHC+NO_X or PM. This requirement applies only to reduction catalysts; monitoring of oxidation catalysts is not required. This monitoring need not be done if the manufacturer can demonstrate that deterioration or malfunction of the system will not result in exceedance of the threshold.

(B) If equipped with a particulate trap, catastrophic failure of the device must be detected. Any particulate trap whose complete failure results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NMHC+NO_X or PM must be monitored. This monitoring need not be done if the manufacturer can demonstrate that a catastrophic failure of the system will not result in exceedance of the threshold.

(2) *Engine Misfire.* (i) *Otto-cycle.* Engine misfire resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NMHC+NO_X or CO; and any misfire capable of damaging the catalytic converter.

(ii) *Diesel.* Lack of cylinder combustion must be detected.

(3) *Oxygen sensors.* If equipped, oxygen sensor deterioration or malfunction resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NMHC+NO_X or CO.

(4) *Evaporative leaks.* If equipped, any vapor leak in the evaporative and/or refueling system (excluding the tubing and connections between the purge valve and the intake manifold) greater than or equal in magnitude to a leak caused by a 0.040 inch diameter orifice; an absence of evaporative purge air flow from the complete evaporative emission control system. Where fuel tank capacity is greater than 25 gallons, the Administrator may, following a request from the manufacturer, revise the size of the orifice to the smallest orifice feasible, based on test data, if the most reliable monitoring method available cannot reliably detect a system leak equal to a 0.040 inch diameter orifice.

(5) *Other emission control systems.* Any deterioration or malfunction occurring in an engine system or component directly intended to control emissions, including but not necessarily limited to, the exhaust gas recirculation (EGR) system, if equipped, the secondary air system, if equipped, and the fuel control system, singularly resulting in exhaust emissions exceeding 1.5 times the applicable emission standard or FEL for NMHC+NO_X, CO or diesel PM. For engines equipped with a secondary air system, a functional check, as described in paragraph (b)(6) of this section, may satisfy the requirements of this paragraph (b)(5) provided the manufacturer can demonstrate that deterioration of the flow distribution system is unlikely. This demonstration is subject to Administrator approval and, if the demonstration and associated functional check are approved, the diagnostic system must indicate a malfunction when some degree of secondary airflow is not detectable in the exhaust system during the check. For engines equipped with positive crankcase ventilation (PCV), monitoring of the PCV system is not necessary provided the manufacturer can demonstrate to the Administrator's satisfaction that the PCV system is unlikely to fail.

(6) *Other emission-related engine components.* Any other deterioration or malfunction occurring in an electronic emission-related engine system or component not otherwise described above that either provides input to or receives commands from the on-board computer and has a measurable impact on emissions; monitoring of components required by this paragraph (b)(6) must be satisfied by employing electrical circuit continuity checks and rationality checks for computer input

components (input values within manufacturer specified ranges based on other available operating parameters), and functionality checks for computer output components (proper functional response to computer commands) except that the Administrator may waive such a rationality or functionality check where the manufacturer has demonstrated infeasibility. Malfunctions are defined as a failure of the system or component to meet the electrical circuit continuity checks or the rationality or functionality checks.

(7) *Performance of OBD functions.* Oxygen sensor or any other component deterioration or malfunction which renders that sensor or component incapable of performing its function as part of the OBD system must be detected and identified on vehicles so equipped.

(c) *Malfunction indicator light (MIL).* The OBD system must incorporate a malfunction indicator light (MIL) readily visible to the vehicle operator. When illuminated, the MIL must display ''Check Engine,'' ''Service Engine Soon,'' a universally recognizable engine symbol, or a similar phrase or symbol approved by the Administrator. More than one general purpose malfunction indicator light for emission-related problems should not be used; separate specific purpose warning lights (*e.g.*, brake system, fasten seat belt, oil pressure, *etc.*) are permitted. The use of red for the OBD-related malfunction indicator light is prohibited.

(d) *MIL illumination.* The MIL must illuminate and remain illuminated when any of the conditions specified in paragraph (b) of this section are detected and verified, or whenever the engine control enters a default or secondary mode of operation considered abnormal for the given engine operating conditions. The MIL must blink once per second under any period of operation during which engine misfire is occurring and catalyst damage is imminent. If such misfire is detected again during the following driving cycle (*i.e.,* operation consisting of, at a minimum, engine start-up and engine shut-off) or the next driving cycle in which similar conditions are encountered, the MIL must maintain a steady illumination when the misfire is not occurring and then remain illuminated until the MIL extinguishing criteria of this section are satisfied. The MIL must also illuminate when the vehicle's ignition is in the ''key-on'' position before engine starting or cranking and extinguish after engine starting if no malfunction has previously been detected. If a fuel system or engine misfire malfunction has previously been detected, the MIL may be extinguished if the malfunction does not reoccur during three subsequent sequential trips during which similar conditions are encountered and no new malfunctions have been detected. Similar conditions are defined as engine speed within 375 rpm, engine load within 20 percent, and engine warm-up status equivalent to that under which the malfunction was first detected. If any malfunction other than a fuel system or engine misfire malfunction has been detected, the MIL may be extinguished if the malfunction does not reoccur during three subsequent sequential trips during which the monitoring system responsible for illuminating the MIL functions without detecting the malfunction, and no new malfunctions have been detected. Upon Administrator approval, statistical MIL illumination protocols may be employed, provided they result in comparable timeliness in detecting a malfunction and evaluating system performance, *i.e.,* three to six driving cycles would be considered acceptable.

(e) *Storing of computer codes.* The OBD system shall record and store in computer memory diagnostic trouble codes and diagnostic readiness codes indicating the status of the emission control system. These codes shall be available through the standardized data link connector per specifications as referenced in paragraph (h) of this section.

(1) A diagnostic trouble code must be stored for any detected and verified malfunction causing MIL illumination. The stored diagnostic trouble code must identify the malfunctioning system or component as uniquely as possible. At the manufacturer's discretion, a diagnostic trouble code may be stored for conditions not causing MIL illumination. Regardless, a separate code should be stored indicating the expected MIL illumination status (*i.e.,* MIL commanded ''ON,'' MIL commanded ''OFF'').

(2) For a single misfiring cylinder, the diagnostic trouble code(s) must uniquely identify the cylinder, unless the manufacturer submits data and/or engineering evaluations which adequately demonstrate that the misfiring cylinder cannot be reliably identified under certain operating conditions. For diesel engines only, the specific cylinder for which combustion cannot be detected need not be identified if new hardware would be required to do so. The diagnostic trouble code must identify multiple misfiring cylinder conditions; under multiple misfire conditions, the misfiring cylinders need not be uniquely identified if a distinct multiple misfire diagnostic trouble code is stored.

(3) The diagnostic system may erase a diagnostic trouble code if the same code is not re-registered in at least 40 engine warm-up cycles, and the malfunction indicator light is not illuminated for that code.

(4) Separate status codes, or readiness codes, must be stored in computer memory to identify correctly functioning emission control systems and those emission control systems which require further engine operation to complete proper diagnostic evaluation. A readiness code need not be stored for those monitors that can be considered continuously operating monitors (*e.g.,* misfire monitor, fuel system monitor, etc.). Readiness codes should never be set to ''not ready'' status upon key-on or key-off; intentional setting of readiness codes to ''not ready'' status via service procedures must apply to all such codes, rather than applying to individual codes. Subject to Administrator approval, if monitoring is disabled for a multiple number of driving cycles (*i.e.,* more than one) due to the continued presence of extreme operating conditions (*e.g.,* ambient temperatures below 40 °F, or altitudes above 8000 feet), readiness for the subject monitoring system may be set to ''ready'' status without monitoring having been completed. Administrator approval shall be based on the conditions for monitoring system disablement, and the number of driving cycles specified without completion of monitoring before readiness is indicated.

(f) *Available diagnostic data.* (1) Upon determination of the first malfunction of any component or system, ''freeze frame'' engine conditions present at the time must be stored in computer memory. Should a subsequent fuel system or misfire malfunction occur, any previously stored freeze frame conditions must be replaced by the fuel system or misfire conditions (whichever occurs first). Stored engine conditions must include, but are not limited to: engine speed, open or closed loop operation, fuel system commands, coolant temperature, calculated load value, fuel pressure, vehicle speed, air flow rate, and intake manifold pressure if the information needed to determine these conditions is available to the computer. For freeze frame storage, the manufacturer must include the most appropriate set of conditions to facilitate effective repairs. If the diagnostic trouble code causing the conditions to be stored is erased in accordance with paragraph (d) of this section, the stored engine conditions may also be erased.

(2) The following data in addition to the required freeze frame information must be made available on demand through the serial port on the standardized data link connector, if the information is available to the on-board computer or can be determined using information available to the on-board computer: Diagnostic trouble codes, engine coolant temperature, fuel control system status (closed loop, open loop, other), fuel trim, ignition timing advance, intake air temperature, manifold air pressure, air flow rate, engine RPM, throttle position sensor output value, secondary air status (upstream, downstream, or atmosphere), calculated load value, vehicle speed, and fuel pressure. The signals must be provided in standard units based on SAE specifications incorporated by reference in paragraph (h) of this section. Actual signals must be clearly identified separately from default value or limp home signals.

(3) For all OBD systems for which specific on-board evaluation tests are conducted (catalyst, oxygen sensor, etc.), the results of the most recent test performed by the vehicle, and the limits to which the system is compared must be available through the standardized data link connector per the appropriate standardized specifications as referenced in paragraph (h) of this section.

(4) Access to the data required to be made available under this section shall be unrestricted and shall not require any access codes or devices that are only available from the manufacturer.

(g) *Exceptions.* The OBD system is not required to evaluate systems or components during malfunction conditions if such evaluation would result in a risk to safety or failure of systems or components. Additionally, the OBD system is not required to evaluate systems or components during operation of a power take-off unit such as a dump bed, snow plow blade, or aerial bucket, etc.

(h) *Reference materials.* The OBD system shall provide for standardized access and conform with the following Society of Automotive Engineers (SAE) standards and/or the following International Standards Organization (ISO) standards. The following documents are incorporated by reference (see § 86.1):

(1) *SAE material.* Copies of these materials may be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096–0001.

(i) SAE J1850 ''Class B Data Communication Network Interface,'' (July 1995) shall be used as the on-board to off-board communications protocol. All emission related messages sent to the scan tool over a J1850 data link shall use the Cyclic Redundancy Check and the three byte header, and shall not use inter-byte separation or checksums.

(ii) Basic diagnostic data (as specified in §§ 86.094–17(e) and (f)) shall be provided in the format and units in SAE J1979 ''E/E Diagnostic Test Modes,'' (July 1996).

(iii) Diagnostic trouble codes shall be consistent with SAE J2012 ''Recommended Practices for Diagnostic Trouble Code Definitions,'' (July 1996).

(iv) The connection interface between the OBD system and test equipment and diagnostic tools shall meet the functional requirements of SAE J1962 ''Diagnostic Connector,'' (January 1995).

(v) As an alternative to the above standards, heavy-duty engines may conform to the specifications of the SAE J1939 series of standards (SAE J1939–11, J1939–13, J1939–21, J1939–31, J1939–71, J1939–73, J1939–81).

(2) *ISO materials.* Copies of these materials may be obtained from the International Organization for Standardization, Case Postale 56, CH–1211 Geneva 20, Switzerland.

(i) ISO 9141–2 ''Road vehicles—Diagnostic systems—Part 2: CARB requirements for interchange of digital information,'' (February 1994) may be used as an alternative to SAE J1850 as the on-board to off-board communications protocol.

(ii) ISO 14230–4 ''Road vehicles—Diagnostic systems—Keyword Protocol 2000—Part 4: Requirements for emission-related systems'' may also be used as an alternative to SAE J1850.

(i) *Deficiencies and alternate fueled engines.* Upon application by the manufacturer, the Administrator may accept an OBD system as compliant even though specific requirements are not fully met. Such compliances without meeting specific requirements, or deficiencies, will be granted only if compliance would be infeasible or unreasonable considering such factors as, but not limited to: technical feasibility of the given monitor and lead time and production cycles including phase-in or phase-out of engines or vehicle designs and programmed upgrades of computers. Unmet requirements should not be carried over from the previous model year except where unreasonable hardware or software modifications would be necessary to correct the deficiency, and the manufacturer has demonstrated an acceptable level of effort toward compliance as determined by the Administrator. Furthermore, EPA will not accept any deficiency requests that include the complete lack of a major diagnostic monitor (''major'' diagnostic monitors being those for exhaust aftertreatment devices, oxygen sensor, engine misfire, evaporative leaks, and diesel EGR, if equipped), with the possible exception of the special provisions for alternate fueled engines. For alternate fueled heavy-duty engines (*e.g.* natural gas, liquefied petroleum gas, methanol, ethanol), beginning with the model year for which alternate fuel emission standards are applicable and extending through the 2006 model year, manufacturers may request the Administrator to waive specific monitoring requirements of this section for which monitoring may not be reliable with respect to the use of the alternate fuel. At a minimum, alternate fuel engines must be equipped with an OBD system meeting OBD requirements to the extent feasible as approved by the Administrator.

(j) *California OBD II compliance option.* For heavy-duty engines at or below 14,000 pounds GVWR, demonstration of compliance with California OBD II requirements (Title 13 California Code section 1968.1), as modified pursuant to California Mail Out #97–24 (December 9, 1997), shall satisfy the requirements of this section, except that the exemption to the catalyst monitoring provisions of California Code section 1968.1(b)(1.1.2) for diesel engines does not apply, and compliance with California Code sections 1968.1(b)(4.2.2), pertaining to 0.02 inch evaporative leak detection, and 1968.1(d), pertaining to tampering protection, are not required to satisfy the requirements of this section. Also, the deficiency fine provisions of California Code sections 1968.1(m)(6.1) and (6.2) do not apply.

(k) *Phase-in for heavy-duty engines.* Manufacturers of heavy-duty engines must comply with the OBD requirements in this section according to the phase-in schedule in this paragraph (k), based on the percentage of projected engine sales within each category. The 2004 model year requirements in the phase-in schedule in this paragraph (k) are applicable only to heavy-duty Otto-cycle engines where the manufacturer has selected Otto-cycle Option 1 for alternative 2004 compliance according to § 86.005–1 (c)(2). The 2005 through 2007 requirements in the phase-in schedule in this paragraph (k) apply to all heavy-duty engines intended for use in a heavy-duty vehicle weighing 14,000 pounds GVWR or less. Manufacturers may exempt 2005 model year diesel heavy-duty engines and 2005 model year Otto-cycle heavy-duty engines and vehicles if the manufacturer has selected Otto-cycle Option 3 whose model year commences before July 31, 2004 from the requirements of this section. For the purposes of calculating compliance with the phase-in provisions of this paragraph (k), heavy-duty engines may be combined with heavy-duty vehicles subject to the phase-in requirements of paragraph § 86.1806–04(l). The phase-in schedule follows:

OBD COMPLIANCE PHASE-IN FOR HEAVY-DUTY ENGINES INTENDED FOR USE IN A HEAVY-DUTY VEHICLE WEIGHING 14,000 POUNDS GVWR OR LESS

Model year	Phase-in based on projected sales
2004 MY	—applicable only to Otto-cycle engines complying with Options 1 or 2. —40% compliance. —alternative fuel waivers available.
2005 MY	—60% compliance. —alternative fuel waivers available.
2006 MY	—80% compliance. —alternative fuel waivers available.
2007 + MY	—100% compliance.

21. A new § 86.007–11 is added to subpart A, to read as follows:

§ 86.007–11 Emission standards and supplemental requirements for 2007 and later model year diesel heavy-duty engines and vehicles.

This section applies to new 2007 and later model year diesel HDEs. Section 86.007–11 includes text that specifies requirements that differ from § 86.004–11. Where a paragraph in § 86.004–11 is identical and applicable to § 86.007–11, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.004–11.''.

(a) through (a)(2) [Reserved]. For guidance see § 86.004–11.

(a)(3)(i) The weighted average exhaust emissions, as determined under § 86.1360–2007(e)(5) pertaining to the supplemental steady-state test cycle, for each regulated pollutant shall not exceed 1.0 times the applicable emission standards or FELs specified in § 86.004–11(a)(1).

(ii) Gaseous exhaust emissions shall not exceed the steady-state interpolated values determined by the Maximum Allowable Emission Limits (for the corresponding speed and load), as determined under § 86.1360–2007(f), when the engine is operated in the steady-state control area defined under § 86.1360–2007(d), during steady-state engine operation.

(4)(i) The brake-specific exhaust emissions in grams/bhp-hr, as determined under § 86.1370–2007 pertaining to the not-to-exceed test procedures, for each regulated pollutant shall not exceed 1.25 times the applicable emission standards or FELs specified in § 86.004–11(a)(1) during engine and vehicle operation specified in paragraph (a)(4)(ii) of this section, except as noted in paragraph (a)(4)(iii) of this section.

(ii) For each engine family, the not-to-exceed emission limits must apply during one of the following two ambient operating regions:

(A) The not-to-exceed limits apply for all altitudes less than or equal to 5,500 feet above sea-level, during all ambient conditions (temperature and humidity). Temperature and humidity ranges for which correction factors are allowed are specified in § 86.1370–2007(e); or

(B)(*1*) The not-to-exceed emission limits apply at all altitudes less than or equal to 5,500 feet above sea-level, for temperatures less than or equal to the temperature determined by the following equation at the specified altitude:

$$T = -0.00254 \times A + 100$$

Where:

T = ambient air temperature in degrees Fahrenheit.

A = altitude in feet above sea-level (A is negative for altitudes below sea-level).

(*2*) Temperature and humidity ranges for which correction factors are allowed are specified in § 86.1370–2007(e);

(iii) For engines equipped with exhaust gas recirculation, the not-to-exceed emission limits specified in paragraph (a)(4)(i) of this section do not apply to engine or vehicle operation during cold operating conditions as specified in § 86.1370–2007(f).

(iv) *Deficiencies for NTE emission standards.* (A) For model years 2007 through 2009, upon application by the manufacturer, the Administrator may accept a HDDE as compliant with the NTE standards even though specific requirements are not fully met. Such compliances without meeting specific requirements, or deficiencies, will be granted only if compliance would be infeasible or unreasonable considering such factors as, but not limited to: Technical feasibility of the given hardware and lead time and production cycles including phase-in or phase-out of engines or vehicle designs and programmed upgrades of computers. Deficiencies will be approved on a engine model and/or horsepower rating basis within an engine family, and each approval is applicable for a single model year. A manufacturer's application must include a description of the auxiliary emission control device(s) which will be used to maintain emissions to the lowest practical level, considering the deficiency being requested, if applicable. An application for a deficiency must be made during the certification process; no deficiency will be granted to retroactively cover engines already certified.

