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Control of Air Pollution From New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 80, 85, and 86

[AMS–FRL–6516–2]

RIN 2060–AI23

Control of Air Pollution From New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Today's action finalizes a major program designed to significantly reduce the emissions from new passenger cars and light trucks, including pickup trucks, vans, minivans, and sport-utility vehicles. These reductions will provide for cleaner air and greater public health protection, primarily by reducing ozone and PM pollution. The program is a comprehensive regulatory initiative that treats vehicles and fuels as a system, combining requirements for much cleaner vehicles with requirements for much lower levels of sulfur in gasoline. A list of major highlights of the program appears at the beginning of the **SUPPLEMENTARY INFORMATION** section of this **Federal Register**.

The program we are finalizing today will phase in a single set of tailpipe emission standards that will, for the first time, apply to all passenger cars, light trucks, and larger passenger vehicles operated on any fuel. This set of ''Tier 2 standards'' is feasible and the use of a single set of standards is appropriate because of the increased use of light trucks for personal transportation. The miles traveled in light trucks is increasing and the emissions from these vehicles are thus an increasing problem. This approach builds on the recent technology improvements resulting from the successful National Low-Emission Vehicles (NLEV) program.

To enable the very clean Tier 2 vehicle emission control technology to be introduced and to maintain its effectiveness, we are also requiring reduced gasoline sulfur levels nationwide. The reduction in sulfur levels will also contribute directly to cleaner air in addition to its beneficial effects on vehicle emission control systems. Refiners will generally install additional refining equipment to remove sulfur in their refining processes. Importers of gasoline will be required to import and market only gasoline meeting the sulfur standards. Today's action also introduces an averaging, banking, and trading program to provide flexibility for refiners and ease implementation of the gasoline sulfur control program.

The overall program focuses on reducing the passenger car and light truck emissions most responsible for causing ozone and particulate matter problems. Without today's action, we project that emissions of nitrogen oxides from these vehicles will represent as much as 40 percent of this ozone-forming pollutant in some cities, and almost 20 percent nationwide, by the year 2030.

Today's program will bring about major reductions in annual emissions of these pollutants and also reduce the emissions of sulfur compounds resulting from the sulfur in gasoline. For example, we project a reduction in oxides of nitrogen emissions of at least 856,000 tons per year by 2007 and 1,236,000 by 2010, the time frame when many states will have to demonstrate compliance with air quality standards. Emission reductions will continue increasing for many years, reaching at least 2,220,000 tons per year in 2020 and continuing to rise further in future years. In addition, the program will reduce the contribution of vehicles to other serious public health and environmental problems, including VOC, PM, and regional visibility problems, toxic air pollutants, acid rain, and nitrogen loading of estuaries.

Furthermore, we project that these reductions, and their resulting environmental benefits, will come at an average cost increase of less than $100 per passenger car, an average cost increase of less than $200 for light trucks, and an average cost increase of about $350 for medium-duty passenger vehicles, and an average increase of less than 2 cents per gallon of gasoline (or about $120 over the life of an average vehicle).

DATES: This rule is effective April 10, 2000.

The incorporation by reference of certain publications contained in this rule are approved by the Director of the Federal Register as of April 10, 2000.

ADDRESSES: *Comments:* All comments and materials relevant to today's action have been placed in Public Docket No. A–97–10 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: Carol Connell, U.S. EPA, National Vehicle and Fuels Emission Laboratory, 2000 Traverwood, Ann Arbor MI 48105; Telephone (734) 214–4349, FAX (734) 214–4816, E-mail connell.carol@epa.gov.