(B) Unmet requirements should not be carried over from the previous model year except where unreasonable hardware or software modifications would be necessary to correct the deficiency, and the manufacturer has demonstrated an acceptable level of effort toward compliance as determined by the Administrator. The NTE deficiency should only be seen as an allowance for minor deviations from the NTE requirements. The NTE deficiency provisions allow a manufacturer to apply for relief from the NTE emission requirements under limited conditions. EPA expects that manufacturers should have the necessary functioning emission control hardware in place to comply with the NTE.

(b)(1) introductory text through (b)(1)(iii) [Reserved]. For guidance see § 86.004–11.

(b)(1)(iv) Operation within the NTE zone (defined in § 86.1370–2007) must comply with a filter smoke number of 1.0 under steady-state operation, or the following alternate opacity limits:

(A) A 30 second transient test average opacity limit of 4% for a 5 inch path; and

(B) A 10 second steady state test average opacity limit of 4% for a 5 inch path.

(2)(i) The standards set forth in § 86.004–11 (b)(1)(i) through (iii) refer to exhaust smoke emissions generated under the conditions set forth in subpart I of this part and measured and calculated in accordance with those procedures.

(ii) The standards set forth in paragraph (b)(1)(iv) of this section refer to exhaust smoke emissions generated under the conditions set forth in § 86.1370–2007 and calculated in accordance with the procedures set forth in § 86.1372–2007.

(b)(3) through (d) [Reserved]. For guidance see § 86.004–11.

22. A new § 86.007–21 is added to Subpart A, to read as follows:

§ 86.007–21 Application for certification.

Section 86.007–21 includes text that specifies requirements that differ from § 86.004–21, 86.094–21 or 86.096–21. Where a paragraph in § 86.004–21, 86.094–21 or 86.096–21 is identical and applicable to § 86.007–21, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.004–21.'', ''[Reserved]. For guidance see § 86.094–21.'', or ''[Reserved]. For guidance see § 86.096–21.''.

(a) through (b)(3) [Reserved]. For guidance see § 86.094–21.

(b)(4)(i) [Reserved]. For guidance see § 86.004–21.

(b)(4)(ii) through (b)(5)(iv) [Reserved]. For guidance see § 86.094–21.

(b)(5)(v) through (b)(6) [Reserved]. For guidance see § 86.004–21.

(b)(7) and (b)(8) [Reserved]. For guidance see § 86.094–21.

(b)(9) and (b)(10) [Reserved]. For guidance see § 86.004–21.

(c) through (j) [Reserved]. For guidance see § 86.094–21.

(k) and (l) [Reserved]. For guidance see § 86.096–21.

(m) and (n) [Reserved]. For guidance see § 86.004–21.

(o) For diesel heavy-duty engines, the manufacturer must provide the following additional information pertaining to the supplemental steady-state test conducted under § 86.1360–2007:

(1) Weighted brake-specific emissions data (*i.e.,* in units of g/bhp-hr), calculated according to § 86.1360–2007(e)(5), for all pollutants for which an emission standard is established in § 86.004–11(a);

(2) Brake specific gaseous emission data for each of the 13 test points (identified under § 86.1360–2007(b)(1)) and the 3 EPA-selected test points (identified under § 86.1360–2007(b)(2));

(3) Concentrations and mass flow rates of all regulated gaseous emissions plus carbon dioxide;

(4) Values of all emission-related engine control variables at each test point;

(5) Weighted break-specific particulate matter (*i.e.,* in units of g/bhp-hr);

(6) A statement that the test results correspond to the maximum NO_X producing condition specified in § 86.1360–2007(e)(4). The manufacturer also must maintain records at the manufacturer's facility which contain all test data, engineering analyses, and other information which provides the basis for this statement, where such information exists. The manufacturer must provide such information to the Administrator upon request;

(7) A statement that the engines will comply with the weighted average emissions standard and interpolated values comply with the Maximum Allowable Emission Limits specified in § 86.007–11(a)(3) for the useful life of the engine. The manufacturer also must maintain records at the manufacturer's facility which contain a detailed description of all test data, engineering analyses, and other information which provides the basis for this statement, where such information exists. The manufacturer must provide such information to the Administrator upon request.

(p)(1) The manufacturer must provide a statement in the application for certification that the diesel heavy-duty engine for which certification is being requested will comply with the applicable Not-To-Exceed Limits specified in § 86.007–11(a)(4) when operated under all conditions which may reasonably be expected to be encountered in normal vehicle operation and use. The manufacturer also must maintain records at the manufacturers facility which contain all test data, engineering analyses, and other information which provides the basis for this statement, where such information exists. The manufacturer must provide such information to the Administrator upon request.

(2) For engines equipped with exhaust gas recirculation, the manufacturer must provide a detailed description of the control system the engine will use to comply with the requirements of § 86.007–11(a)(4)(iii) and § 86.1370–2007(f) for NTE cold temperature operating exclusion, including but not limited to the method the manufacturer will use to access this exclusion during normal vehicle operation.

(3) For each engine model and/or horsepower rating within an engine family for which a manufacturer is applying for an NTE deficiency(ies) under the provisions of § 86.007–11(a)(4)(iv), the manufacturer's application for an NTE deficiency(ies) must include a complete description of the deficiency, including but not limited to: the specific description of the deficiency; what pollutant the deficiency is being applied for, all engineering efforts the manufacturer has made to overcome the deficiency, what specific operating conditions the deficiency is being requested for (i.e., temperature ranges, humidity ranges, altitude ranges, etc.), a full description of the auxiliary emission control device(s) which will be used to maintain emissions to the lowest practical level; and what the lowest practical emission level will be.

23. A new § 86.008–10 is added to subpart A to read as follows:

§ 86.008–10 Emission standards for 2008 and later model year Otto-cycle heavy-duty engines and vehicles.

Section 86.008–10 includes text that specifies requirements that differ from § 86.098–10, § 86.099–10, § 86.005–10. Where a paragraph in § 86.098–10, § 86.099–10, or § 86.005–10 is identical and applicable to § 86.008–10, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.098–10.'', ''[Reserved]. For guidance see § 86.099–10.'', or ''[Reserved]. For guidance see § 86.005–10.''.

(a)(1) Exhaust emissions from new 2008 and later model year Otto-cycle HDEs shall not exceed:

(i)(A) *Oxides of Nitrogen plus Non-methane Hydrocarbons (NO_X + NMHC) for engines fueled with either gasoline, natural gas, or liquefied petroleum gas.* 1.0 grams per brake horsepower-hour (0.37 grams per megajoule).

(B) *Oxides of Nitrogen plus Non-methane Hydrocarbon Equivalent (NO_X + NMHCE) for engines fueled with methanol.* 1.0 grams per brake horsepower-hour (0.37 grams per megajoule).

(a)(1)(i)(C) through (a)(3)(ii) [Reserved]. For guidance see § 86.005–10.

(4) [Reserved]

(b) [Reserved]. For guidance see § 86.099–10.

(c) [Reserved]. For guidance see § 86.098–10.

(d) [Reserved]. For guidance see § 86.005–10.

(e) [Reserved]. For guidance see § 86.099–10.

(f) [Reserved]

24. Section 86.098–10 is amended by revising paragraph (a)(1) introductory text, to read as follows:

§ 86.098–10 Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.

* * * * *

(a)(1) Except as provided for 2003 and 2004 model years in §§ 86.005–10(f) and 86.1816–05, exhaust emissions from new 1998 and later model year Otto-cycle heavy-duty engines shall not exceed:

* * * * *

25. Subpart B is amended by revising the heading of the subpart, to read as follows:

Subpart B—Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles and New Light-Duty Trucks and New Otto-Cycle Complete Heavy-Duty Vehicles; Test Procedures

26. Section 86.101 is amended by revising paragraphs (a) introductory text, (a)(3) and (d), and by adding paragraph (e) to read as follows:

§ 86.101 General applicability.

(a) The provisions of this subpart are applicable to 1977 and later model year new light-duty vehicles and light duty trucks, and 2001 and later model year new Otto-cycle heavy-duty vehicles and engines certified under the provisions of subpart S of this part.

* * * * *

(3) Sections 86.150 through 86.157 describe the refueling test procedures for light-duty vehicles and light duty trucks and apply for model years 1998 and later. They also describe the refueling test procedures for 2004 and later model year Otto-cycle complete heavy-duty vehicles that must meet the ORVR standards under the provisions of subpart S of this part.

* * * * *

(d) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and heavy-duty vehicles under the provisions of subpart S of this part.

(e) References in this subpart to light-duty vehicles or light-duty trucks shall be deemed to apply to light-duty vehicles, light-duty trucks, or heavy-duty vehicles and engines as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and heavy-duty vehicles and engines under the provisions of subpart S of this part.

27. Section 86.129–94 is amended by revising paragraph (a) to read as follows:

§ 86.129–94 Road load power, test weight, inertia weight class determination, and fuel temperature profile.

* * * * *

(a) Flywheels, electrical, or other means of simulating test weight as shown in the following table shall be used. If the equivalent test weight specified is not available on the dynamometer being used, the next higher equivalent test weight (not to exceed 250 pounds) available shall be used:

Road load power at 50 mi/hour—light duty trucks [1 2 3]	Test weight basis [4 5]	Test equivalent test weight (pounds)	Inertia weight class (pounds)
	Up to 1062	1,000	1,000
	1063 to 1187	1,125	1,000
	1188 to 1312	1,250	1,250
	1313 to 1437	1,375	1,250
	1438 to 1562	1,500	1,500
	1563 to 1687	1,625	1,500
	1688 to 1812	1,750	1,750
	1813 to 1937	1,875	1,750
	1938 to 2062	2,000	2,000
	2063 to 2187	2,125	2,000
	2188 to 2312	2,250	2,250
	2313 to 2437	2,375	2,250
	2438 to 2562	2,500	2,500
	2563 to 2687	2,625	2,500
	2688 to 2812	2,750	2,750
	2813 to 2937	2,875	2,750
	2938 to 3062	3,000	3,000
	3063 to 3187	3,125	3,000
	3188 to 3312	3,250	3,000
	3313 to 3437	3,375	3,500
	3438 to 3562	3,500	3,500
	3563 to 3687	3,625	3,500
	3688 to 3812	3,750	3,500
	3813 to 3937	3,875	4,000
	3938 to 4125	4,000	4,000
	4126 to 4375	4,250	4,000
	4376 to 4625	4,500	4,500
	4626 to 4875	4,750	4,500
	4876 to 5125	5,000	5,000
	5126 to 5375	5,250	5,000
	5376 to 5750	5,500	5,500
	5751 to 6250	6,000	6,000
	6251 to 6750	6,500	6,500
	6751 to 7250	7,000	7,000
	7251 to 7750	7,500	7,500
	7751 to 8250	8,000	8,000
	8251 to 8750	8,500	8,500
	8751 to 9250	9,000	9,000
	9251 to 9750	9,500	9,500
	9751 to 10250	10,000	10,000
	10251 to 10750	10,500	10,500
	10751 to 11250	11,000	11,000
	11251 to 11750	11,500	11,500
	11751 to 12250	12,000	12,000
	12251 to 12750	12,500	12,500
	12751 to 13250	13,000	13,000
	13251 to 13750	13,500	13,500

Road load power at 50 mi/hour—light duty trucks [1 2 3]	Test weight basis [4 5]	Test equivalent test weight (pounds)	Inertia weight class (pounds)
	13751 to 14000	14,000	14,000

[1] For all light-duty trucks except vans, and for heavy-duty vehicles optionally certified as light-duty trucks, and for complete heavy-duty vehicles, the road load power (horsepower) at 50 mi/h shall be 0.58 times B (defined in footnote 3 of this table) rounded to the nearest ½ horsepower.
[2] For vans, the road load power at 50 mi/h (horsepower) shall be 0.50 times B (defined in footnote 3 of this table) rounded to the nearest ½ horsepower.
[3] B is the basic vehicle frontal area (square foot) plus the additional frontal area (square foot) of mirrors and optional equipment exceeding 0.1 ft^2 which are anticipated to be sold on more than 33 percent of the car line. Frontal area measurements shall be computed to the nearest 10th of a square foot using a method approved in advance by the Administrator.
[4] For model year 1994 and later heavy light-duty trucks not subject to the Tier 0 standards of § 86.094–9, test weight basis is as follows: for emissions tests, the basis shall be adjusted loaded vehicle weight, as defined in § 86.094–2; and for fuel economy tests, the basis shall be loaded vehicle weight, as defined in § 86.082–2, or, at the manufacturer's option, adjusted loaded vehicle weight as defined in § 86.094–2. For all other vehicles, test weight basis shall be loaded vehicle weight, as defined in § 86.082–2.
[5] Light-duty vehicles over 5,750 lb. loaded vehicle weight shall be tested at a 5,500 lb. equivalent test weight.

* * * * *

Subpart H—[Amended]

28. Section 86.701–94 is revised to read as follows:

§ 86.701–94 General applicability.

(a) The provisions of this subpart apply to: 1994 and later model year Otto-cycle and diesel light-duty vehicles; 1994 and later model year Otto-cycle and diesel light-duty trucks; and 1994 and later model year Otto-cycle and diesel heavy-duty engines; and 2001 and later model year Otto-cycle heavy-duty vehicles and engines certified under the provisions of subpart S of this part. The provisions of subpart B of this part apply to this subpart.

(b) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and Otto-cycle heavy-duty vehicles and engines under the provisions of subpart S of this part.

Subpart K—[Amended]

29. Section 86.1001–84 is amended by revising paragraph (b), to read as follows:

§ 86.1001–84 Applicability.

* * * * *

(b) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and Otto-cycle complete heavy-duty vehicles under the provisions of subpart S of this part.

30. A new § 86.1008–2004 is added to subpart K, to read as follows:

§ 86.1008–2004 Test procedures.

Section 86.1008–2004 includes text that specifies requirements that differ from § 86.1008–2001. Where a paragraph in § 86.1008–2001 is identical and applicable to § 86.1008–2004, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.1008–2001.''.

(a)(1)(i) For heavy-duty engines, the prescribed test procedure is the Federal Test Procedure as described in subparts N, I, and P of this part, except that 2004 and later model year engines shall not be subject to the test procedures specified in § 86.1380, and 2007 and later model year engines shall not be subject to the test procedures specified in §§ 86.1360(b)(2), 86.1360(f), 86.1370, and 86.1372. The Administrator may, on the basis of a written application by a manufacturer, approve optional test procedures other than those in subparts N, I, and P of this part for any heavy-duty vehicle which is not susceptible to satisfactory testing using the procedures in subparts N, I, and P of this part.

(a)(1)(ii) through (i) [Reserved]. For guidance see § 86.1008–2001.

Subpart L—[Amended]

31. Section 86.1101–87 is revised to read as follows:

§ 86.1101–87 Applicability.

(a) The provisions of this subpart are applicable for 1987 and later model year gasoline-fueled and diesel heavy-duty engines and heavy-duty vehicles. These vehicles include light-duty trucks rated in excess of 6,000 pounds gross vehicle weight.

(b) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty trucks and Otto-cycle complete heavy-duty vehicles under the provisions of subpart S of this part.

Subpart M—[Amended]

32. Section 86.1206–96 is amended by revising the last sentence of paragraph (b), to read as follows:

§ 86.1206–96 Equipment required; overview.

* * * * *

(b) * * * The driving cycle is specified in § 86.1215.

33. Section 86.1215–85 is amended by redesignating paragraph (a) as paragraph (a)(1) and adding a new paragraph (a)(2), to read as follows:

§ 86.1215–85 EPA heavy-duty vehicle (HDV) urban dynamometer driving schedule.

(a)(1) * * *

(2) For evaporative emission testing of heavy-duty vehicles a manufacturer may optionally use the dynamometer driving schedule for light-duty vehicles and light-duty trucks specified in appendix I(a) of this part. This driving schedule may not be used for exhaust emissions testing of heavy-duty vehicles. If the manufacturer chooses to use this option, the Administrator will use this driving schedule when conducting evaporative emission tests, as described in § 86.1230–96.

* * * * *

34. Section 86.1229–85 is amended by revising paragraph (d)(5)(vi), to read as follows:

§ 86.1229–85 Dynamometer load determination and fuel temperature profile.

* * * * *

(d) * * *

(5) * * *

(vi) Time of initiation of the first driving cycle;

* * * * *

35. Section 86.1232–96 is amended by revising the third sentence in paragraph (c), to read as follows:

§ 86.1232–96 Vehicle preconditioning.

* * * * *

(c) * * * Following this soak period, the test vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one driving schedule, specified in § 86.1215 and appendix I of this part. * * *

* * * * *

36. Section 86.1234–96 is amended by revising paragraph (b), to read as follows:

§ 86.1234–96 Running loss test.

* * * * *

(b) *Driving schedule.* Conduct the running loss test by operating the test vehicle through three driving schedules (see § 86.1215 and appendix I of this part). Fifteen seconds after the engine starts, place the transmission in gear. Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule. The transmission shall be operated according to the specifications of § 86.1228 during the driving cycles.

* * * * *

37. Section 86.1235–96 is amended by revising the first sentence of paragraph (a), to read as follows:

§ 86.1235–96 Dynamometer procedure.

* * * * *

(a) The dynamometer run consists of one dynamometer driving schedule cycle (see § 86.1215 and appendix I of this part) starting not less than 12 nor more than 36 hours after completion of the drive specified in § 86.1232–96. * * *

* * * * *

38. Section 86.1246–96 is amended by revising paragraph (e), to read as follows:

§ 86.1246–96 Fuel dispensing spitback procedure.

* * * * *

(e) The vehicle shall be soaked at 80±6 °F (27±3 °C) for a minimum of six hours, then placed, either by being driven or pushed, on a dynamometer and operated through one dynamometer driving schedule (specified in § 86.1215 and appendix I of this part). The test vehicle may not be used to set the dynamometer horsepower.

* * * * *

Subpart N—[Amended]

39. Section 86.1304–90 is revised to read as follows:

§ 86.1304–90 Section numbering; construction.

(a) *Section numbering.* The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is applicable. The section continues to apply to subsequent model years unless a later model year section is adopted.

Example: Section 86.13xx–2004 applies to the 2004 and subsequent model years. If a § 86.13xx–2007 is promulgated it would apply beginning with the 2007 model year; § 86.13xx–2004 would apply to model years 2004 through 2006.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

40. A new § 86.1305–2004 is added to subpart N, to read as follows:

§ 86.1305–2004 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emissions tests on Otto-cycle and diesel-cycle heavy duty engines. Subpart A of this part sets forth the emission standards and general testing requirements to comply with EPA certification procedures.

(b) This subpart contains five key sets of requirements, as follows: specifications and equipment needs (§§ 86.1306 through 86.1314); calibration methods and frequencies (§§ 86.1316 through 86.1326); test procedures (§§ 86.1327 through 86.1341 and §§ 86.1360 through 86.1380); calculation formulas (§§ 86.1342 and 86.1343); and data requirements (§ 86.1344).

41. A new § 86.1360–2007 is added to subpart N to read as follows:

§ 86.1360–2007 Supplemental steady-state test; test cycle and procedures.

(a) *Applicability.* This section applies to 2007 and later diesel heavy duty engines.

(b) *Test cycle.* (1) The following 13-mode cycle must be followed in dynamometer operation on the test engine:

Mode No.	Engine speed	Percent load	Weighting factor	Mode length (minutes)
1	Idle	NA	0.15	4
2	A	100	0.08	2
3	B	50	0.10	2
4	B	75	0.10	2
5	A	50	0.05	2
6	A	75	0.05	2
7	A	25	0.05	2
8	B	100	0.09	2
9	B	25	0.10	2
10	C	100	0.08	2
11	C	25	0.05	2
12	C	75	0.05	2
13	C	50	0.05	2

(2) In addition to the 13 test points identified in paragraph (b)(1) of this section, EPA may select, and require the manufacturer to conduct the test using, up to 3 additional test points within the control area (as defined in paragraph (d) of this section). EPA will notify the manufacturer of these supplemental test points in writing in a timely manner before the test. Emissions sampling for the additional test modes must include all regulated gaseous pollutants. Particulate matter does not need to be measured.

(c) *Determining engine speeds.* (1) The engine speeds A, B and C, referenced in the table in paragraph (b)(1) of this section, and speeds D and E, referenced in § 86.1380, must be determined as follows:

$$\text{Speed A} = n_{lo} + 0.25 \times (n_{hi} - n_{lo})$$

$$\text{Speed B} = n_{lo} + 0.50 \times (n_{hi} - n_{lo})$$

$$\text{Speed C} = n_{lo} + 0.75 \times (n_{hi} - n_{lo})$$

$$\text{Speed D} = n_{hi}$$

$$\text{Speed E} = n_{lo} + 0.15 \times (n_{hi} - n_{lo})$$

Where:

n_{hi} = High speed as determined by calculating 70% of the maximum power. The highest engine speed where this power value occurs on the power curve is defined as n_{hi}.

n_{lo} = Low speed as determined by calculating 50% of the maximum power. The lowest engine speed where this power value occurs on the power curve is defined as n_{lo}.

Maximum power = the maximum observed power calculated according to the engine mapping procedures defined in § 86.1332.

(d) *Determining the control area.* The control area extends from the engine speed A to C, as defined in paragraph (c) of this section, and extends from 25 to 100 percent load.

(e) *Test requirements*—(1) *Engine warm-up.* Prior to beginning the test sequence, the engine must be warmed-up according to the procedures in § 86.1332–90(d)(3)(i) through (iv).

(2) *Test sequence.* The test must be performed in the order of the mode numbers in paragraph (b)(1) of this section. The EPA-selected test points identified under paragraph (b)(2) of this section must be performed immediately upon completion of mode 13. The engine must be operated for the prescribed time in each mode, completing engine speed and load changes in the first 20 seconds of each mode. The specified speed must be held to within <plus-minus>50 rpm and the specified torque must be held to within plus or minus two percent of the maximum torque at the test speed.

(3) *Particulate sampling.* One pair of filters (primary and back-up) shall be used for sampling PM over the 13-mode test procedure. The modal weighting factors specified in paragraph (b)(1) of this section shall be taken into account by taking a sample proportional to the exhaust mass flow during each individual mode of the cycle. This can be achieved by adjusting sample flow rate, sampling time, and/or dilution ratio, accordingly, so that the criterion for the effective weighting factors is met. The sampling time per mode must be at least 4 seconds per 0.01 weighting factor. Sampling must be conducted as late as possible within each mode. Particulate sampling shall be completed no earlier than 5 seconds before the end of each mode.

(4) The test must be conducted with all emission-related engine control variables in the highest brake-specific NO_X emissions state which could be encountered for a 30 second or longer averaging period at the given test point and for the conditions under which the engine is being tested.

(5) *Exhaust emissions measurements and calculations.* Manufacturers must follow the exhaust emissions sample analysis procedures under § 86.1340, and the calculation formulas and procedures under § 86.1342, for the 13-mode cycle and the 3 EPA-selected test points as applicable for steady-state testing, including the NO_X correction factor for humidity.

(6) *Calculating the weighted average emissions.* (i) For each regulated gaseous pollutant, the weighted average emissions must be calculated as follows:

$$A_{WA} = \frac{\sum_{i=1}^{n}\left[A_{Mi} \times WF_i\right]}{\sum_{i=2}^{n}\left[A_{Pi} \times WF_i\right]}$$

Where:

A_{WA} = Weighted average emissions for each regulated gaseous pollutant, in grams per brake horse-power hour.

A_M = Modal average mass emissions level, in grams per hour. Mass emissions must be calculated as described in § 86.1342.

A_P = Modal average power, in brake horse-power. Any power measured during the idle mode (mode 1) is not included in this calculation.

W_F = Weighting factor corresponding to each mode of the steady-state test cycle, as defined in paragraph (b)(1) of this section.

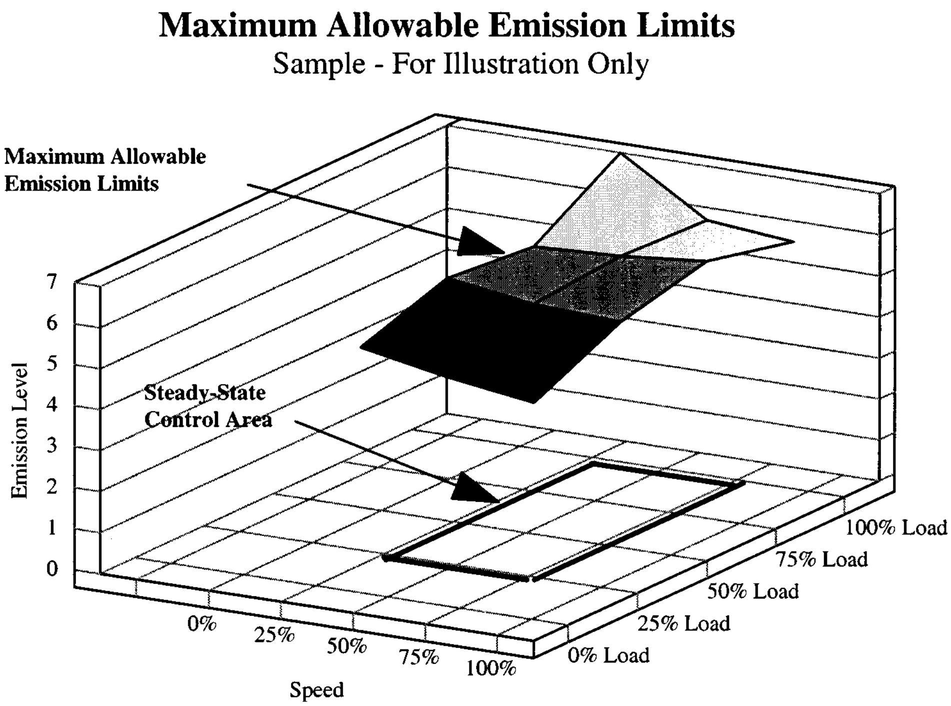
i = The modes of the steady-state test cycle, as defined in paragraph (b)(1) of this section.

n = 13, corresponding to the 13 modes of the steady-state test cycle, as defined in paragraph (b)(1) of this section.

(ii) For PM measurements, a single pair of filters must be used to measure PM over the 13 modes. The brake-specific PM emission level for the test must be calculated as described for a transient hot start test in § 86.1343. Only the power measured during the sampling period shall be used in the calculation.

(f) *Maximum allowable emission limits.* (1) For gaseous emissions, the 12 non-idle test point results and the four-point linear interpolation procedure specified in paragraph (g) of this section for intermediate conditions, shall define Maximum Allowable Emission Limits for purposes of § 86.007–11(a)(3) except as modified under paragraph (f)(3) of this section. Each engine shall have it's own Maximum Allowable Emission Limits generated from the 12 non-idle supplemental steady state test points from that engine. The control area extends from the 25% to the 75% engine speeds, at engine loads of 25% to 100%, as defined in paragraph (d) of this section. Figure 1 of this paragraph (f)(1) depicts a sample Maximum Allowable Emission Limit curve, for illustration purposes only, as follows:

Figure 1



(2) If the weighted average emissions, calculated according to paragraph (e)(6) of this section, for any gaseous pollutant is equal to or lower than required by § 86.007–11(a)(3), each of the 13 test values for that pollutant shall first be multiplied by the ratio of the applicable emission standard (under § 86.007–11(a)(3)) to the weighted average emissions value, and then by 1.10 for interpolation allowance, before determining the Maximum Allowable Emission Limits under paragraph (f)(1) of this section.

(3) If the Maximum Allowable Emission Limit for any point, as calculated under paragraphs (f)(1) and (2) of this section, is greater than the applicable Not-to-Exceed limit (if within the Not-to-Exceed control area defined in § 86.1370–2007(b)), then the Maximum Allowable Emission Limit for that point shall be defined as the applicable Not-to-Exceed limit.

(g) *Calculating intermediate test points.* (1) For the three test points selected by EPA under paragraph (b)(2) of this section, the emissions must be measured and calculated as described in paragraph (e)(6)(i) of this section (except that n = 1 and WF = 1). The measured values then must be compared to the interpolated values according to paragraph (g)(3) of this section. The interpolated values are determined from the modes of the test cycle closest to the respective test point according to paragraph (g)(2) of this section.

(2) Interpolating emission values from the test cycle. The gaseous emissions for each regulated pollutant for each of the control points (Z) must be interpolated from the four closest modes of the test cycle that envelop the selected control point Z as shown in Figure 2 of this paragraph (g)(2).

(i) For these modes (R, S, T, U), the following definitions apply:

(A) Speed (R) = Speed(T) = n_{RT}.

(B) Speed (S) = Speed(U) = n_{SU}.

(C) Per cent load (R) = Per cent load (S).

(D) Per cent load (T) = Per cent load (U).

(ii) The interpolated value of the brake specific gaseous emissions of the selected control point Z(EZ) must be calculated as follows:

$E_Z = E_{RS} + (E_{TU}-E_{RS}) * (M_Z-M_{RS}) / (M_{TU}-M_{RS})$

$E_{TU} = E_T + (E_U-E_T) * (n_Z-n_{RT}) / (n_{SU}-n_{RT})$

$E_{RS} = E_R + (E_S-E_R) * (n_Z-n_{RT}) / (n_{SU}-n_{RT})$

$M_{TU} = M_T + (M_U-M_T) * (n_Z-n_{RT}) / (n_{SU}-n_{RT})$

$M_{RS} = M_R + (M_S-M_R) * (n_Z-n_{RT}) / (n_{SU}-n_{RT})$

Where:

E_R, E_S, E_T, E_U = for each regulated pollutant, brake specific gaseous emissions of the enveloping modes adjusted according to the factors in(f)(2).

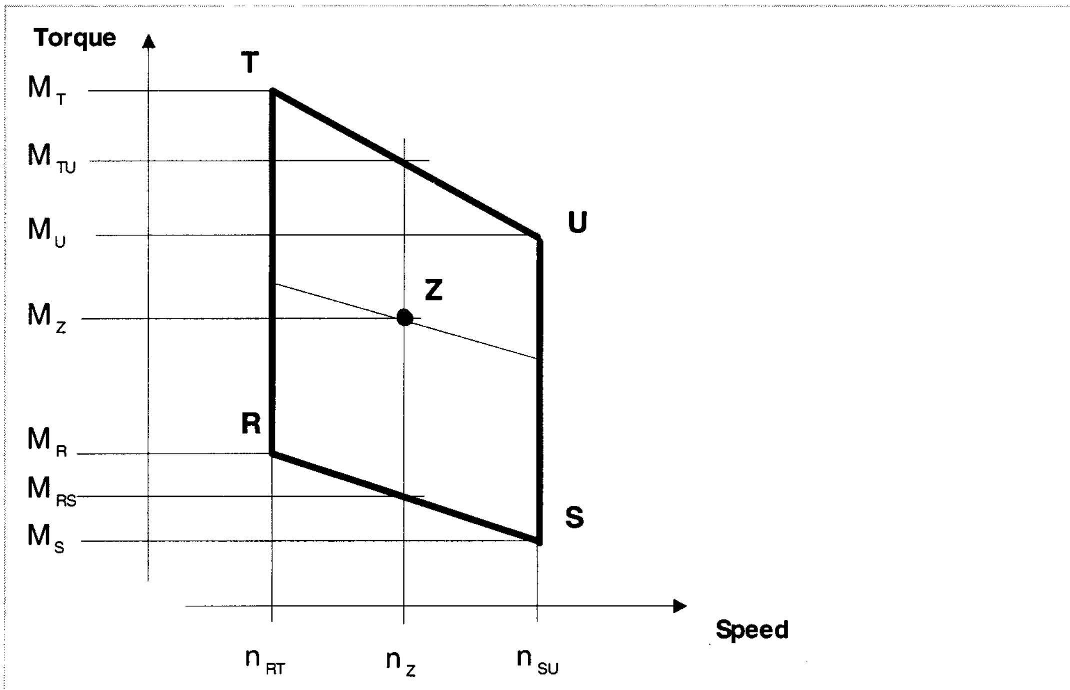
M_R, M_S, M_T, M_U = engine torque of the enveloping modes.

M_Z = engine torque of the selected control point Z.

n_Z = engine speed of the selected control point Z.

(iii) Figure 2 follows:

Figure 2
Four-Point Linear Interpolation



(3) *Comparing calculated and interpolated emission values.* The measured brake specific gaseous emissions of the control point Z (X_Z) must be less than or equal to the interpolated value (E_Z).

(h) *Test fuel specifications.* The test fuel used for supplemental steady-state testing under this section must meet the requirements of § 86.1313.

(i) *General requirements.* Ambient conditions, charge cooling specifications, and intake and exhaust restrictions for supplemental steady-state testing and maximum allowable emission limit testing under this section must meet the requirements of § 86.1330.

42. A new § 86.1370–2007 is added to subpart N, to read as follows:

§ 86.1370–2007 Not-To-Exceed test procedures.

(a) *General.* The purpose of this test procedure is to measure in-use emissions of heavy-duty diesel engines while operating within a broad range of speed and load points (the Not-To-Exceed Control Area) and under conditions which can reasonably be expected to be encountered in normal vehicle operation and use. Emission results from this test procedure are to be compared to the Not-To-Exceed Limits specified in § 86.007–11 (a)(4).

(b) *Not-to-exceed control area for diesel heavy-duty engines.* The Not-To-Exceed Control Area for diesel heavy-duty engines consists of the following engine speed and load points:

(1) All operating speeds greater than the speed calculated using the following formula, where n_{hi} and n_{lo} are determined according to the provisions in § 86.1360(c):

$$n_{lo}+0.15\times(n_{hi}-n_{lo})$$

(2) All engine load points greater than or equal to 30% or more of the maximum torque value produced by the engine.

(3) Notwithstanding the provisions of paragraphs (b)(1) and (b)(2) of this section, all operating speed and load points with brake specific fuel consumption (BSFC) values within 5% of the minimum BSFC value of the engine. For the purposes of this requirement, BFSC must be calculated under the general test cell conditions specified in § 86.1330. The manufacturer may petition the Administrator at certification to exclude such points if the manufacturer can demonstrate that the engine is not expected to operate at such points in normal vehicle operation and use. Engines equipped with drivelines with multi-speed manual transmissions or automatic transmissions with a finite number of gears are not subject to the requirements of this paragraph (b)(3).

(4) Notwithstanding the provisions of paragraphs (b)(1) through (b)(3) of this section, speed and load points below 30% of the maximum power value produced by the engine shall be excluded from the Not-To-Exceed Control Area for all emissions.

(5) For particulate matter only, speed and load points determined by one of the following methods, whichever is applicable, shall be excluded from the Not-To-Exceed Control Area. B and C engine speeds shall be determined according to the provisions of § 86.1360 (c):

(i) If the C speed is below 2400 rpm, the speed and load points to the right of or below the line formed by connecting the following two points:

(A) 30% of maximum torque or 30% of maximum power, whichever is greater, at the B speed;

(B) 70% of maximum power at 100% speed (n_{hi});

(ii) If the C speed is above 2400 rpm, the speed and load points to the right of the line formed by connecting the two points in paragraphs (b)(5)(ii)(A) and (B) of this section and below the line formed by connecting the two points in paragraphs (b)(5)(ii)(B) and (C) of this section:

(A) 30% of maximum torque or 30% of maximum power, whichever is greater, at the B speed;

(B) 50% of maximum power at 2400 rpm;

(C) 70% of maximum power at 100% speed (n_{hi}).

(6) For natural gas and other non-diesel fueled diesel cycle engines, the manufacturer may petition the

Administrator at certification to exclude operating points from the Not-to-Exceed Control Area defined in § 86.1370(b)(1) through (5) if the manufacturer can demonstrate that the engine is not expected to operate at such points in normal vehicle operation and use.

(c) [Reserved]

(d) *Not-to-exceed control area limits.* (1) When operated within the Not-To-Exceed Control Area defined in paragraph (b) of this section, diesel engine emissions shall not exceed the applicable Not-To-Exceed Limits specified in § 86.007–11(a)(4) when averaged over any period of time greater than or equal to 30 seconds.

(2) [Reserved]

(e) *Ambient corrections.* The measured data shall be corrected based on the ambient conditions under which it was taken, as specified in this section.