SUPPLEMENTARY INFORMATION:

Highlights of the Tier2/Gasoline Sulfur Program

For cars, and light trucks, and larger passenger vehicles, the program will—

- Starting in 2004, through a phase-in, apply for the first time the same set of emission standards covering passenger cars, light trucks, and large SUVs and passenger vehicles. These emission levels (''Tier 2 standards'') are feasible for these vehicles. The Tier 2 standards are also appropriate because of the increased use of light trucks for personal transportation—the miles traveled in light trucks is increasing and the emissions from these vehicles are thus an increasing problem.
- Introduce a new category of vehicles, ''medium-duty passenger vehicles,'' thus bringing larger passenger vans and SUVs into the Tier 2 program.
- During the phase-in, apply interim fleet emission average standards that match or are more stringent than current federal and California ''LEV I'' (Low-Emission Vehicle, Phase I) standards.
- Apply the same standards to vehicles operated on any fuel.
- Allow auto manufacturers to comply with the very stringent new standards in a flexible way while ensuring that the needed environmental benefits occur.
- Build on the recent technology improvements resulting from the successful National Low-Emission Vehicles (NLEV) program and improve the performance of these vehicles through lower sulfur gasoline.
- Set more stringent particulate matter standards.
- Set more stringent evaporative emission standards.

For commercial gasoline, the program will—

- Significantly reduce average gasoline sulfur levels nationwide as early as 2000, fully phased in in 2006. Refiners will generally add refining equipment to remove sulfur in their refining processes. Importers of gasoline will be required to import and market only gasoline meeting the sulfur limits.

• Provide for flexible implementation by refiners through an averaging, banking, and trading program.

• Encourage early introduction of cleaner fuel into the marketplace through an early sulfur credit and allotment program.

• Apply temporary gasoline sulfur standards to certain small refiners and gasoline marketed in a limited geographic area in the western U.S.

• Enable the new Tier 2 vehicles to meet the emission standards by greatly reducing the degradation of vehicle emission control performance from sulfur in gasoline. Lower sulfur gasoline also appears to be necessary for the introduction of advanced technologies that promise higher fuel economy but are very susceptible to sulfur poisoning (for example, gasoline direct injection engines).

• Reduce emissions from NLEV vehicles and other vehicles already on the road.

Regulated Entities

This action will affect you if you produce new motor vehicles, alter individual imported motor vehicles to address U.S. regulation, or convert motor vehicles to use alternative fuels. It will also affect you if you produce, distribute, or sell gasoline motor fuel.

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 parts 80 and 86. If you have questions, call the person listed in the **FOR FURTHER INFORMATION CONTACT** section above.

Category	NAICS codes [a]	SIC Codes [b]	Examples of potentially regulated entities
Industry	336111	3711	Motor Vehicle Manufacturers.
	336112		
	336120		
Industry	336311	3592	Alternative fuel vehicle converters.
	336312	3714	
	422720	5172	
	454312	5984	
	811198	7549	
	541514	8742	
	541690	8931	
Industry	811112	7533	Commercial Importers of Vehicles and Vehicle Components.
	811198	7549	
	541514	8742	
Industry	324110	2911	Petroleum Refiners.
Industry	422710	5171	Gasoline Marketers and Distributors.
	422720	5172	
Industry	484220	4212	Gasoline Carriers.
	484230	4213	

[a] North American Industry Classification System (NAICS).
[b] Standard Industrial Classification (SIC) system code.

Access to Rulemaking Documents Through the Internet

Today's action is available electronically on the day of publication from the Office of the Federal Register 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 Mobile Sources 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.

Federal Register Web Site: http://www.epa.gov/docs/fedrgstr/epa-air/ (Either select a desired date or use the Search feature.)

Office of Mobile Sources (OMS) Web Site: http://www.epa.gov/oms/ (Look in ''What's New'' or under the ''Automobiles'' topic.)

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

Since the passage of the 1990 Clean Air Act Amendments, the U.S. has made significant progress in reducing emissions from passenger cars and light trucks. The National Low-Emission Vehicle (NLEV) and Reformulated Gasoline (RFG) programs are important examples of control programs that are in place and will continue to help reduce car and light-duty truck emissions into the near future.

Nonetheless, due to increasing vehicle population and vehicle miles traveled, passenger cars and light trucks will continue to be significant contributors to air pollution inventories well into the future. In fact, the emission contribution of light trucks and sport utility vehicles now matches that of passenger cars. (This is occurring because of the combination of growth in miles traveled by light trucks and the fact that their emission standards are currently less stringent than those of passenger cars). The program we describe below builds on the NLEV and RFG Phase II programs to develop a strong new national program to protect public health and the environment well into the next century. The program, while reducing VOC and other emissions, focuses especially on NO_X, because that is where the largest air quality gains can be achieved.

We have followed several overarching principles in developing this final rule:

- Design a strong national program that will assist states in every region of the country to meet their air quality objectives and that will ensure that cars and trucks continue to contribute a fair share to our nation's overall air quality solutions;
- View vehicles and fuels as an integrated system, recognizing that only by addressing both can the best overall emission performance be achieved;
- Establish a single set of emission standards that apply regardless of the fuel used and whether the vehicle is a car, a light truck, or a larger passenger vehicle;
- Provide compliance flexibilities that allow vehicle manufacturers and oil refiners to adjust to future market trends and honor consumer preferences;
- Not preclude the development of advanced low emission or fuel efficient technologies such as lean-burn engines; and
- Ensure sufficient leadtime for phase-in of the Tier 2 and gasoline sulfur program.

With these principles as background, we turn now to an overview of the vehicle and fuel aspects of the program. Sections I and II of this preamble will give you a brief overview of our program and our rationale for implementing it. Subsequent sections will expand on the air quality need, technological feasibility, economic impacts, and provide a detailed description of the specifics 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 Internet. They provide additional analyses and discussions of many topics raised in this preamble.

A. What Are the Basic Components of the Program?

The nation's air quality, while certainly better than in the past, will nevertheless continue to expose tens of millions of Americans to unhealthy levels of air pollution well into the future in the absence of significant new controls on emissions from motor vehicles. EPA is therefore finalizing 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. Under the program, automakers will produce vehicles designed to have very low emissions when operated on low-sulfur gasoline, and oil refiners will provide that much cleaner gasoline nationwide. In this preamble, we refer to the comprehensive program as the ''Tier 2/ Gasoline Sulfur program.''

1. Vehicle Emission Standards

Today's action sets new federal emission standards (''Tier 2 standards'') for passenger cars, light trucks, and larger passenger vehicles. The program is designed to focus on reducing the emissions most responsible for the ozone and particulate matter (PM) impact from these vehicles—nitrogen oxides (NO_X) and non-methane organic gases (NMOG), consisting primarily of hydrocarbons (HC) and contributing to ambient volatile organic compounds (VOC). The program will also, for the first time, apply the same set of federal standards to all passenger cars, light trucks, and medium-duty passenger vehicles. Light trucks include ''light light-duty trucks'' (or LLDTs), rated at less than 6000 pounds gross vehicle weight and ''heavy light-duty trucks'' (or HLDTs), rated at more than 6000 pounds gross vehicle weight).[1] ''Medium-duty passenger vehicles'' (or MDPVs) form a new class of vehicles introduced by this rule that includes SUVs and passenger vans rated at between 8,500 and 10,000 GVWR. The program thus ensures that essentially all vehicles designed for passenger use in the future will be very clean vehicles.

The Tier 2 standards finalized today will reduce new vehicle NO_X levels to an average of 0.07 grams per mile (g/mi). For new passenger cars and light LDTs, these standards will phase in beginning in 2004, with the standards to be fully phased in by 2007.[2] For heavy LDTs and MDPVs, the Tier 2 standards will be phased in beginning in 2008, with full compliance in 2009.

During the phase-in period from 2004–2007, all passenger cars and light LDTs not certified to the primary Tier 2 standards will have to meet an interim average standard of 0.30 g/mi NO_X, equivalent to the current NLEV standards for LDVs and more stringent than NLEV for LDT2s (e.g., minivans).[3] During the period 2004–2008, heavy LDTs and MDPVs not certified to the final Tier 2 standards will phase in to an interim program with an average standard of 0.20 g/mi NO_X, with those not covered by the phase-in meeting a per-vehicle standard (i.e., an emissions ''cap'') of 0.6 g/mi NO_X (for HLDTs) and 0.9 g/mi NO_X (for MDPVs). The average standards for NO_X will allow manufacturers to comply with the very stringent new standards in a flexible way, assuring that the average emissions of a company's production meet the target emission levels while allowing the manufacturer to choose from several more- and less-stringent emission categories for certification.