(1) For engines operating within the ambient conditions specified in § 86.007–11(a)(4)(ii)(a):

(i) NO_X emissions shall be corrected for ambient air humidity to a standard humidity level of 50 grains (7.14 g/kg) if the humidity of the intake air was below 50 grains, or to 75 grains (10.71 g/kg) if above 75 grains.

(ii) NO_X and PM emissions shall be corrected for ambient air temperature to a temperature of 55 degrees F (12.8 degrees C) for ambient air temperatures below 55 degrees F or to 95 degrees F (35.0 degrees C) if the ambient air temperature is above 95 degrees F.

(iii) No ambient air temperature or humidity correction factors shall be used within the ranges of 50–75 grains or 55–95 degrees F.

(iv) Where test conditions require such correction factors, the manufacturer must use good engineering judgement and generally accepted engineering practice to determine the appropriate correction factors, subject to EPA review.

(2) For engines operating within the ambient conditions specified in § 86.007–11(a)(4)(ii)(b):

(i) NO_X emissions shall be corrected for ambient air humidity to a standard humidity level of 50 grains (7.14 g/kg) if the humidity of the intake air was below 50 grains, or to 75 grains (10.71 g/kg) if above 75 grains.

(ii) NO_X and PM emissions shall be corrected for ambient air temperature to a temperature of 55 degrees F (12.8 degrees C) for ambient air temperatures below 55 degrees F.

(iii) No ambient air temperature or humidity correction factors shall be used within the ranges of 50–75 grains or for temperatures greater than or equal to 55 degrees F.

(iv) Where test conditions require such correction factors, the manufacturer must use good engineering judgement and generally accepted engineering practice to determine the appropriate correction factors, subject to EPA review.

(f) *NTE cold temperature operating exclusion.* Engines equipped with exhaust gas recirculation (EGR) whose operation within the NTE control area specified in § 86.1370(b) when operating during cold temperature conditions as specified in paragraph (f)(1) of this section are not subject to the NTE emission limits during the specified cold temperature operation conditions.

(1) Cold temperature operation is defined as engine operating conditions meeting either of the following two criteria:

(i) Intake manifold temperature (IMT) less than or equal to the temperature defined by the following relationship between IMT and absolute intake manifold pressure (IMP) for the corresponding IMP:

$$P = 0.0875 \times IMT - 7.75 \quad \text{Equation (1)}$$

Where:

P = absolute intake manifold pressure in bars.

IMT = intake manifold temperature in degrees Fahrenheit.

(ii) Engine coolant temperature (ECT) less than or equal to the temperature defined by the following relationship between ECT and absolute intake manifold pressure (IMP) for the corresponding IMP:

$$P = 0.0778 \times ECT - 9.8889 \quad \text{Equation (2)}$$

Where:

P = absolute intake manifold pressure in bars.

ECT = engine coolant temperature in degrees Fahrenheit.

(2) [Reserved]

43. A new § 86.1372–2007 is added to subpart N, to read as follows:

§ 86.1372–2007 Measuring smoke emissions within the NTE zone.

This section contains the measurement techniques to be used for determining compliance with the filter smoke limit or opacity limits in § 86.007–11(b)(1)(iv).

(a) For steady-state or transient smoke testing using full-flow opacimeters, equipment meeting the requirements of subpart I of this part or ISO/DIS–11614 ''Reciprocating internal combustion compression-ignition engines—Apparatus for measurement of the opacity and for determination of the light absorption coefficient of exhaust gas'' is required. This document is incorporated by reference (see § 86.1).

(1) All full-flow opacimeter measurements shall be reported as the equivalent percent opacity for a five inch effective optical path length using the Beer-Lambert relationship.

(2) Zero and full-scale (100 percent opacity) span shall be adjusted prior to testing.

(3) Post test zero and full scale span checks shall be performed. For valid tests, zero and span drift between the pre-test and post-test checks shall be less than two percent of full-scale.

(4) Opacimeter calibration and linearity checks shall be performed using manufacturer's recommendations or good engineering practice.

(b) For steady-state testing using a filter-type smokemeter, equipment meeting the requirements of ISO/FDIS–10054 ''Internal combustion compression-ignition engines—Measurement apparatus for smoke from engines operating under steady-state conditions—Filter-type smokemeter'' is recommended. Other equipment may be used provided it is approved in advance by the Administrator.

(1) All filter-type smokemeter results shall be reported as a filter smoke number (FSN) that is similar to the Bosch smoke number (BSN) scale.

(2) Filter-type smokemeters shall be calibrated every 90 days using manufacturer's recommended practices or good engineering practice.

(c) For steady-state testing using a partial-flow opacimeter, equipment meeting the requirements of ISO–8178–3 and ISO/DIS–11614 is recommended. Other equipment may be used provided it is approved in advance by the Administrator.

(1) All partial-flow opacimeter measurements shall be reported as the equivalent percent opacity for a five inch effective optical path length using the Beer-Lambert relationship.

(2) Zero and full scale (100 percent opacity) span shall be adjusted prior to testing.

(3) Post-test zero and full scale span checks shall be performed. For valid tests, zero and span drift between the pre-test and post-test checks shall be less than two percent of full scale.

(4) Opacimeter calibration and linearity checks shall be performed using manufacturer's recommendations or good engineering practice.

(d) Replicate smoke tests may be run to improve confidence in a single test or stabilization. If replicate tests are run, three additional tests which confirm to this section shall be run, and the final reported test results must be the average of all the valid tests.

(e) A minimum of thirty seconds sampling time shall be used for average transient smoke measurements. The opacity values used for this averaging must be collected at a minimum rate of 1 data point per second, and all data points used in the averaging must be equally spaced in time.

44. A new § 86.1380–2004 is added to subpart N, to read as follows:

§ 86.1380–2004 Load response test.

(a) *General.* This section applies to 2004 through 2007 model year heavy-duty diesel engines. The purpose of this test procedure is to measure the brake-specific gaseous and particulate emissions from a heavy-duty diesel engine as it is suddenly loaded, with its fueling lever, at a given engine operating speed. The results of this test procedure are not compared to emission standards, and this test is not considered part of the Federal Test Procedure. This procedure shall be conducted on a dynamometer.

(b) *Test conditions and equipment.* All laboratory conditions, laboratory equipment, engine set-up procedures, test fuel, and testing conditions specified in this subpart for transient testing shall apply to the Load Response Test where applicable.

(c) *Test sequence.* (1) The test has 5 separate measurement segments, each identified by a specific engine speed. At each of the following speeds, beginning with the lowest torque point at that engine speed within the NTE control area for $NMHC+NO_X$, the engine fuel control shall be moved suddenly to the full fuel position and held at that point for four seconds, while the specified speed is maintained constant within the tolerances of the test facility. After the four second full fuel position, the load should be immediately brought back to the minimum NTE control area load for the specified engine speed for a period of 6 seconds. Prior to the beginning of each measurement segment, the engine shall be warmed up at the supplemental steady-state Mode 4 conditions (75% engine load, Speed B as specified in § 86.1360) until engine oil temperature has stabilized.

(i) Speed A as determined in § 86.1360(c);

(ii) Speed B as determined in § 86.1360(c);

(iii) Speed C as determined in § 86.1360(c);

(iv) Speed D as determined in § 86.1360(c);

(v) Speed E as determined in § 86.1360(c).

(2) The test sequence at each engine speed may be repeated, without pause between repeats, if it is necessary to obtain sufficient particulate matter sample amount for analysis.

(3) The exhaust emissions sample shall be analyzed using the applicable procedures under § 86.1340, and the exhaust emission shall be calculated using the applicable procedures under § 86.1342, for each measurement segment. Sampling rates for engine speed, engine load, and gaseous emissions shall performed a minium rate of 10 Hz. Emissions for all regulated pollutants must be calculated and reported for each test speed condition in terms of g/bhp-hr.

(4) Data must be collected beginning with the start of the transition from the minimum NTE control area load to the full fuel position. Data must be collected until the end of the (final if repeated) 6 second operational period at the minimum NTE control area load described in paragraph (c)(1) of this section. Good engineering practice must be used to ensure that the sampling time is properly aligned with the engine operation.

Subpart P—[Amended]

45. Section 86.1501–94 is revised to read as follows:

§ 86.1501–94 Scope; applicability.

(a) This subpart contains gaseous emission idle test procedures for light-duty trucks and heavy-duty engines for which idle CO standards apply. It applies to 1994 and later model years. The idle test procedures are optionally applicable to 1994 through 1996 model year natural gas-fueled and liquified petroleum gas-fueled light-duty trucks and heavy-duty engines.

(b) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty trucks and Otto-cycle complete heavy-duty vehicles under the provisions of subpart S of this part.

Subpart Q—[Amended]

46. Section 86.1601 is amended by revising paragraph (d), to read as follows:

§ 86.1601 General applicability.

* * * * *

(d) References in this subpart to engine families and emission control systems shall be deemed to apply to durability groups and test groups as applicable for manufacturers certifying new light-duty vehicles, light-duty trucks, and Otto-cycle complete heavy-duty vehicles under the provisions of subpart S of this part.

47. Subpart S is amended by revising the subpart heading to read as follows:

Subpart S—General Compliance Provisions for Control of Air Pollution From New and In-Use Light-Duty Vehicles, Light-Duty Trucks, and Complete Otto-Cycle Heavy-Duty Vehicles

47. Section 86.1801–01 is amended by revising paragraphs (a), (b), (c), the last sentence of paragraph (d), and paragraph (h), to read as follows:

§ 86.1801–01 Applicability.

(a) *Applicability.* Except as otherwise indicated, the provisions of this subpart apply to new 2001 and later model year Otto-cycle and diesel cycle light-duty vehicles, light-duty trucks, medium-duty passenger vehicles, and 2005 and later model year Otto-cycle complete heavy-duty vehicles (2003 or 2004 model year for manufacturers choosing Otto-cycle HDE option 1 or 2, respectively, in § 86.005–1(c)) including multi-fueled, alternative fueled, hybrid electric, and zero emission vehicles. These provisions also apply to 2001 model year and later new incomplete light-duty trucks below 8,500 Gross Vehicle Weight Rating, and to 2001 and later model year Otto-cycle complete heavy-duty vehicles participating in the provisions of the averaging, trading, and banking program under the provisions of § 86.1817–05(n). In cases where a provision applies only to a certain vehicle group based on its model year, vehicle class, motor fuel, engine type, or other distinguishing characteristics, the limited applicability is cited in the appropriate section of this subpart.

(b) *Aftermarket conversions.* The provisions of this subpart apply to aftermarket conversions of all model year Otto-cycle and diesel-cycle light-duty vehicles, light-duty trucks, and complete Otto-cycle heavy-duty vehicles as defined in 40 CFR 85.502.

(c) *Optional applicability.* (1) A manufacturer may request to certify any Otto-cycle heavy-duty vehicle of 14,000 pounds Gross Vehicle Weight Rating or less in accordance with the light-duty truck provisions through the 2004 model year (2002 model year for manufacturers choosing Otto-cycle HDE option 1 in § 86.005–1(c) or 2003 model year for manufacturers choosing Otto-cycle HDE option 2 in § 86.005–1(c)). Heavy-duty engine or heavy-duty vehicle provisions of subpart A of this part do not apply to such a vehicle. A 2004 model year heavy-duty vehicle optionally certified as a light-duty truck under this provision must comply with all provisions applicable to MDPVs including exhaust and evaporative emission standards, test procedures, on-board diagnostics, refueling standards, phase-in requirements and fleet average standards under 40 CFR part 85 and this part.

(2) Beginning with the 2001 model year, a manufacturer may request to certify any incomplete Otto-cycle heavy-duty vehicle of 14,000 pounds Gross Vehicle Weight Rating or less in accordance with the provisions for complete heavy-duty vehicles. Heavy-duty engine or heavy-duty vehicle provisions of subpart A of this part do not apply to such a vehicle.

(3) A manufacturer may optionally use the provisions of this subpart in lieu of the provisions of subpart A beginning with the 2000 model year for light-duty vehicles and light-duty trucks. Manufacturers choosing this option must comply with all provisions of this subpart. Manufacturers may elect this provision for either all or a portion of their product line.

(4) Upon preapproval by the Administrator, a manufacturer may optionally certify an aftermarket conversion of a complete heavy-duty vehicle greater than 10,000 pounds Gross Vehicle Weight Rating and of 14,000 pounds Gross Vehicle Weight Rating or less under the heavy-duty engine or heavy-duty vehicle provisions of subpart A of this part. Such preapproval will be granted only upon demonstration that chassis-based certification would be infeasible or unreasonable for the manufacturer to perform.

(5) A manufacturer may optionally certify an aftermarket conversion of a complete heavy-duty vehicle greater than 10,000 pounds Gross Vehicle Weight Rating and of 14,000 pounds Gross Vehicle Weight Rating or less under the heavy-duty engine or heavy-duty vehicle provisions of subpart A of this part without advance approval from the Administrator if the vehicle was originally certified to the heavy-duty engine or heavy-duty vehicle provisions of subpart A of this part.

(d) * * * The small volume manufacturer's light-duty vehicle, light-duty truck and complete heavy-duty vehicle certification procedures are described in § 86.1838–01.

* * * * *

(h) *Applicability of provisions of this subpart to LDVs, LDTs, MDPVs and HDVs.* Numerous sections in this subpart provide requirements or procedures applicable to a ''vehicle'' or ''vehicles.'' Unless otherwise specified or otherwise determined by the Administrator, the term ''vehicle'' or ''vehicles'' in those provisions apply equally to LDVs, LDTs, MDPVs and HDVs.

48. Section 86.1803–01 is amended by revising the definitions for ''Car line,'' ''Curb-idle,'' ''Durability useful life,'' and ''Van,'' and by adding new definitions in alphabetical order, to read as follows:

§ 86.1803–01 Definitions.

* * * * *

Averaging for chassis-bases heavy-duty vehicles means the exchange of NO_X emission credits among test groups within a given manufacturer's product line.

Averaging set means a subcategory of complete heavy-duty vehicles within which test groups can average and trade emission credits with one another.

* * * * *

Banking means the retention of NO_X emission credits for complete heavy-duty vehicles by the manufacturer generating the emission credits, for use in future model year certification programs as permitted by regulation.

* * * * *

Car line means a name denoting a group of vehicles within a make or car division which has a degree of commonality in construction (*e.g.*, body, chassis). Car line does not consider any level of decor or opulence and is not generally distinguished by characteristics as roofline, number of doors, seats, or windows except for station wagons or light-duty trucks. Station wagons, light-duty trucks, and complete heavy-duty vehicles are considered to be different car lines than passenger cars.

* * * * *

Complete heavy-duty vehicle means any Otto-cycle heavy-duty vehicle of 14,000 pounds Gross Vehicle Weight Rating or less that has the primary load carrying device or container attached at the time the vehicle leaves the control of the manufacturer of the engine.

* * * * *

Curb-idle means, for manual transmission code motor vehicles, the engine speed with the transmission in neutral or with the clutch disengaged and with the air conditioning system, if present, turned off. For automatic transmission code motor vehicles, curb-idle means the engine speed with the automatic transmission in the park position (or neutral position if there is no park position), and with the air conditioning system, if present, turned off.

* * * * *

Durability useful life means the highest useful life mileage out of the set of all useful life mileages that apply to a given vehicle. The durability useful life determines the duration of service accumulation on a durability data vehicle. The determination of durability useful life shall reflect any light-duty truck or complete heavy-duty vehicle alternative useful life periods approved by the Administrator under § 86.1805–01(c). The determination of durability useful life shall exclude any standard and related useful life mileage for which the manufacturer has obtained a waiver of emission data submission requirements under § 86.1829–01.

* * * * *

Emission credits mean the amount of emission reductions or exceedances, by a complete heavy-duty vehicle test group, below or above the emission standard, respectively. Emission credits below the standard are considered as ''positive credits,'' while emission credits above the standard are considered as ''negative credits.'' In addition, ''projected credits'' refer to emission credits based on the projected U.S. production volume of the test group. ''Reserved credits'' are emission credits generated within a model year waiting to be reported to EPA at the end of the model year. ''Actual credits'' refer to emission credits based on actual U.S. production volumes as contained in the end-of-year reports submitted to EPA. Some or all of these credits may be revoked if EPA review of the end of year reports or any subsequent audit actions uncover problems or errors.

* * * * *

Family emission limit (FEL) means an emission level declared by the manufacturer which serves in lieu of an emission standard for certification purposes in the averaging, trading and banking program. FELs must be expressed to the same number of decimal places as the applicable emission standard.

* * * * *

Incomplete heavy-duty vehicle means any heavy-duty vehicle which does not have the primary load carrying device or container attached.

* * * * *

Trading means the exchange of complete heavy-duty vehicle NO_X emission credits between manufacturers.

* * * * *

Van means a light-duty truck or complete heavy-duty vehicle having an integral enclosure, fully enclosing the driver compartment and load carrying device, and having no body sections protruding more than 30 inches ahead of the leading edge of the windshield.

* * * * *

49. Section 86.1804–01 is amended by adding ''FEL'' and ''HDV'' as new abbreviations in alphabetical order, to read as follows:

§ 86.1804–01 Acronyms and abbreviations.

* * * * *

FEL—Family Emission Limit.

* * * * *

HDV—Heavy-duty vehicle.

* * * * *

50. Section 86.1805–01 is amended by:

a. Revising paragraph (a).

b. Adding paragraph (b)(3).

c. Revising the first and last sentences of paragraph (c).

The revisions and addition read as follows:

§ 86.1805–01 Useful life.

(a) For light-duty vehicles and light-duty trucks, intermediate useful life is a period of use of 5 years or 50,000 miles, whichever occurs first.

(b) * * *

(3) For complete heavy-duty vehicles, the full useful life is a period of use of 11 years or 120,000 miles, which ever occurs first.

(c) Manufacturers may petition the Administrator to provide alternative useful life periods for light-duty trucks or complete heavy-duty vehicles when they believe that the useful life periods are significantly unrepresentative for one or more test groups (either too long or too short). * * * For light-duty trucks, alternative useful life periods will be granted only for THC, THCE, and idle CO requirements.

51. Section 86.1805–04 is amended by revising paragraph (a), to read as follows:

§ 86.1805–04 Useful life.

(a) Except as required under paragraph (b) of this section or permitted under paragraphs (d), (e) and (f) of this section, the full useful life for all LDVs, LDT1s and LDT2s is a period of use of 10 years or 120,000 miles, whichever occurs first. For all HLDTs, MDPVs, and complete heavy-duty vehicles full useful life is a period of 11 years or 120,000 miles, whichever occurs first. This full useful life applies to all exhaust, evaporative and refueling emission requirements except for standards which are specified to only be applicable at the time of certification.