We are also setting stringent particulate matter standards that will be especially important if there is substantial future growth in the sales of diesel vehicles. Before 2004, we are establishing more stringent interim PM standards for most light trucks than exist now under NLEV. With higher sales of diesel cars and light trucks, they could easily contribute between one-half and two percent of the PM10 concentration allowed by the NAAQS, with some possibility that the contribution could be as high as 5 to 40 percent in some roadside situations with heavy traffic. These increases would make attainment even more difficult for 8 counties which we already predict to need further emission reductions even without an increase in diesel sales, and would put at risk another 18 counties which are now within 10 percent of a NAAQS violation. Thus, by including a more stringent PM standard in the program finalized today, we help address environmental concerns about the potential growth in the numbers of light-duty diesels on the road—even if that growth is substantial. The new requirements also include more stringent hydrocarbon controls (exhaust NMOG and evaporative emissions standards). We will also monitor the progress of the development of advanced technologies and the role of fuels.

2. Gasoline Sulfur Standards

The other major part of today's action will significantly reduce average gasoline sulfur levels nationwide. We expect these reductions could begin to phase in as early as 2000, with full compliance for most refiners occurring by 2006. Refiners will generally install advanced refining equipment to remove sulfur during the production of gasoline. Importers of gasoline will be required to import and market only gasoline meeting the sulfur limits. Temporary, less stringent standards will apply to a few small refiners through 2007. In addition, temporary, less stringent standards will apply to a limited geographic area in the western U.S. for the 2004–2006 period.

This significant new control of gasoline sulfur content will have two important effects. The lower sulfur levels will enable the much-improved emission control technology necessary to meet the stringent vehicle standards of today's rule to operate effectively over the useful life of the new vehicles. In addition, as soon as the lower sulfur gasoline is available, all gasoline vehicles already on the road will have reduced emissions—from less degradation of their catalytic converters and from fewer sulfur compounds in the exhaust.

Today's action will encourage refiners to reduce sulfur in gasoline as early as 2000. The program requires that most refiners and importers meet a corporate average gasoline sulfur standard of 120 ppm and a cap of 300 ppm beginning in 2004. By 2006, the cap will be reduced to 80 ppm and most refineries must produce gasoline averaging no more than 30 ppm sulfur. The program builds upon the existing regulations covering gasoline composition as it relates to emissions performance. It includes provisions for trading of sulfur credits, increasing the flexibility available to refiners for complying with the new requirements. We intend for the credit program to ease compliance uncertainties by providing refiners the flexibility to phase in early controls in 2000–2003 and use credits gained in these years to delay some control until as late as 2006. As finalized today, the program will achieve the needed environmental benefits while providing substantial flexibility to refiners.

B. What Is Our Statutory Authority for Today's Action?

1. Light-Duty Vehicles and Trucks

We are setting motor vehicle emission standards under the authority of section 202 of the Clean Air Act. Sections 202(a) and (b) of the Act provide EPA with general authority to prescribe vehicle standards, subject to any specific limitations otherwise included in the Act. Sections 202(g) and (h) specify the current standards for LDVs and LDTs, which became effective beginning in model year 1994 (''Tier 1 standards'').

Section 202(i) of the Act provides specific procedures that EPA must follow to determine whether standards more stringent than Tier 1 standards for LDVs and certain LDTs[4] are appropriate beginning between the 2004 and 2006 model years.[5] Specifically, we are required to first issue a study regarding ''whether or not further reductions in emissions from light-duty vehicles and light-duty trucks should be required * * *'' (the ''Tier 2 Study''). This study ''shall examine the need for further reductions in emissions in order to attain or maintain the national ambient air quality standards.'' It is also to consider: (1) The availability of technology to meet more stringent standards, taking cost, lead time, safety, and energy impacts into consideration; and (2) the need for, and cost effectiveness of, such standards, including consideration of alternative methods of attaining or maintaining the national ambient air quality standards. A certain set of ''default'' emission

[1] A vehicle's ''Gross Vehicle Weight Rating,'' or GVWR, is the curb weight of the vehicle plus its maximum recommended load of passengers and cargo.