* * * * *

52. A new § 86.1806–05 is added to subpart S, to read as follows:

§ 86.1806–05 On-board diagnostics.

(a) *General.* (1) Except as provided by paragraph (a)(2) of this section, all light-duty vehicles, light-duty trucks and complete heavy-duty vehicles weighing 14,000 pounds GVWR or less (including MDPVs) must be equipped with an onboard diagnostic (OBD) system capable of monitoring all emission-related powertrain systems or components during the applicable useful life of the vehicle. All systems and components required to be monitored by these regulations must be evaluated periodically, but no less frequently than once per applicable certification test cycle as defined in paragraphs (a) and (d) of Appendix I of this part, or similar trip as approved by the Administrator.

(2) Diesel fueled MDPVs and heavy-duty vehicles weighing 14,000 pounds GVWR or less that are not MDPVs must meet the OBD requirements of this section according to the phase-in schedule in paragraph (l) of this section. Paragraph (l) of this section does not apply to Otto-cycle MDPVs.

(3) An OBD system demonstrated to fully meet the requirements in § 86.004–17 may be used to meet the requirements of this section, provided that such an OBD system also incorporates appropriate transmission diagnostics as may be required under this section, and provided that the Administrator finds that a manufacturer's decision to use the flexibility in this paragraph (a)(3) is based on good engineering judgement.

(b) *Malfunction descriptions.* The OBD system must detect and identify malfunctions in all monitored emission-related powertrain systems or components according to the following malfunction definitions as measured and calculated in accordance with test procedures set forth in subpart B of this part (chassis-based test procedures), excluding those test procedures defined as ''Supplemental'' test procedures in § 86.004–2 and codified in §§ 86.158, 86.159, and 86.160.

(1) *Catalysts and particulate traps.* (i) *Otto-cycle.* Catalyst deterioration or malfunction before it results in an increase in NMHC emissions 1.5 times the $NMHC+NO_X$ standard or FEL, as compared to the $NMHC+NO_X$ emission level measured using a representative 4000 mile catalyst system.

(ii) *Diesel.* (A) If equipped, catalyst deterioration or malfunction before it results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for $NMHC+NO_X$ or PM. This requirement applies only to reduction catalysts; monitoring of oxidation catalysts is not required. This monitoring need not be done if the manufacturer can demonstrate that deterioration or malfunction of the system will not result in exceedance of the threshold.

(B) If equipped with a particulate trap, catastrophic failure of the device must be detected. Any particulate trap whose complete failure results in exhaust emissions exceeding 1.5 times the applicable standard or FEL for $NMHC+NO_X$ or PM must be monitored. This monitoring need not be done if the manufacturer can demonstrate that a catastrophic failure of the system will not result in exceedance of the threshold.

(2) *Engine misfire.* (i) *Otto-cycle.* Engine misfire resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NMHC, CO or NO_X; and any misfire capable of damaging the catalytic converter.

(ii) *Diesel.* Lack of cylinder combustion must be detected.

(3) *Oxygen sensors.* If equipped, oxygen sensor deterioration or malfunction resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NMHC, CO or NO_X.

(4) *Evaporative leaks.* If equipped, any vapor leak in the evaporative and/or refueling system (excluding the tubing and connections between the purge valve and the intake manifold) greater than or equal in magnitude to a leak caused by a 0.040 inch diameter orifice; an absence of evaporative purge air flow from the complete evaporative emission control system. On vehicles with fuel tank capacity greater than 25 gallons, the Administrator may, following a request from the manufacturer, revise the size of the orifice to the smallest orifice feasible, based on test data, if the most reliable monitoring method available cannot reliably detect a system leak equal to a 0.040 inch diameter orifice.

(5) *Other emission control systems.* Any deterioration or malfunction occurring in a powertrain system or component directly intended to control emissions, including but not necessarily limited to, the exhaust gas recirculation (EGR) system, if equipped, the secondary air system, if equipped, and the fuel control system, singularly resulting in exhaust emissions exceeding 1.5 times the applicable emission standard or FEL for NMHC, CO, NO_X, or diesel PM. For vehicles equipped with a secondary air system, a functional check, as described in paragraph (b)(6) of this section, may satisfy the requirements of this paragraph provided the manufacturer can demonstrate that deterioration of the flow distribution system is unlikely. This demonstration is subject to Administrator approval and, if the

demonstration and associated functional check are approved, the diagnostic system must indicate a malfunction when some degree of secondary airflow is not detectable in the exhaust system during the check. For vehicles equipped with positive crankcase ventilation (PCV), monitoring of the PCV system is not necessary provided the manufacturer can demonstrate to the Administrator's satisfaction that the PCV system is unlikely to fail.

(6) *Other emission-related powertrain components.* Any other deterioration or malfunction occurring in an electronic emission-related powertrain system or component not otherwise described in paragraphs (b)(1) through (b)(5) of this section that either provides input to or receives commands from the on-board computer and has a measurable impact on emissions; monitoring of components required by this paragraph (b)(6) must be satisfied by employing electrical circuit continuity checks and rationality checks for computer input components (input values within manufacturer specified ranges based on other available operating parameters), and functionality checks for computer output components (proper functional response to computer commands) except that the Administrator may waive such a rationality or functionality check where the manufacturer has demonstrated infeasibility. Malfunctions are defined as a failure of the system or component to meet the electrical circuit continuity checks or the rationality or functionality checks.

(7) *Performance of OBD functions.* Oxygen sensor or any other component deterioration or malfunction which renders that sensor or component incapable of performing its function as part of the OBD system must be detected and identified on vehicles so equipped.

(8) *Hybrid electric vehicles.* For Tier 2 and interim non-Tier 2 hybrid electric vehicles (HEVs) only. Unless added to HEVs in compliance with other requirements of this section, or unless otherwise approved by the Administrator:

(i) The manufacturer must equip each HEV with a maintenance indicator consisting of a light that must activate automatically by illuminating the first time the minimum performance level is observed for each battery system component. Possible battery system components requiring monitoring are: battery water level, temperature control, pressure control, and other parameters critical for determining battery condition.

(ii) The manufacturer must equip ''off-vehicle charge capable HEVs'' with a useful life indicator for the battery system consisting of a light that must illuminate the first time the battery system is unable to achieve an all-electric operating range (starting from a full state-of-charge) which is at least 75 percent of the range determined for the vehicle in the Urban Driving Schedule portion of the All-Electric Range Test (see the California Exhaust Emission Standards and Test Procedures for 2003 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes. These requirements are incorporated by reference (see § 86.1).

(iii) The manufacturer must equip each HEV with a separate odometer or other device subject to the approval of the Administrator that can accurately measure the mileage accumulation on the engines used in these vehicles.

(c) *Malfunction indicator light (MIL).* The OBD system must incorporate a malfunction indicator light (MIL) readily visible to the vehicle operator. When illuminated, the MIL must display ''Check Engine,'' ''Service Engine Soon,'' a universally recognizable engine symbol, or a similar phrase or symbol approved by the Administrator. A vehicle should not be equipped with more than one general purpose malfunction indicator light for emission-related problems; separate specific purpose warning lights (e.g. brake system, fasten seat belt, oil pressure, etc.) are permitted. The use of red for the OBD-related malfunction indicator light is prohibited.

(d) *MIL illumination.* (1) The MIL must illuminate and remain illuminated when any of the conditions specified in paragraph (b) of this section are detected and verified, or whenever the engine control enters a default or secondary mode of operation considered abnormal for the given engine operating conditions. The MIL must blink once per second under any period of operation during which engine misfire is occurring and catalyst damage is imminent. If such misfire is detected again during the following driving cycle (*i.e.,* operation consisting of, at a minimum, engine start-up and engine shut-off) or the next driving cycle in which similar conditions are encountered, the MIL must maintain a steady illumination when the misfire is not occurring and then remain illuminated until the MIL extinguishing criteria of this section are satisfied. The MIL must also illuminate when the vehicle's ignition is in the ''key-on'' position before engine starting or cranking and extinguish after engine starting if no malfunction has previously been detected. If a fuel system or engine misfire malfunction has previously been detected, the MIL may be extinguished if the malfunction does not reoccur during three subsequent sequential trips during which similar conditions are encountered and no new malfunctions have been detected. Similar conditions are defined as engine speed within 375 rpm, engine load within 20 percent, and engine warm-up status equivalent to that under which the malfunction was first detected. If any malfunction other than a fuel system or engine misfire malfunction has been detected, the MIL may be extinguished if the malfunction does not reoccur during three subsequent sequential trips during which the monitoring system responsible for illuminating the MIL functions without detecting the malfunction, and no new malfunctions have been detected. Upon Administrator approval, statistical MIL illumination protocols may be employed, provided they result in comparable timeliness in detecting a malfunction and evaluating system performance, i.e., three to six driving cycles would be considered acceptable.

(2)(i) For interim non-Tier 2 and Tier 2 LDV/LLDTs and HLDT/MDPVs, vehicles produced through the 2007 model year, upon a manufacturer's written request, EPA will consider allowing the use of an on-board diagnostic system during the certification process, that functions properly on low-sulfur gasoline, but indicates sulfur-induced passes when exposed to high sulfur gasoline.

(ii) For interim non-Tier 2 and Tier 2 LDV/LLDTs and HLDT/MDPVs, if vehicles produced through the 2007 model year exhibit illuminations of the emission control diagnostic system malfunction indicator light due to high sulfur gasoline, EPA will consider, upon a manufacturer's written request, allowing modifications to such vehicles on a case-by-case basis so as to eliminate the sulfur induced illumination.

(e) *Storing of computer codes.* The OBD system shall record and store in computer memory diagnostic trouble codes and diagnostic readiness codes indicating the status of the emission control system. These codes shall be available through the standardized data link connector per specifications as referenced in paragraph (h) of this section.

(1) A diagnostic trouble code must be stored for any detected and verified malfunction causing MIL illumination. The stored diagnostic trouble code must identify the malfunctioning system or

component as uniquely as possible. At the manufacturer's discretion, a diagnostic trouble code may be stored for conditions not causing MIL illumination. Regardless, a separate code should be stored indicating the expected MIL illumination status (*i.e.,* MIL commanded ''ON,'' MIL commanded ''OFF'').

(2) For a single misfiring cylinder, the diagnostic trouble code(s) must uniquely identify the cylinder, unless the manufacturer submits data and/or engineering evaluations which adequately demonstrate that the misfiring cylinder cannot be reliably identified under certain operating conditions. For diesel vehicles only, the specific cylinder for which combustion cannot be detected need not be identified if new hardware would be required to do so. The diagnostic trouble code must identify multiple misfiring cylinder conditions; under multiple misfire conditions, the misfiring cylinders need not be uniquely identified if a distinct multiple misfire diagnostic trouble code is stored.

(3) The diagnostic system may erase a diagnostic trouble code if the same code is not re-registered in at least 40 engine warm-up cycles, and the malfunction indicator light is not illuminated for that code.

(4) Separate status codes, or readiness codes, must be stored in computer memory to identify correctly functioning emission control systems and those emission control systems which require further vehicle operation to complete proper diagnostic evaluation. A readiness code need not be stored for those monitors that can be considered continuously operating monitors (*e.g.,* misfire monitor, fuel system monitor, etc.). Readiness codes should never be set to ''not ready'' status upon key-on or key-off; intentional setting of readiness codes to ''not ready'' status via service procedures must apply to all such codes, rather than applying to individual codes. Subject to Administrator approval, if monitoring is disabled for a multiple number of driving cycles (*i.e.,* more than one) due to the continued presence of extreme operating conditions (*e.g.,* ambient temperatures below 40 °F, or altitudes above 8000 feet), readiness for the subject monitoring system may be set to ''ready'' status without monitoring having been completed. Administrator approval shall be based on the conditions for monitoring system disablement, and the number of driving cycles specified without completion of monitoring before readiness is indicated.

(f) *Available diagnostic data.* (1) Upon determination of the first malfunction of any component or system, ''freeze frame'' engine conditions present at the time must be stored in computer memory. Should a subsequent fuel system or misfire malfunction occur, any previously stored freeze frame conditions must be replaced by the fuel system or misfire conditions (whichever occurs first). Stored engine conditions must include, but are not limited to: engine speed, open or closed loop operation, fuel system commands, coolant temperature, calculated load value, fuel pressure, vehicle speed, air flow rate, and intake manifold pressure if the information needed to determine these conditions is available to the computer. For freeze frame storage, the manufacturer must include the most appropriate set of conditions to facilitate effective repairs. If the diagnostic trouble code causing the conditions to be stored is erased in accordance with paragraph (d) of this section, the stored engine conditions may also be erased.

(2) The following data in addition to the required freeze frame information must be made available on demand through the serial port on the standardized data link connector, if the information is available to the on-board computer or can be determined using information available to the on-board computer: Diagnostic trouble codes, engine coolant temperature, fuel control system status (closed loop, open loop, other), fuel trim, ignition timing advance, intake air temperature, manifold air pressure, air flow rate, engine RPM, throttle position sensor output value, secondary air status (upstream, downstream, or atmosphere), calculated load value, vehicle speed, and fuel pressure. The signals must be provided in standard units based on SAE specifications incorporated by reference in paragraph (h) of this section. Actual signals must be clearly identified separately from default value or limp home signals.

(3) For all OBD systems for which specific on-board evaluation tests are conducted (catalyst, oxygen sensor, etc.), the results of the most recent test performed by the vehicle, and the limits to which the system is compared must be available through the standardized data link connector per the appropriate standardized specifications as referenced in paragraph (h) of this section.

(4) Access to the data required to be made available under this section shall be unrestricted and shall not require any access codes or devices that are only available from the manufacturer.

(g) *Exceptions.* The OBD system is not required to evaluate systems or components during malfunction conditions if such evaluation would result in a risk to safety or failure of systems or components. Additionally, the OBD system is not required to evaluate systems or components during operation of a power take-off unit such as a dump bed, snow plow blade, or aerial bucket, etc.

(h) *Reference materials.* The OBD system shall provide for standardized access and conform with the following Society of Automotive Engineers (SAE) standards and/or the following International Standards Organization (ISO) standards. The following documents are incorporated by reference (see § 86.1):

(1) *SAE material.* Copies of these materials may be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096–0001.

(i) SAE J1850 ''Class B Data Communication Network Interface,'' (July 1995) shall be used as the on-board to off-board communications protocol. All emission related messages sent to the scan tool over a J1850 data link shall use the Cyclic Redundancy Check and the three byte header, and shall not use inter-byte separation or checksums.

(ii) Basic diagnostic data (as specified in §§ 86.094–17(e) and (f)) shall be provided in the format and units in SAE J1979 ''E/E Diagnostic Test Modes,''(July 1996).

(iii) Diagnostic trouble codes shall be consistent with SAE J2012 ''Recommended Practices for Diagnostic Trouble Code Definitions,'' (July 1996).

(iv) The connection interface between the OBD system and test equipment and diagnostic tools shall meet the functional requirements of SAE J1962 ''Diagnostic Connector,'' (January 1995).

(v) As an alternative to the above standards, heavy-duty vehicles may conform to the specifications of the SAE J1939 series of standards (SAE J1939–11, J1939–13, J1939–21, J1939–31, J1939–71, J1939–73, J1939–81).

(2) *ISO materials.* Copies of these materials may be obtained from the International Organization for Standardization, Case Postale 56, CH–1211 Geneva 20, Switzerland.

(i) ISO 9141–2 ''Road vehicles—Diagnostic systems—Part 2: CARB requirements for interchange of digital information,'' (February 1994) may be used as an alternative to SAE J1850 as the on-board to off-board communications protocol.

(ii) ISO 14230–4 ''Road vehicles—Diagnostic systems—Keyword Protocol 2000—Part 4: Requirements for emission-related systems'' may also be used as an alternative to SAE J1850.

(i) *Deficiencies and alternate fueled vehicles.* Upon application by the manufacturer, the Administrator may accept an OBD system as compliant even though specific requirements are not fully met. Such compliances without meeting specific requirements, or deficiencies, will be granted only if compliance would be infeasible or unreasonable considering such factors as, but not limited to: Technical feasibility of the given monitor and lead time and production cycles including phase-in or phase-out of engines or vehicle designs and programmed upgrades of computers. Unmet requirements should not be carried over from the previous model year except where unreasonable hardware or software modifications would be necessary to correct the deficiency, and the manufacturer has demonstrated an acceptable level of effort toward compliance as determined by the Administrator. Furthermore, EPA will not accept any deficiency requests that include the complete lack of a major diagnostic monitor (''major'' diagnostic monitors being those for exhaust aftertreatment devices, oxygen sensor, engine misfire, evaporative leaks, and diesel EGR, if equipped), with the possible exception of the special provisions for alternate fueled vehicles. For alternate fueled vehicles (*e.g.* natural gas, liquefied petroleum gas, methanol, ethanol), beginning with the model year for which alternate fuel emission standards are applicable and extending through the 2004 model year, manufacturers may request the Administrator to waive specific monitoring requirements of this section for which monitoring may not be reliable with respect to the use of the alternate fuel; manufacturers may request this alternate fuel waiver for heavy-duty vehicles through the 2006 model year. At a minimum, alternate fuel vehicles must be equipped with an OBD system meeting OBD requirements to the extent feasible as approved by the Administrator.

(j) *California OBDII compliance option.* For light-duty vehicles, light-duty trucks, and heavy-duty vehicles at or below 14,000 pounds GVWR, demonstration of compliance with California OBD II requirements (Title 13 California Code section 1968.1), as modified pursuant to California Mail Out #97–24 (December 9, 1997), shall satisfy the requirements of this section, except that the exemption to the catalyst monitoring provisions of California Code section 1968.1(b)(1.1.2) for diesel vehicles does not apply, and compliance with California Code sections 1968.1(b)(4.2.2), pertaining to 0.02 inch evaporative leak detection, and 1968.1(d), pertaining to tampering protection, are not required to satisfy the requirements of this section. Also, the deficiency fine provisions of California Code section 1968.1(m)(6.1) and (6.2) do not apply.

(k) *Certification.* For test groups required to have an OBD system, certification will not be granted if, for any test vehicle approved by the Administrator in consultation with the manufacturer, the malfunction indicator light does not illuminate under any of the following circumstances, unless the manufacturer can demonstrate that any identified OBD problems discovered during the Administrator's evaluation will be corrected on production vehicles.