[2] By comparison, the NO_X standards for the National Low Emission Vehicle (NLEV) program, which will be in place nationally in 2001, range from 0.30 g/mi for passenger cars to 0.50 g/mi for medium-sized light trucks (larger light trucks are not covered). For further comparison, the standards met by today's Tier 1 vehicles range from 0.60 g/mi to 1.53 g/mi.

[3] There are also NMOG standards associated with both the interim and Tier 2 standards. The NMOG standards vary depending on which of various individual sets of emission standards manufacturers choose to use in complying with the average NO_X standard. This ''bin'' approach is described more fully in section IV.B. of this preamble.

[4] LDTs with a loaded vehicle weight less than or equal to 3750 pounds, called LDT1s and LDT2s.

[5] Section 202(b)(1)(C) forbids EPA from promulgating mandatory standards more stringent than Tier 1 standards until the 2004 model year.

standards for these vehicle classes is among those options for new standards that EPA is to consider.

After the study is completed and the results are reported to Congress, EPA is required to determine by rulemaking whether: (1) There is a need for further emission reductions; (2) the technology for more stringent emission standards from the affected classes is available; and (3) such standards are needed and cost-effective, taking into account alternatives. If EPA answers ''yes'' to these questions, then the Agency is to promulgate new, more stringent motor vehicle standards (''Tier 2 standards'').

EPA submitted its report to Congress on July 31, 1998. Today's final rule makes affirmative responses to the three questions above (see Section II below) and sets new standards that are more stringent than the default standards in the Act.

EPA is also setting standards for larger light-duty trucks and MDPVs under the general authority of Section 202(a)(1) and 202(b) and under Section 202(a)(3) of the Act, which requires that standards applicable to emissions of hydrocarbons, NO_X, CO and PM from heavy-duty vehicles[6] reflect the greatest degree of emission reduction available for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety. We are also setting standards for formaldehyde under our authority in sections 202(a) and (l).

2. Gasoline Sulfur Controls

We are adopting gasoline sulfur controls pursuant to our authority under Section 211(c)(1) of the Clean Air Act.[7] Under Section 211(c)(1), EPA may adopt a fuel control if at least one of the following two criteria is met: (1) The emission products of the fuel cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare; or (2) the emission products of the fuel will significantly impair emissions control systems in general use or which will be in general use were the fuel control to be adopted.

We are adopting gasoline sulfur controls based on both of these criteria. Under the first criterion, we believe that sulfur in gasoline used in Tier 1 and LEV technology vehicles contributes to ozone pollution, air toxics, and PM. Under the second criterion, we believe that gasoline sulfur in fuel will significantly impair the emissions control systems expected to be used in Tier 2 technology vehicles, as well as emissions control systems currently used in LEVs. Please refer to Section IV.C. below and to the Final Regulatory Impact Analysis (RIA) for more details of our analysis and findings. The RIA includes a more detailed discussion of EPA's authority to set gasoline sulfur standards, including a discussion of our conclusions relating to the factors required to be considered under Section 211(c).

C. The Tier 2 Study and the Sulfur Staff Paper

On July 31, 1998, EPA submitted its report to Congress containing the results of the Tier 2 study.[8] The study indicated that in the 2004 and later time frame, there will be a need for emission reductions to aid in meeting and maintaining the National Ambient Air Quality Standards (NAAQS) for both ozone and PM. Air quality modeling showed that in the 2007–2010 time frame, when Tier 2 standards will become fully effective, a number of areas will still be in nonattainment for ozone and PM even after the implementation of existing emission controls. The study also noted the continued existence of carbon monoxide (CO) nonattainment areas. It also found ample evidence that technologies will be available to meet more stringent Tier 2 standards. In addition, the study provided evidence that such standards could be implemented at a similar cost per ton of reduced pollutants as other programs aimed at similar air quality problems. Finally, the study identified several additional issues in need of further examination, including the relative stringency of car and light truck emission standards, the appropriateness of identical versus separate standards for gasoline and diesel vehicles, and the effects of sulfur in gasoline on catalyst efficiency. Section IV of this preamble describes the steps we have taken to follow up on the Tier 2 Study.

In addition, on May 1, 1998, EPA released a staff paper presenting EPA's understanding of the impact of gasoline sulfur on emissions from motor vehicles and exploring what gasoline producers and automobile manufacturers could do to reduce sulfur's impact on emissions. The staff paper noted that gasoline sulfur degrades the effectiveness of catalytic converters and that high sulfur levels in commercial gasoline could affect the ability of future automobiles—especially those designed for very low emissions—to meet more stringent standards in use. It also pointed out that sulfur control will provide additional benefits by lowering emissions from the current fleet of vehicles.

D. Relationship of Diesel Fuel Sulfur Control to the Tier 2/Gasoline Sulfur Program

In the NPRM, we raised the question of what if any changes to diesel fuel may be needed to enable diesel vehicles to meet the Tier 2 standards or any future heavy-duty diesel engine standards. Specifically, we raised the question of whether diesel sulfur levels need to be controlled. Since diesel fuel controls of any kind would have an impact on the refinery as a whole, and since in some cases (including potential diesel sulfur limits) could have implications for gasoline sulfur control, we requested comment on this issue in our proposal. We also indicated that we planned to release an Advance Notice of Proposed Rulemaking to solicit more information on this subject.

We published the ANPRM on May 13, 1999 (64 FR 26142). We are in the process of considering all of the comments received in response to the ANPRM and plan to issue a Notice of Proposed Rulemaking (NPRM) in early spring of 2000. We received many comments on the subject of diesel fuel control along with the comments submitted on the proposed Tier 2/Gasoline Sulfur regulations. We have prepared brief responses to some of these comments in the Response to Comments document, and will deal fully with these comments as part of the forthcoming NPRM on diesel fuel. We are taking no action on diesel fuel as part of today's action.

II. Tier 2 Determination

Based on the statutory requirements described above and the evidence provided in the Tier 2 Study and since its release, as described elsewhere in this preamble, EPA has determined that new, more stringent emission standards are indeed needed, technologically feasible, and cost effective.

[6] LDTs that have gross vehicle weight ratings above 6000 pounds are considered ''heavy-duty vehicles'' under the Act. See section 202(b)(3). For regulatory purposes, we refer to these LDTs as ''heavy light-duty trucks'' made up of LDT3s and LDT4s.

[7] We currently have regulatory requirements for conventional and reformulated gasoline adopted under Sections 211(c) and 211(k) of the Act, in addition to the ''substantially similar'' requirements for fuel additives of Section 211(f). These requirements have the effect of limiting sulfur levels in gasoline to some extent. See the Final RIA for more details.

[8] On April 28, 1998, EPA published a notice of availability announcing the release of a draft of the Tier 2 study and requesting comments on the draft. The final report to Congress included a summary and analysis of the comments EPA received.

A. There Is a Substantial Need for Further Emission Reductions in Order to Attain and Maintain National Ambient Air Quality Standards

EPA finds that there is a clear air quality need for new emission standards, based on the continuing air quality problems predicted to exist in future years. As the discussion in Section III.B. illustrates, 26 metropolitan areas are each certain or highly likely to need additional reductions. These areas are distributed across most regions of the U.S., and have a combined population of over 86 million. Section III.B. also shows that an additional 12 areas each has a moderate to significant probability of needing additional reductions, representing another 25 million people. This provides ample evidence that further emission reductions are needed to meet the 1-hour ozone NAAQS.

In addition to these ozone concerns, our analysis of PM_{10} monitoring data and PM_{10} projections indicates that 15 PM_{10} nonattainment counties violated the PM_{10} NAAQS in recent years, and that 8 of them with a 1996 population of almost 8 million have a high risk of failing to attain and maintain without more emission reductions. Eighteen other counties, with a population of 23 million have a significant risk of failing or are within 10 percent of violating the PM_{10} NAAQS. It is also important to recognize that nonattainment areas remain for other criteria pollutants (*e.g.,* CO) and that non-criteria pollution (*e.g.,* air toxics and regional haze) also contributes to environmental and health concerns.