(1)(i) *Otto-cycle.* A catalyst is replaced with a deteriorated or defective catalyst, or an electronic simulation of such, resulting in an increase of 1.5 times the NMHC standard or FEL above the NMHC emission level measured using a representative 4000 mile catalyst system.

(ii) *Diesel.* (A) If monitored for emissions performance—a catalyst is replaced with a deteriorated or defective catalyst, or an electronic simulation of such, resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NO_X or PM.

(B) If monitored for performance—a particulate trap is replaced with a trap that has catastrophically failed, or an electronic simulation of such.

(2)(i) *Otto-cycle.* An engine misfire condition is induced resulting in exhaust emissions exceeding 1.5 times the applicable standards or FEL for NMHC, CO or NO_X.

(ii) *Diesel.* An engine misfire condition is induced and is not detected.

(3) If so equipped, any oxygen sensor is replaced with a deteriorated or defective oxygen sensor, or an electronic simulation of such, resulting in exhaust emissions exceeding 1.5 times the applicable standard or FEL for NMHC, CO or NO_X.

(4) If so equipped, a vapor leak is introduced in the evaporative and/or refueling system (excluding the tubing and connections between the purge valve and the intake manifold) greater than or equal in magnitude to a leak caused by a 0.040 inch diameter orifice, or the evaporative purge air flow is blocked or otherwise eliminated from the complete evaporative emission control system.

(5) A malfunction condition is induced in any emission-related powertrain system or component, including but not necessarily limited to, the exhaust gas recirculation (EGR) system, if equipped, the secondary air system, if equipped, and the fuel control system, singularly resulting in exhaust emissions exceeding 1.5 times the applicable emission standard or FEL for NMHC, CO, NO_X or PM.

(6) A malfunction condition is induced in an electronic emission-related powertrain system or component not otherwise described in this paragraph (k) that either provides input to or receives commands from the on-board computer resulting in a measurable impact on emissions.

(l) *Phase-in for complete heavy-duty vehicles.* Complete heavy-duty vehicles weighing 14,000 pounds GVWR or less that are not Otto-cycle MDPVs must meet the OBD requirements of this section according to the following phase-in schedule, based on the percentage of projected vehicle sales. The 2004 model year requirements in the following phase-in schedule are applicable only to heavy-duty Otto-cycle vehicles where the manufacturer has selected Otto-cycle Option 1 or 2 for alternative 2003 or 2004 compliance according to § 86.005–1(c)(1) or (c)(2). The 2005 through 2007 requirements in the following phase-in schedule apply to all heavy-duty vehicles weighing 14,000 pounds GVWR or less, excluding MDPVs. If the manufacturer has selected Otto-cycle Option 3 they may exempt 2005 model year complete heavy-duty engines and vehicles whose model year commences before July 31, 2004 from the requirements of this section. For the purposes of calculating compliance with the phase-in provisions of this paragraph (l), heavy-duty vehicles subject to the phase-in requirements of this section may be combined with heavy-duty vehicles subject to the phase-in requirements of paragraph § 86.004–17(k). The phase-in schedule follows:

OBD COMPLIANCE PHASE-IN FOR COMPLETE HEAVY-DUTY VEHICLES WEIGHING 14,000 POUNDS GVWR OR LESS

Model year	Phase-in based on projected sales
2004 MY	—Applicable only to Otto-cycle engines complying with Options 1 or 2 —40% compliance —Alternative fuel waivers available
2005 MY	—60% compliance —Alternative fuel waivers available
2006 MY	—80% compliance

OBD COMPLIANCE PHASE-IN FOR COMPLETE HEAVY-DUTY VEHICLES WEIGHING 14,000 POUNDS GVWR OR LESS—Continued

Model year	Phase-in based on projected sales
2007+ MY	—Alternative fuel waivers available —100% compliance

53. Section 86.1807–01 is amended by:

a. Revising paragraphs (a)(3)(v) and (a)(3)(vi).

b. Adding paragraph (c)(3).

c. Revising paragraphs (d), (e), and (f).

The revisions and addition read as follows:

§ 86.1807–01 Vehicle labeling.

(a) * * *

(3) * * *

(v) An unconditional statement of compliance with the appropriate model year U.S. EPA regulations which apply to light-duty vehicles, light-duty trucks, or complete heavy-duty vehicles;

(vi) The exhaust emission standards (or FEL, as applicable) to which the test group is certified, and for test groups having different in-use standards, the corresponding exhaust emission standards that the test group must meet in use. In lieu of this requirement, manufacturers may use the standardized test group name designated by EPA;

* * * * *

(c) * * *

(3) The manufacturer of any complete heavy-duty vehicle subject to the emission standards of this subpart shall add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d)(1) Incomplete light-duty trucks shall have the following prominent statement printed on the label required by paragraph (a)(3)(v) of this section: ''This vehicle conforms to U.S. EPA regulations applicable to 20xx Model year Light-Duty Trucks under the special provisions of 40 CFR 86.1801–01(c)(1) when it does not exceed XXX pounds in curb weight, XXX pounds in gross vehicle weight rating, and XXX square feet in frontal area.''

(2) Incomplete heavy-duty vehicles optionally certified in accordance with the provisions for complete heavy-duty vehicles under the special provisions of § 86.1801–01(c)(2) shall have the following prominent statement printed on the label required by paragraph (a)(3)(v) of this section: ''This vehicle conforms to U.S. EPA regulations applicable to 20xx Model year Complete Heavy-Duty Vehicles under the special provisions of 40 CFR 86.1801–01(c)(2) when it does not exceed XXX pounds in curb weight, XXX pounds in gross vehicle weight rating, and XXX square feet in frontal area.''

(e) The manufacturer of any incomplete light-duty vehicle, light-duty truck, or heavy-duty vehicle shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National Highway Traffic Safety Administration safety notification requirements published in 49 CFR part 568.

(f) All light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles shall comply with SAE Recommended Practices J1877 ''Recommended Practice for Bar-Coded Vehicle Identification Number Label,'' (July 1994), and J1892 ''Recommended Practice for Bar-Coded Vehicle Emission Configuration Label'' (October 1993). SAE J1877 and J1892 are incorporated by reference (see § 86.1).

* * * * *

54. Section 86.1809–01 is amended by revising paragraph (a), to read as follows:

§ 86.1809–01 Prohibition of defeat devices.

(a) No new light-duty vehicle, light-duty truck, or complete heavy-duty vehicle shall be equipped with a defeat device.

* * * * *

55. Section 86.1810–01 is amended by:

a. Revising the introductory text.

b. Revising paragraphs (d) and (e).

c. Revising paragraphs (j)(1) and (j)(3).

d. Revising paragraphs (k)(1)(i) introductory text, and (k)(2).

e. Revising paragraph (l)(1) introductory text.

f. Revising paragraph (m)(1) introductory text.

The revisions read as follows:

§ 86.1810–01 General standards; increase in emissions; unsafe conditions; waivers.

This section applies to model year 2001 and later light-duty vehicles and light-duty trucks fueled by gasoline, diesel, methanol, natural gas and liquefied petroleum gas fuels. This section also applies to complete heavy-duty vehicles certified according to the provisions of this subpart. Multi-fueled vehicles (including dual-fueled and flexible-fueled vehicles) shall comply with all requirements established for each consumed fuel (or blend of fuels in the case of flexible fueled vehicles). The standards of this subpart apply to both certification and in-use vehicles unless otherwise indicated. For Tier 2 and interim non-Tier 2 vehicles, this section also applies to hybrid electric vehicles and zero emission vehicles. Unless otherwise specified, requirements and provisions of this subpart applicable to methanol fueled vehicles are also applicable to Tier 2 and interim non-Tier 2 ethanol fueled vehicles.

* * * * *

(d) *Crankcase emissions prohibited.* No crankcase emissions shall be discharged into the ambient atmosphere from any 2001 and later model year light-duty vehicle, light-duty truck, or complete heavy-duty vehicle certified according to the provisions of this subpart.

(e) *On-board diagnostics.* All light-duty vehicles, light-duty trucks and complete heavy-duty vehicles must have an on-board diagnostic system as described in § 86.1806–01 or § 86.1806–04, as applicable.

* * * * *

(j) * * * (1) The evaporative standards in §§ 86.1811–01(d), 86.1811–04(e), 86.1812–01(d), 86.1813–01(d), 86.1814–01(d), 86.1814–02(d), 86.1815–01(d), 1815–02(d) and 86.1816–04(d) apply equally to certification and in-use vehicles and trucks. The spitback standard also applies to newly assembled vehicles.

* * * * *

(3) All fuel vapor generated in a gasoline- or methanol-fueled light-duty vehicle, light-duty truck, or complete heavy-duty vehicle during in-use operation shall be routed exclusively to the evaporative control system (*e.g.,* either canister or engine purge.) The only exception to this requirement shall be for emergencies.

(k) * * * (1) * * * (i) Tables S01–3, S01–4, and S01–5 in this paragraph (k)(1)(i) give the minimum percentage of a manufacturer's sales of the applicable model year's gasoline- and methanol-fueled Otto-cycle and petroleum-fueled and methanol-fueled diesel-cycle light-duty vehicles, light-duty trucks and complete heavy-duty vehicles which shall be tested under the applicable procedures in subpart B of this part, and shall not exceed the standards described in §§ 86.1811–01(e), 86.1811–04(e)(3), 86.1812–01(e), 86.1813–01(e), and 86.1816–04(e). Vehicles waived from the emission standards under the provisions of paragraphs (m) and (n) of this section shall not be counted in the calculation of the percentage of compliance. Either manufacturer sales or actual production intended for sale in the United States may be used to determine combined volume, at the manufacturers option. Tables S01–3, S01–4, and S01–5 follow:

* * * * *

(2) *Determining sales percentages.* Sales percentages for the purposes of determining compliance with the applicable refueling emission standards light-duty vehicles, light-duty trucks, medium-duty passenger vehicles, and complete heavy-duty vehicles shall be based on total actual U.S. sales of heavy light-duty trucks and complete heavy-duty vehicles of the applicable model year by a manufacturer to a dealer, distributor, fleet operator, broker, or any other entity which comprises the point of first sale.

* * * * *

(l) * * * (1) Vehicles certified to the refueling emission standards set forth in §§ 86.1811–01(e), 86.1811–04(e)(3), 86.1812–01(e), 86.1813–01(e), and 86.1816–04(e) are not required to demonstrate compliance with the fuel dispensing spitback standard contained in that section provided that:

* * * * *

(m) * * *

(1) Vehicles using fuels/fuel systems inherently low in refueling emissions are not required to conduct testing to demonstrate compliance with the refueling emission standards set forth in §§ 86.1811–01(e), 86.1811–04(e)(3), 86.1812–01(e), 86.1813–01(e), and 86.1816–04(e), provided that:

* * * * *

56. Section 86.1811–01 is amended by adding paragraph (g), to read as follows:

§ 86.1811–01 Emission standards for light-duty vehicles.

* * * * *

(g) Manufacturers may request to group light-duty vehicles into the same test group as vehicles subject to more stringent standards, so long as those light-duty vehicles meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827(a)(5) and (d)(4).

57. Section 86.1811–04 is amended by adding a new paragraph (s), to read as follows:

§ 86.1811–04 Emission standards for light-duty vehicles, light-duty trucks and medium-duty passenger vehicles.

* * * * *

(s) Manufacturers may request to group heavy-duty vehicles into the same test group as other vehicles subject to more stringent standards, so long as all vehicles in the test group meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827–1(a)(5) and (d)(4).

58. Section 86.1812–01 is amended by adding paragraph (h), to read as follows:

§ 86.1812–01 Emission standards for light-duty trucks 1.

* * * * *

(h) Manufacturers may request to group light-duty truck 1's into the same test group as vehicles subject to more stringent standards, so long as those light-duty truck 1's meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827(a)(5) and (d)(4).

59. Section 86.1813–01 is amended by adding paragraph (h), to read as follows:

§ 86.1813–01 Emission standards for light-duty trucks 2.

* * * * *

(h) Manufacturers may request to group light-duty truck 2's into the same test group as vehicles subject to more stringent standards, so long as those light-duty truck 2's meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827(a)(5) and (d)(4).

60. Section 86.1814–01 is amended by adding paragraph (h), to read as follows:

§ 86.1814–01 Emission standards for light-duty trucks 3.

* * * * *

(h) Manufacturers may request to group light-duty truck 3's into the same test group as vehicles subject to more stringent standards, so long as those light-duty truck 3's meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827(a)(5) and (d)(4).

61. Section 86.1814–02 is amended by adding paragraph (h), to read as follows:

§ 86.1814–02 Emission standards for light-duty trucks 3.

* * * * *

(h) Manufacturers may request to group light-duty truck 3's into the same test group as vehicles subject to more stringent standards, so long as those light-duty truck 3's meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827(a)(5) and (d)(4).

62. Section 86.1815–01 is amended by adding paragraph (h), to read as follows:

§ 86.1815–01 Emission standards for light-duty trucks 4.

* * * * *

(h) Manufacturers may request to group light-duty truck 4's into the same test group as vehicles subject to more stringent standards, so long as those light-duty truck 4's meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827(a)(5) and (d)(4).

63. Section 86.1815–02 is amended by adding paragraph (h), to read as follows:

§ 86.1815–02 Emission standards for light-duty trucks 4.

* * * * *

(h) Manufacturers may request to group light-duty truck 4's into the same test group as vehicles subject to more stringent standards, so long as those light-duty truck 4's meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827(a)(5) and (d)(4).

64. A new section 86.1816–05 is added to subpart S, to read as follows:

§ 86.1816–05 Emission standards for complete heavy-duty vehicles.

This section applies to 2005 and later model year complete heavy-duty vehicles (2003 model year for manufacturers choosing Otto-cycle HDE option 1 in § 86.005–1(c)(1), or 2004 model year for manufacturers choosing Otto-cycle HDE option 2 in § 86.005–1(c)(2)) fueled by gasoline, methanol, natural gas and liquefied petroleum gas fuels except as noted. This section does not apply to Medium-duty Passenger Vehicles, which are covered under § 86.1811. This section also applies to 2000 and later model year complete heavy duty vehicles participating in the early banking provisions of the averaging, trading and banking program as specified in § 86.1817–05(n). Multi-fueled vehicles shall comply with all requirements established for each consumed fuel. For methanol fueled vehicles, references in this section to hydrocarbons or total hydrocarbons shall mean total hydrocarbon equivalents and references to non-methane hydrocarbons shall mean non-methane hydrocarbon equivalents.

(a) *Exhaust emission standards.* (1) Exhaust emissions from 2005 and later model year complete heavy-duty vehicles at and above 8,500 pounds Gross Vehicle Weight Rating but equal to or less than 10,000 Gross Vehicle Weight Rating pounds shall not exceed the following standards at full useful life:

(i) [Reserved]

(ii) *Non-methane organic gas.* 0.280 grams per mile; this requirement may be satisfied by measurement of non-methane hydrocarbons or total hydrocarbons, at the manufacturer's option.

(iii) *Carbon monoxide.* 7.3 grams per mile.

(iv) *Oxides of nitrogen.* 0.9 grams per mile.

(v) [Reserved]

(2) Exhaust emissions from 2005 and later model year complete heavy-duty vehicles above 10,000 pounds Gross Vehicle Weight Rating but less than 14,000 pounds Gross Vehicle Weight Rating shall not exceed the following standards at full useful life:

(i) [Reserved].

(ii) *Non-methane organic gas.* 0.330 grams per mile; this requirement may be satisfied by measurement of non-methane hydrocarbons or total hydrocarbons, at the manufacturer's option.

(iii) *Carbon monoxide.* 8.1 grams per mile.

(iv) *Oxides of nitrogen.* 1.0 grams per mile.

(v) [Reserved].

(b) [Reserved].

(c) [Reserved].

(d) *Evaporative emissions.* Evaporative hydrocarbon emissions from gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled, and methanol-fueled complete heavy-duty vehicles shall not exceed the following standards. The standards apply equally to certification and in-use vehicles. The spitback standard also applies to newly assembled vehicles.

(1) Gasoline, natural gas, liquefied petroleum gas, and methanol fuel. For the full three-diurnal test sequence, diurnal plus hot soak measurements: 3.0 grams per test.

(2) *Gasoline and methanol fuel only.* For the supplemental two-diurnal test sequence, diurnal plus hot soak measurements: 3.5 grams per test.

(3) *Gasoline and methanol fuel only.* Running loss test: 0.05 grams per mile.

(4) *Gasoline and methanol fuel only.* Fuel dispensing spitback test: 1.0 grams per test.

(e) *Refueling emissions.* (1) *Standards.* Refueling emissions from Otto-cycle complete heavy-duty vehicles equal to or less than 10,000 pounds Gross Vehicle Weight Rating shall be phased in, in accordance with the schedule in Table S01–5 in § 86.1810–01 not to exceed the following emission standards:

(i) For gasoline-fueled and methanol-fueled vehicles: 0.20 grams hydrocarbon per gallon (0.053 gram per liter) of fuel dispensed.

(ii) For liquefied petroleum gas-fueled vehicles: 0.15 grams hydrocarbon per gallon (0.04 gram per liter) of fuel dispensed.

(2) *Phase-in.* Complete heavy-duty vehicles subject to refueling standards must comply with the phase-in requirements found in Table S01–5 in § 86.1810–01, and must be grouped with HLDTs and MDPVs to determine phase-in compliance.

(3) *Alternate timing.* (i) For manufacturers choosing Otto-cycle HDE option 3 under § 86.005–1(c)(3), the refueling emissions standards are optional for 2004 model year complete heavy-duty vehicles.

(ii) For manufacturers choosing Otto-cycle HDE option 3 under § 86.005–1(c)(3), the manufacturer may exempt 2005 model year HDE test groups whose model year begins before July 31, 2004. Only 2005 model year HDE test groups whose model year begins on or after July 31, 2004 shall be considered (together with all 2005 model year HLDTs and MDPVs) for purposes of calculating the sales percentage for phase-in as outlined in § 86.1810–01(k).

(iii) For complete heavy-duty vehicles which have total fuel tank capacity of greater than 35 gallons, or which do not share a common fuel system with a light-duty truck or medium-duty passenger vehicle configuration, the refueling emissions standards are optional for the 2004 and 2005 model years.

(4) *Exceptions.* The provisions of this § 86.1816–05(e) do not apply to incomplete heavy-duty vehicles optionally certified to complete heavy duty vehicle standards under the provisions of § 86.1801–01(c)(2).