B. More Stringent Standards for Light-Duty Vehicles and Trucks Are Technologically Feasible

We find that emission standards significantly more stringent than current Tier 1 and National Low Emission Vehicle (NLEV) levels are technologically feasible. This is true both for the LDVs and LDTs specifically covered in section 202(i) and for the medium-duty passenger vehicles also included in today's final rule. Manufacturers are currently producing NLEV vehicles that meet more stringent standards than similar Tier 1 models. Our analysis shows that mainly through improvements in engine control software and catalytic converter technology, manufacturers can build and are building durable vehicles and trucks, including heavy light-duty trucks, which have very low emission levels.[9] Section IV.A. below discusses our feasibility conclusions in more detail.

Many current production vehicles are already certified at or near the Tier 2 standards. For year 2000 certification (although not yet complete), over 50 vehicle models have emissions at or below Tier 2 levels. In addition, we performed a demonstration program at our EPA laboratory that showed that even large vehicles, which would be expected to face the toughest challenges reaching Tier 2 emission levels, can do so with conventional technology. Others, including the Manufacturers of Emission Controls Association (MECA) and the State of California, have also performed demonstration programs, with similar results. Manufacturers have also certified LDVs and LDTs to NMOG and CO levels as much as 80 percent below Tier 1 standards. Furthermore, for passenger vehicles greater than 8500 lbs GVWR, we believe that by using technologies and control strategies similar to what will be used on lighter vehicles, manufacturers will be able to meet the Tier 2 emission standards.

Thus, we believe that, by the 2004–2009 time frame, manufacturers will be fully able to comply with the new Tier 2 emission standard levels. In addition, to facilitate manufacturers' efforts to meet these new standards, the Tier 2 regulations include a phase-in over several years and a corporate fleet average NO_X standard, which will allow manufacturers to optimize the deployment of technology across their product lines with no loss of environmental benefit. Our analysis of the available technology improvements and the very low emission levels already being realized on these vehicles leads us to find that the standards adopted today are fully feasible for LDVs and LDTs.

C. More Stringent Standards for Light-Duty Vehicles and Trucks Are Needed and Cost Effective Compared to Available Alternatives

In this action, we also find that more stringent motor vehicle standards are both necessary and cost effective. As discussed above, substantial further reductions in emissions are needed to help reduce the levels of unhealthy air pollution to which millions of people are being exposed; in particular, we expect that a number of areas will not attain or maintain compliance with the National Ambient Air Quality Standards for ozone and PM_{10} without such reductions. (We describe this further in Section III below and in the RIA.)

Furthermore, mobile sources are important contributors to the air quality problem. As we will explain more fully later in this preamble, in the year 2030, the cars and light trucks that are the subject of today's final rule are projected to contribute as much as 40 percent of the total NO_X inventory in some cities, and almost 20 percent of nationwide NO_X emissions. This situation would have been considerably worse without the NLEV program created by vehicle manufacturers, EPA, the Northeastern states, and others.

These emission reductions are clearly necessary to meet and maintain the 1-hour ozone NAAQS. We project that while the emission reductions of this program will lead to substantial progress in meeting and maintaining the NAAQS, many areas will still not come into attainment even with this magnitude of reductions.

We find that the Tier 2/Gasoline Sulfur program is a reasonable, cost-effective method of providing substantial progress towards attainment and maintenance of the NAAQS, costing about $2000 per ton of NO_X plus hydrocarbon emissions reduced. This program will reduce annual NO_X emissions by about 2.2 million tons per year in 2020 and 2.8 million tons per year in 2030 after the program is fully implemented. By way of comparison, when EPA established its 8-hour NAAQS for ozone, we identified several types of emission control programs that were reasonably cost effective. If all of the controls identified in that analysis costing less than $10,000/ton were implemented nationwide, they would produce NO_X emission reductions of about 2.9 million tons per year. (That is, to achieve about the same emission reductions as the Tier 2/Gasoline Sulfur program, other alternative measures would have a significantly higher cost per ton). These emission reductions are clearly necessary to meet and maintain the one-hour ozone NAAQS. We project that while the emission reductions of this program will lead to substantial progress in meeting and maintaining the NAAQS, many areas will still not come into attainment even with this magnitude of reductions.