(f) [Reserved]

(g) *Idle exhaust emission standards, complete heavy-duty vehicles.* Exhaust emissions of carbon monoxide from 2005 and later model year gasoline, methanol, natural gas-and liquefied petroleum gas-fueled complete heavy-duty vehicles shall not exceed 0.50 percent of exhaust gas flow at curb idle for a useful life of 11 years or 120,000 miles, whichever occurs first.

(h) *Alternate test groups.* Manufacturers may request to group complete heavy-duty vehicles into the same test group as vehicles subject to more stringent standards, so long as those complete heavy-duty vehicles meet the most stringent standards applicable to any vehicle within that test group, as provided at § 86.1827–(a)(5) and (d)(4).

65. A new section 86.1817–05 is added to subpart S, to read as follows:

§ 86.1817–05 Complete heavy-duty vehicle averaging, trading, and banking program.

(a) *General.* (1) Complete heavy-duty vehicles eligible for the NO_X averaging, trading and banking program are described in the applicable emission standards section of this subpart. All heavy-duty vehicles which include an engine labeled for use in clean-fuel vehicles as specified in 40 CFR part 88 are not eligible for this program. Participation in this averaging, trading, and banking program is voluntary.

(2)(i) Test groups with a family emission limit (FEL) as defined in § 86.1803–01 exceeding the applicable standard shall obtain emission credits as defined in § 86.1803–01 in a mass amount sufficient to address the shortfall. Credits may be obtained from averaging, trading, or banking, as defined in § 86.1803–01 within the averaging set restrictions described in paragraph (d) of this section.

(ii) Test groups with an FEL below the applicable standard will have emission credits available to average, trade, bank or a combination thereof. Credits may not be used for averaging or trading to offset emissions that exceed an FEL. Credits may not be used to remedy an in-use nonconformity determined by a Selective Enforcement Audit or by recall testing. However, credits may be used to allow subsequent production of vehicles for the test group in question if the manufacturer elects to recertify to a higher FEL.

(b) *Participation.* Participation in the NO_X averaging, trading, and banking program shall be done as follows:

(1) During certification, the manufacturer shall:

(i) Declare its intent to include specific test groups in the averaging, trading and banking program.

(ii) Declare an FEL for each test group participating in the program.

(A) The FEL must be to the same level of significant digits as the emission standard (one-hundredth of a gram per mile for NO_X emissions).

(B) In no case may the FEL exceed the upper limit prescribed in the section concerning the applicable complete heavy-duty vehicle chassis-based NO_X emission standard.

(iii) Calculate the projected NO_X emission credits (positive or negative) as defined in § 86.1803–01 based on quarterly production projections for each participating test group, using the applicable equation in paragraph (c) of this section and the applicable factors for the specific test group.

(iv)(A) Determine and state the source of the needed credits according to quarterly projected production for test groups requiring credits for certification.

(B) State where the quarterly projected credits will be applied for test groups generating credits.

(C) Emission credits as defined in § 86.1803–01 may be obtained from or applied to only test groups within the same averaging set as defined in § 86.1803–01. Emission credits available for averaging, trading, or banking, may be applied exclusively to a given test group, or designated as reserved credits as defined in § 86.1803–01.

(2) Based on this information, each manufacturer's certification application must demonstrate:

(i) That at the end of model year production, each test group has a net emissions credit balance of zero or more using the methodology in paragraph (c) of this section with any credits obtained from averaging, trading or banking.

(ii) The source of the credits to be used to comply with the emission standard if the FEL exceeds the standard, or where credits will be applied if the FEL is less than the emission standard. In cases where credits are being obtained, each test group involved must state specifically the source (manufacturer/test group) of the credits being used. In cases where credits are being generated/supplied, each test group involved must state specifically the designated use (manufacturer/test group or reserved) of the credits involved. All such reports shall include all credits involved in averaging, trading or banking.

(3) During the model year, manufacturers must:

(i) Monitor projected versus actual production to be certain that compliance with the emission standards is achieved at the end of the model year.

(ii) Provide the end-of-year reports required under paragraph (i) of this section.

(iii) For manufacturers participating in emission credit trading, maintain the quarterly records required under paragraph (l) of this section.

(4) Projected credits based on information supplied in the certification application may be used to obtain a certificate of conformity. However, any such credits may be revoked based on review of end-of-model year reports, follow-up audits, and any other compliance measures deemed appropriate by the Administrator.

(5) Compliance under averaging, banking, and trading will be determined at the end of the model year. Test groups without an adequate amount of NO_X emission credits will violate the conditions of the certificate of conformity. The certificates of conformity may be voided *ab initio* for test groups exceeding the emission standard.

(6) If EPA or the manufacturer determines that a reporting error occurred on an end-of-year report previously submitted to EPA under this section, the manufacturer's credits and credit calculations will be recalculated. Erroneous positive credits will be void. Erroneous negative balances may be adjusted by EPA for retroactive use.

(i) If EPA review of a manufacturer's end-of-year report indicates a credit shortfall, the manufacturer will be permitted to purchase the necessary credits to bring the credit balance for that test group to zero, at the ratio of 1.2 credits purchased for every credit needed to bring the balance to zero. If sufficient credits are not available to bring the credit balance for the test group in question to zero, EPA may void the certificate for that test group *ab initio*.

(ii) If within 180 days of receipt of the manufacturer's end-of-year report, EPA review determines a reporting error in the manufacturer's favor (*i.e.* resulting in a positive credit balance) or if the manufacturer discovers such an error within 180 days of EPA receipt of the end-of-year report, the credits will be restored for use by the manufacturer.

(c) *Calculations.* For each participating test group, NO_X emission credits (positive or negative) are to be calculated according to one of the following equations and rounded, in accordance with ASTM E29–93a (incorporated by reference at § 86.1), to the nearest one-tenth of a Megagram (MG). Consistent units are to be used throughout the equation.

(1) For determining credit need for all test groups and credit availability for test groups generating credits for averaging only:

Emission credits=(Std-FEL) × (UL) × (Production) × (10^{-6})

(2) For determining credit availability for test groups generating credits for trading or banking:

Emission credits=(Std-FEL) × (UL) × (Production) × (10^{-6}) (Discount)

(3) For purposes of the equations in paragraphs (c)(1) and (c)(2) of this section:

Std=the current and applicable complete heavy-duty vehicle NO_X emission standard in grams per mile or grams per kilometer.

Std=0.9 grams per mile for heavy-duty vehicles at and above 8,500 pounds Gross Vehicle Weight Rating but equal to or less than 10,000 Gross Vehicle Weight Rating pounds and 1.0 grams per mile for heavy-duty vehicles above 10,000 pounds Gross Vehicle Weight Rating but less than 14,000 pounds Gross Vehicle Weight Rating for cases where certification to chassis-based standards is optional for purposes of early credit banking.

FEL=the NO_X family emission limit for the test group in grams per mile or grams per kilometer.

UL=the useful life, or alternative life as described in paragraph (c) of § 86.1805–01, for the given test group in miles or kilometers.

Production=the number of vehicles produced for U.S. sales within the given test group during the model year. Quarterly production projections are used for initial certification. Actual production is used for end-of-year compliance determination.

Discount=a one-time discount applied to all credits to be banked or traded within the model year generated. Except as otherwise allowed in paragraph (m) of this section, the discount applied here is 0.9. Banked credits traded in a subsequent model year will not be subject to an additional discount. Banked credits used in a subsequent model year's averaging program will not have the discount restored.

(d) *Averaging sets.* The averaging and trading of NO_X emission credits will be allowed between all test groups of heavy-duty vehicles subject to chassis-based standards excluding those vehicles produced for sale in California. Averaging, banking, and trading are not applicable to vehicles sold in California.

(e) *Banking of NO_X emission credits*—(1) *Credit deposits.* (i) NO_X emission credits may be banked from test groups produced in 2000 and later model years. Early banking is described in paragraph (n) of this section.

(ii) Manufacturers may bank credits only after the end of the model year and after actual credits have been reported to EPA in the end-of-year report. During the model year and before submittal of the end-of-year report, credits originally designated in the certification process for banking will be considered reserved and may be redesignated for trading or averaging.

(2) *Credit withdrawals.* (i) NO_X credits do not expire, except as provided in paragraph (o)(2) of this section.

(ii) Manufacturers withdrawing banked emission credits shall indicate so during certification and in their credit reports, as described in paragraph (i) of this section.

(3) *Use of banked emission credits.* The use of banked credits shall be within the averaging set and geographic restrictions described in paragraph (d) of this section, and only for the following purposes:

(i) Banked credits may be used in averaging, or in trading, or in any combination thereof, during the certification period. Credits declared for banking from the previous model year but not reported to EPA may also be used. However, if EPA finds that the reported credits cannot be proven, they will be revoked and unavailable for use.

(ii) Banked credits may not be used for averaging and trading to offset emissions that exceed an FEL. Banked credits may not be used to remedy an in-use nonconformity determined by a Selective Enforcement Audit or by recall testing. However, banked credits may be used for subsequent production of the test group if the manufacturer elects to recertify to a higher FEL.

(f) *Negative credit balance.* In the event of a negative credit balance in a trading situation, both the buyer and the seller would be liable.

(g) *Fuel.* Certification fuel used for credit generation must be of a type that is both available in use and expected to be used by the vehicle purchaser. Therefore, upon request by the Administrator, the vehicle manufacturer must provide information acceptable to the Administrator that the designated fuel is readily available commercially and would be used in customer service.

(h) *Credit apportionment.* At the manufacturers option, credits generated from complete heavy-duty vehicles under the provisions described in this section may be sold to or otherwise provided to another party for use in programs other than the averaging, trading and banking program described in this section.

(1) The manufacturer shall pre-identify two emission levels per test group for the purposes of credit apportionment. One emission level shall be the FEL and the other shall be the level of the standard that the test group is required to certify under § 86.1816–04. For each test group, the manufacturer may report vehicle sales in two categories, ''ABT-only credits'' and ''nonmanufacturer-owned credits''.

(i) For vehicle sales reported as ''ABT-only credits'', the credits generated must be used solely in the averaging, trading and banking program described in this section.

(ii) The vehicle manufacturer may declare a portion of vehicle sales ''nonmanufacturer-owned credits'' and this portion of the credits generated between the standard and the FEL, based on the calculation in paragraph (c)(1) of this section, would belong to the vehicle purchaser. The manufacturer may not generate any credits for the vehicle sales reported as ''nonmanufacturer-owned credits'' for this averaging, trading and banking program. Vehicles reported as ''nonmanufacturer-owned credits'' shall comply with the FEL and the requirements of this averaging, trading and banking program in all other respects.

(2) Only manufacturer-owned credits reported as ''ABT-only credits'' shall be used in the averaging, trading, and banking provisions described in this section.

(3) Credits shall not be double-counted. Credits used in this averaging, trading and banking program may not be provided to a vehicle purchaser for use in another program.

(4) Manufacturers shall determine and state the number of vehicles sold as ''ABT-only credits'' and ''nonmanufacturer-owned credits'' in the end-of-model year reports required under paragraph (i) of this section.

(i) *Application for certification and end-of-year reports.* Manufacturers participating in the emissions averaging, trading and banking program, shall submit for each participating test group the items listed in paragraphs (i)(1) through (3) of this section.

(1) *Application for certification.* (i) The application for certification will include a statement that the vehicles for which certification is requested will not, to the best of the manufacturer's belief, when included in the averaging, trading and banking program, cause the applicable NO_X emissions standard to be exceeded.

(ii) The application for certification will also include identification of the section of this subpart under which the test group is participating in the averaging, trading and banking program (*e.g.,* § 86.1817–05), the type (NO_X), and the projected number of credits generated/needed for this test group, the applicable averaging set, the projected U.S. production volumes (excluding vehicles produced for sale in California), by quarter, and the values required to calculate credits as given in the applicable averaging, trading and banking section. Manufacturers shall also submit how and where credit surpluses are to be dispersed and how and through what means credit deficits are to be met, as explained in the applicable averaging, trading and banking section. The application must project that each test group will be in compliance with the applicable emission standards based on the vehicle mass emissions and credits from averaging, trading and banking.

(2) [Reserved].

(3) *End-of-year report.* The manufacturer shall submit end-of-year reports for each test group participating in the averaging, trading and banking program, as described in paragraphs (i)(3)(i) through (iv) of this section.

(i) These reports shall be submitted within 90 days of the end of the model year to: Director, Engine Programs and Compliance Division (6405J), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460.

(ii) These reports shall indicate the test group, the averaging set, the actual U.S. production volume (excluding vehicles produced for sale in California), the values required to calculate credits as given in the applicable averaging, trading and banking section, and the resulting type and number of credits generated/required. Manufacturers shall also submit how and where credit surpluses were dispersed (or are to be banked) and how and through what means credit deficits were met. Copies of contracts related to credit trading must also be included or supplied by the broker if applicable. The report shall also include a calculation of credit balances to show that net mass emissions balances are within those allowed by the emission standards (equal to or greater than a zero credit balance). Any credit discount factor described in the applicable averaging, trading and banking section must be included as required.

(iii) The production counts for end-of-year reports shall be based on the location of the first point of retail sale (*e.g.,* customer, dealer, secondary manufacturer) by the manufacturer.

(iv) Errors discovered by EPA or the manufacturer in the end-of-year report, including changes in the production counts, may be corrected up to 180 days subsequent to submission of the end-of-year report. Errors discovered by EPA after 180 days shall be corrected if credits are reduced. Errors in the manufacturer's favor will not be corrected if discovered after the 180 day correction period allowed.

(j) *Failure to submit quarterly or end-of-year reports.* Failure by a manufacturer participating in the averaging, trading and banking program to submit any quarterly or end-of-year report (as applicable) in the specified time for all vehicles that are part of an averaging set is a violation of section 203(a)(1) of the Clean Air Act (42 U.S.C. 7522(a)(1)) for such vehicles.

(k) *Failure to submit end-of-year reports for banked credits.* Failure by a manufacturer generating credits for deposit only in the complete heavy-duty vehicle banking program to submit their end-of-year reports in the applicable specified time period (*i.e.,* 90 days after the end of the model year) shall result in the credits not being available for use until such reports are received and reviewed by EPA. Use of projected credits pending EPA review will not be permitted in these circumstances.

(l) *Quarterly records.* Any manufacturer producing a test group participating in trading using reserved credits, shall maintain the following records on a quarterly basis for each test group in the trading subclass:

(1) The test group;

(2) The averaging set;

(3) The actual quarterly and cumulative U.S. production volumes

excluding vehicles produced for sale in California;

(4) The values required to calculate credits as given in paragraph (c) of this section;

(5) The resulting type and number of credits generated/required;

(6) How and where credit surpluses are dispersed; and

(7) How and through what means credit deficits are met.

(m) *Additional flexibility for complete heavy-duty vehicles.* If a complete heavy-duty vehicle has a NO_X FEL of 0.6 grams per mile or lower, a discount of 1.0 may be used in the trading and banking credits calculation for NO_X described in paragraph (c)(2) of this section.

(n) *Early banking for complete heavy-duty vehicles.* Provisions set forth in paragraphs (a) through (m) of this section apply except as specifically stated otherwise in this paragraph (n).

(1) *Early banking eligibility.* To be eligible for the early banking program described in this paragraph, the following must apply:

(i) Credits are generated from complete heavy-duty vehicles.

(ii) During certification, the manufacturer shall declare its intent to include specific test groups in the early banking program described in this paragraph (n).

(2) *Credit generation and use.* (i) Early credits may be generated by test groups starting in model year 2000.

(ii) Credits may only be used for complete heavy-duty vehicles subject to chassis-based standards, except as provided by paragraph (o) in this section, and all credits shall be subject to discounting and all other provisions contained in paragraphs (a) through (m) of this section.

(o) *Credit transfers.* A manufacturer that elects to comply with Option 1 or 2 contained in § 86.005–10(f) may transfer credits between its complete vehicle averaging set and its heavy-duty Otto-cycle engine averaging set as follows:

(1) Credits earned in model years 2004 (2003 for Option 1) through 2007 are eligible to be transferred.

(2) Transferred credits may not be banked for use in model years 2008 and later. Credits that are transferred but not used prior to model year 2008 must be forfeited.

(3) Prior to transferring credits, a manufacturer must develop a methodology to transfer the credits including a conversion factor that may be used to convert between chassis-based credits (derived on a grams per mile basis) and equivalent engine-based credits (derived on a grams per brake horsepower-hour basis). The methodology must be approved by EPA prior to the start of the model year in which the credits are to be transferred. The conversion factor must provide reasonable certainty that the credits are equivalent for the specific vehicle test group(s) and engine family(s) involved in the generation and use of the credits.

66. Section 86.1823–01 is amended by revising the introductory text, paragraph (c)(2) introductory text, and the first sentence of paragraph (h), to read as follows:

§ 86.1823–01 Durability demonstration procedures for exhaust emissions.

This section applies to light-duty vehicles, light-duty trucks, complete heavy-duty vehicles, and heavy-duty vehicles certified under the provisions of § 86.1801–01(c). Eligible small volume manufacturers or small volume test groups may optionally meet the requirements of §§ 86.1838–01 and 86.1826–01 in lieu of the requirements of this section. For model years 2001, 2002, and 2003 all manufacturers may elect to meet the provisions of paragraph (c)(2) of this section in lieu of these requirements for light-duty vehicles or light-duty trucks.

* * * * *

(c) * * *

(2) For the 2001, 2002, and 2003 model years, for light-duty vehicles and light-duty trucks the manufacturer may carry over exhaust emission DF's previously generated under the Standard AMA Durability Program described in § 86.094–13(c), the Alternate Service Accumulation Durability Program described in § 86.094–13(e) or the Standard Self-Approval Durability Program for light-duty trucks described in § 86.094–13(f) in lieu of complying with the durability provisions of paragraph (a)(1) of this section.

* * * * *

(h) The Administrator may withdraw approval to use a durability process or require modifications to a durability process based on the data collected under §§ 86.1845–01, 86.1846–01, and 86.1847–01 or other information if the Administrator determines that the durability processes have not been shown to accurately predict emission levels or compliance with the standards (or FEL, as applicable) in use on candidate vehicles (provided the inaccuracy could result in a lack of compliance with the standards for a test group covered by this durability process). * * *

* * * * *

67. Section 86.1824–01 is amended by revising the first sentence of the introductory text, to read as follows:

§ 86.1824–01 Durability demonstration procedures for evaporative emissions.

This section applies to gasoline-, methanol-, liquefied petroleum gas-, and natural gas-fueled LDV/Ts, MDPVs, complete heavy-duty vehicles, and heavy-duty vehicles certified under the provisions of § 86.1801–01(c). * * *

* * * * *

68. Section 86.1825–01 is amended by revising the first two sentences of introductory text to read as follows:

§ 86.1825–01 Durability demonstration procedures for refueling emissions.

This section applies to light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles, and heavy-duty vehicles which are certified under light-duty rules as allowed under the provisions of § 86.1801–01(c) which are subject to refueling loss emission compliance. Refer to the provisions of §§ 86.1811–01, 86.1811–04, 86.1812–01, 86.1813–01, and 86.1816–04 to determine applicability of the refueling standards to different classes of vehicles for various model years. * * *

* * * * *

69. Section 86.1826–01 is amended by revising paragraphs (b)(2) introductory text and (b)(3) introductory text, to read as follows:

§ 86.1826–01 Assigned deterioration factors for small volume manufacturers and small volume test groups.

* * * * *

(b) * * *

(2) Manufacturers with aggregated sales from and including 301 through 14,999 motor vehicles and motor vehicle engines per year (determined under the provisions of § 86.1838–01(b)) certifying vehicles equipped with proven emission control systems shall conform to the following provisions:

* * * * *

(3) Manufacturers with aggregated sales from 301 through 14,999 motor vehicles and motor vehicle engines per year (determined under the provisions of § 86.1838–01(b)) certifying vehicles equipped with unproven emission control systems shall conform to the following provisions:

* * * * *

70. Section 86.1827–01 is amended by:

a. Revising paragraph (a)(5).

b. Removing ''and'' at the end of paragraph (d)(2).

c. Removing the period at the end of paragraph (d)(3) and adding ''; and'' in its place.

d. Adding paragraph (d)(4).

The revisions and additions read as follows:

§ 86.1827–01 Test group determination.

* * * * *

(a) * * *

(5) Subject to the same emission standards, except that a manufacturer may request to group vehicles into the same test group as vehicles subject to more stringent standards, so long as all the vehicles within the test group are certified to the most stringent standards applicable to any vehicle within that test group. Light-duty trucks which are subject to the same emission standards as light-duty vehicles with the exception of the light-duty truck idle CO standard and/or total HC standard may be included in the same test group.

* * * * *

(d) * * *

(4) A statement that all vehicles within a test group are certified to the most stringent standards applicable to any vehicle within that test group.

* * * * *

71. Section 86.1829–01 is amended by revising paragraphs (b)(1)(ii)(B), (b)(2)(ii)(B), and (b)(5), to read as follows:

§ 86.1829–01 Durability and emission testing requirements; waivers.

* * * * *

(b) * * *

(1) * * *

(ii) * * *

(B) In lieu of testing vehicles according to the provisions of paragraph (b)(1)(ii)(A) of this section, a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of appropriate high-altitude emission testing, all light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles comply with the emission standards at high altitude.

* * * * *

(2) * * *

(ii) * * *

(B) In lieu of testing vehicles according to the provisions of paragraph (b)(2)(ii)(A) of this section, a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate, all light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles comply with the emission standards at high altitude.

* * * * *

(5) *Idle CO testing.* To determine idle CO emission compliance for light-duty trucks and complete heavy-duty vehicles, the manufacturer shall follow one of the following two procedures:

(i) For test groups containing light-duty trucks and complete heavy-duty vehicles, each EDV shall be tested in accordance with the idle CO testing procedures of subpart B of this part; or

(ii) In lieu of testing light trucks and complete heavy-duty vehicles for idle CO emissions, a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of such idle CO testing as the manufacturer deems appropriate, all light-duty trucks and complete heavy-duty vehicles comply with the idle CO emission standards.

* * * * *

72. Section 86.1834–01 is amended by:

a. Revising paragraph (b)(3) introductory text.

b. Redesignating paragraph (b)(3)(i) as paragraph (b)(3)(i)(A), and adding paragraph (b)(3)(i)(B).

c. Revising paragraph (b)(3)(ii) introductory text.

d. Redesignating paragraphs (b)(3)(iii) and (b)(3)(iv) as paragraphs (b)(3)(iv) and (b)(3)(v).

e. Adding a new paragraph (b)(3)(iii).

f. Revising newly redesignated paragraphs (b)(3)(iv) and (b)(3)(v).

g. Adding a new paragraph (b)(3)(vi).

h. Redesignating paragraphs (b)(5) and (b)(6) as paragraphs (b)(6) and (b)(7); adding and reserving paragraph (b)(5).

i. Adding paragraph (b)(6)(i)(H).

j. Revising the first sentence of newly redesignated paragraph (b)(6)(iii), the seventh sentence of newly redesignated paragraph (b)(7)(ii), and the first sentence of newly redesignated paragraph (b)(7)(iii).

k. Revising the heading of paragraph (d).

The revisions and additions read as follows:

§ 86.1834–01 Allowable maintenance.

* * * * *

(b) * * *

(3) Emission-related maintenance in addition to, or at shorter intervals than, that listed in paragraphs (b)(3)(i) through (vi) of this section will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i)(A) * * *

(B) The cleaning or replacement of complete heavy-duty vehicle spark plugs shall occur at 25,000 miles (or 750 hours) of use and at 30,000-mile (or 750 hour) intervals thereafter, for vehicles certified for use with unleaded fuel only.

(ii) For light-duty vehicles and light-duty trucks, the adjustment, cleaning, repair, or replacement of the following items shall occur at 50,000 miles of use and at 50,000-mile intervals thereafter:

* * * * *

(iii) For complete heavy-duty vehicles, the adjustment, cleaning, repair, or replacement of the following items shall occur at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (1,500 hour) intervals thereafter:

(A) Positive crankcase ventilation valve.

(B) Emission-related hoses and tubes.

(C) Ignition wires.

(D) Idle mixture.

(E) Exhaust gas recirculation system related filters and coolers.

(iv) For light-duty trucks, light-duty vehicles, and complete heavy-duty vehicles, the adjustment, cleaning, repair, or replacement of the oxygen sensor shall occur at 80,000 miles (or 2,400 hours) of use and at 80,000-mile (or 2,400-hour) intervals thereafter.

(v) For light-duty trucks and light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following items shall occur at 100,000 miles of use and at 100,000-mile intervals thereafter:

(A) Catalytic converter.

(B) Air injection system components.

(C) Fuel injectors.

(D) Electronic engine control unit and its associated sensors (except oxygen sensor) and actuators.

(E) Evaporative and/or refueling emission canister(s).

(F) Turbochargers.

(G) Carburetors.

(H) Superchargers.

(I) Exhaust gas recirculation system including all related filters and control valves.

(J) Mechanical fillpipe seals.

(vi) For complete heavy-duty vehicles, the adjustment, cleaning, repair, or replacement of the following items shall occur at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000 hour) intervals thereafter:

(A) Catalytic converter.

(B) Air injection system components.

(C) Fuel injectors.

(D) Electronic engine control unit and its associated sensors (except oxygen sensor) and actuators.

(E) Evaporative and/or refueling emission canister(s).

(F) Turbochargers.

(G) Carburetors.

(H) Exhaust gas recirculation system (including all related control valves and tubing) except as otherwise provided in paragraph (b)(3)(iii)(E) of this section.

(I) Mechanical fillpipe seals.

* * * * *

(5) [Reserved].

(6) * * *

(i) * * *

(H) Any other add-on emissions-related component (*i.e.*, a component whose sole or primary purpose is to reduce emissions or whose failure will significantly degrade emissions control and whose function is not integral to the design and performance of the engine.)

* * * * *

(iii) Visible signal systems used under paragraph (b)(6)(ii)(C) of this section are considered an element of design of the emission control system. * * *

(7) * * *

(ii) * * * For maintenance items established as emission-related, the Administrator will further designate the maintenance as critical if the component which receives the maintenance is a critical component under paragraph (b)(6) of this section. * * *

(iii) Any manufacturer may request a hearing on the Administrator's determinations in this paragraph (b)(7). * * *

* * * * *

(d) *Unscheduled maintenance on durability data vehicles.* * * *

* * * * *

73. Section 86.1835–01 is amended by revising the third sentence of paragraph (a)(1)(i), paragraph (b)(1) introductory text, and paragraph (b)(3) introductory text, to read as follows:

§ 86.1835–01 Confirmatory certification testing.

(a) * * *

(1) * * *

(i) * * * The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles, light-duty trucks, or complete heavy-duty vehicles. * * *

* * * * *

(b) * * * (1) If the Administrator determines not to conduct a confirmatory test under the provisions of paragraph (a) of this section, light-duty vehicle and light-duty truck manufacturers will conduct a confirmatory test at their facility after submitting the original test data to the Administrator whenever any of the conditions listed in paragraphs (b)(1)(i) through (v) of this section exist, and complete heavy-duty vehicles manufacturers will conduct a confirmatory test at their facility after submitting the original test data to the Administrator whenever the conditions listed in paragraph (b)(1)(i) or (b)(1)(ii) of this section exist, as follows:

* * * * *

(3) For light-duty vehicles, and light-duty trucks, the manufacturer shall conduct a retest of the FTP or highway test if the difference between the fuel economy of the confirmatory test and the original manufacturer's test equals or exceeds three percent (or such lower percentage to be applied consistently to all manufacturer conducted confirmatory testing as requested by the manufacturer and approved by the Administrator).

* * * * *

74. Section 86.1840–01 is revised to read as follows:

§ 86.1840–01 Special test procedures.

(a) The Administrator may, on the basis of written application by a manufacturer, prescribe test procedures, other than those set forth in this part, for any light-duty vehicle, light-duty truck, or complete heavy-duty vehicle which the Administrator determines is not susceptible to satisfactory testing by the procedures set forth in this part.

(b) If the manufacturer does not submit a written application for use of special test procedures but the Administrator determines that a light-duty vehicle, light-duty truck, or complete heavy-duty vehicle is not susceptible to satisfactory testing by the procedures set forth in this part, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection in accordance with the provisions of § 86.1848(a)(2).

* * * * *

75. Section 86.1844–01 is amended by revising the fourth sentence of paragraph (d)(12), the fourth sentence of paragraph (e)(3), and paragraph (g)(5), and adding paragraph (g)(14) to read as follows:

§ 86.1844–01 Information requirements: Application for certification and submittal of information upon request.

* * * * *

(d) * * *

(12) * * * The description shall include, but is not limited to, information such as model name, vehicle classification (light-duty vehicle, light-duty truck, or complete heavy-duty vehicle), sales area, engine displacement, engine code, transmission type, tire size and parameters necessary to conduct exhaust emission tests such as equivalent test weight, curb and gross vehicle weight, test horsepower (with and without air conditioning adjustment), coast down time, shift schedules, cooling fan configuration, etc. and evaporative tests such as canister working capacity, canister bed volume and fuel temperature profile. * * *

* * * * *

(e) * * *

(3) * * * The description shall include, but is not limited to, information such as model name, vehicle classification (light-duty vehicle, light-duty truck, or complete heavy-duty vehicle), sales area, engine displacement, engine code, transmission type, tire size and parameters necessary to conduct exhaust emission tests such as equivalent test weight, curb and gross vehicle weight, test horsepower (with and without air conditioning adjustment), coast down time, shift schedules, cooling fan configuration, etc and evaporative tests such as canister working capacity, canister bed volume and fuel temperature profile. * * *

* * * * *

(g) * * *

(5) Any information necessary to demonstrate that no defeat devices are present on any vehicles covered by a certificate including, but not limited to, a description of the technology employed to control CO emissions at intermediate temperatures, as applicable.

* * * * *

(14) For complete heavy-duty vehicles only, all hardware (including scan tools) and documentation necessary for EPA to read, interpret, and store (in engineering units if applicable) any information broadcast by an engine's on-board computers and electronic control modules which relates in anyway to emission control devices and auxiliary emission control devices, provided that such hardware, passwords, or documentation exists and is not otherwise commercially available. Passwords include any information necessary to enable generic scan tools or personal computers access to proprietary emission related information broadcast by an engine's on-board computer, if such passwords exist. This requirement includes access by EPA to any proprietary code information which may be broadcast by an engine's on-board computer and electronic control modules. Information which is confidential business information must be marked as such. Engineering units refers to the ability to read, interpret, and store information in commonly understood engineering units, for example, engine speed in revolutions per minute or per second, injection timing parameters such as start of injection in degree's before top-dead

center, fueling rates in cubic centimeters per stroke, vehicle speed in milers per hour or per kilometer.

* * * * *

76. Section 86.1845–01 is amended by revising paragraph (a), to read as follows:

§ 86.1845–01 Manufacturer in-use verification testing requirements.

(a) *General requirements.* A manufacturer light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles shall test, or cause to have tested a specified number of light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles. Such testing shall be conducted in accordance with the provisions of this section. For purposes of this section, the term vehicle shall include light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles.

* * * * *

77. Section 86.1845–04 is amended by revising paragraph (a)(1) and adding a new sentence to the end of paragraph (a)(3), to read as follows:

§ 86.1845–04 Manufacturer in-use verification testing requirements.

(a) * * * (1) A manufacturer of LDVs, LDTs, MDPVs and/or complete HDVs must test, or cause to have tested, a specified number of LDVs, LDTs, MDPVs and complete HDVs. Such testing must be conducted in accordance with the provisions of this section. For purposes of this section, the term vehicle includes light-duty vehicles, light-duty trucks and medium-duty vehicles.

* * * * *

(3) * * * Such procedures are not available for complete HDVs.

* * * * *

78. Section 86.1846–01 is amended by revising paragraphs (a)(1), (a)(3), (a)(4), (b) introductory text, (b)(1), (b)(2), (c), (g), (h), and (j), to read as follows:

§ 86.1846–01 Manufacturer in-use confirmatory testing requirements.

(a) * * * (1) A manufacturer of LDVs, LDTs and/or MDPVs must test, or cause testing to be conducted, under this section when the emission levels shown by a test group sample from testing under §§ 86.1845–01 or 86.1845–04, as applicable, exceeds the criteria specified in paragraph (b) of this section. The testing required under this section applies separately to each test group and at each test point (low and high mileage) that meets the specified criteria. The testing requirements apply separately for each model year starting with model year 2001. These provisions do not apply to heavy-duty vehicles or engines prior to the 2007 model year.

* * * * *

(3) For purposes of this section, the term vehicle includes light-duty vehicles, light-duty trucks, medium-duty vehicles and heavy-duty vehicles and engines, as applicable.

(4) Upon a manufacturer's written request, prior to in-use testing, that presents information to EPA regarding pre-conditioning procedures designed solely to remove the effects of high sulfur in gasoline from vehicles produced through the 2007 model year, EPA will consider allowing such procedures on a case-by-case basis. EPA's decision will apply to manufacturer in-use testing conducted under this section and to any in-use testing conducted by EPA. This provision does not apply to heavy-duty vehicles and engines.

(b) *Criteria for additional testing.* A manufacturer shall test a test group or a subset of a test group as described in paragraph (j) of this section when the results from testing conducted under §§ 86.1845–01 and 86.1845–04, as applicable, show mean emissions for that test group of any pollutant(s) to be equal to or greater than 1.30 times the applicable in-use standard and a failure rate, among the test group vehicles, for the corresponding pollutant(s) of fifty percent or greater.

(1) This requirement does not apply to Supplemental FTP testing conducted under § 86.1845–04(b)(5)(i) or evaporative/refueling testing conducted under § 86.1845–01 or § 86.1845–04. Testing conducted at high altitude under the requirements of §§ 86.1845–01 and 86.1845–04 will be included in determining if a test group meets the criteria triggering testing required under this section.

(2) The vehicle tested under the requirements of § 86.1845–01(c)(2) or § 86.1845–04(c)(2) with a minimum odometer miles of 75% of useful life will not be included in determining if a test group meets the triggering criteria.

* * * * *

(c) *Useful life.* Vehicles tested under the provisions of this section must be within the useful life specified for the emission standards which were exceeded in the testing under § 86.1845–01 or § 86.1845–04, as applicable. Testing should be within the useful life specified, subject to sections 207(c)(5) and (c)(6) of the Clean Air Act where applicable.

* * * * *

(g) *Testing.* Testing required under this section must commence within three months of completion of the testing under § 86.1845–01 or § 86.1845–04 which triggered the confirmatory testing and must be completed within seven months of the completion of the testing which triggered the confirmatory testing. Any industry review of the results obtained under § 86.1845–01 or § 86.1845–04 and any additional vehicle procurement and/or testing which takes place under the provisions of § 86.1845–01 or § 86.1845–04 which the industry believes may affect the triggering of required confirmatory testing must take place within the three month period. The data and the manufacturers reasoning for reconsideration of the data must be provided to the Agency within the three month period.

(h) *Limit on manufacturer conducted testing.* For each manufacturer, the maximum number of test group(s) (or Agency-designated subset(s)) of each model year for which testing under this section shall be required is limited to 50 percent of the total number of test groups of each model year required to be tested by each manufacturer as prescribed in § 86.1845–01 or § 86.1845–04 rounded to the next highest whole number where appropriate. For each manufacturer with only one test group under § 86.1845–01 or § 86.1845–04, as applicable, such manufacturer shall have a maximum potential testing requirement under this section of one test group (or Agency-designated subset) per model year.

* * * * *

(j) *Testing a subset.* EPA may designate a subset of the test group based on transmission type for testing under this section in lieu of testing the entire test group when the results for the entire test group from testing conducted under § 86.1845–01 or § 86.1845–04 show mean emissions and a failure rate which meet these criteria for additional testing.

79. Section 86.1848–01 is amended by revising paragraphs (c)(4) and the first sentence of paragraph (e) introductory text to read as follows:

§ 86.1848–01 Certification.

* * * * *

(c) * * *

(4) For incomplete light-duty trucks and incomplete heavy-duty vehicles, a certificate covers only those new motor vehicles which, when completed by having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in § 86.1844–01.

* * * * *

(e) A manufacturer of new light-duty vehicles, light-duty trucks, and complete heavy-duty vehicles must obtain a certificate of conformity covering such vehicles from the Administrator prior to selling, offering for sale, introducing into commerce, delivering for introduction into commerce, or importing into the United States the new vehicle. * * *

* * * * *

[FR Doc. 00–20144 Filed 10–5–00; 8:45 am]

BILLING CODE 6560–50–P