In addition, the magnitude of emission reductions that can be achieved by a comprehensive national Tier 2/Gasoline Sulfur program will be difficult to achieve from any other source category. Given the large contribution that light-duty mobile source emissions make to the national emissions inventory and the range of control programs ozone-affected areas

[9] The Final RIA contains a more detailed analysis, and Section IV.A. below has further discussion of the technological feasibility of our standards including detailed discussions of the various technology options that we believe manufacturers may use to meet these standards.

already have in place or would be expected to implement, we believe it will be very difficult, if not impossible, to meet (and maintain) the ozone NAAQS in a cost-effective manner without large emission reductions from LDVs and LDTs. We expect emissions from MDPVs to also play an increasing role.

Furthermore, we project that the Tier 2/Gasoline Sulfur program will significantly reduce direct and secondary particulate matter coming from LDVs, LDTs, and MDPVs—by about 36,000 tons per year of direct PM alone by 2030; large secondary PM reductions from significantly lower NO_X and SO_X emissions will add to the overall positive impact on airborne particles. These reductions will be very cost-effective compared to other measures to reduce PM pollution. Because direct PM emissions from gasoline vehicles are related the presence of sulfur in gasoline, no new emission control devices, beyond what manufacturers are expected to install to meet the NO_X and NMOG standards, will be necessary to provide the reductions expected for these pollutants under the program. The standards will provide valuable insurance against increases in PM emissions from LDVs, LDTs, and MDPVs.

Finally, the Tier 2/Gasoline Sulfur program will significantly reduce CO emissions from LDVs, LDTs, and MDPVs. (See Chapter III of the RIA for an analysis of these reductions.) The technical changes needed to meet the NMOG standards will also result in CO reductions sufficient to meet the CO standards. Thus, these CO reductions will be very cost-effective since they will not require any new emission control devices beyond what manufacturers are expected to install to meet the NO_X and NMOG standards.

We conclude, then, that today's final rule is a major source of ozone precursor, PM, and CO emission reductions when compared to other available options. The discussions of cost and cost effectiveness later in this preamble and in the RIA explain the derivation of cost effectiveness estimates and compares them to the cost effectiveness of other alternatives. That discussion indicates that this program will have a cost effectiveness comparable to both the Tier 1 and NLEV standards and will also be cost effective when compared to non-mobile source programs.

III. Air Quality Need For and Impact Of Today's Action

In the absence of significant new controls on emission, tens of millions of Americans would continue to be exposed to unhealthy levels of air pollution. Emissions from passenger cars and light trucks are a significant contributor to a number of air pollution problems. Today's action will significantly reduce emissions from cars and light trucks and hence will significantly reduce the health risks posed by air pollution. This section summarizes the results of the analyses we performed to arrive at our determination that continuing air quality problems are likely to exist, that these air quality problems would be in part due to emissions from cars and light trucks, and that the new standards promulgated by today's final rule will improve air quality and mitigate other environmental problems.

A. Americans Face Serious Air Quality Problems That Require Further Emission Reductions

Air quality in the United States continues to improve. Nationally, the 1997 air quality levels were the best on record for all six criteria pollutants. [10] In fact, the 1990s have shown a steady trend of improvement, due to reductions in emissions from most sources of air pollution, from factories to motor vehicles. Despite great progress in air quality improvement, in 1997 there were still approximately 107 million people nationwide who lived in counties with monitored air quality levels above the primary national air quality standards. [11] There are also people living in counties outside of the air monitoring network where violations of the NAAQS could have also occurred during the year. Moreover, unless there are reductions in overall emissions beyond those that are scheduled to be achieved by already committed controls, many of these Americans will continue to be exposed to unhealthy air.

Ambient ozone is formed in the lower atmosphere through a complex interaction of VOC and NO_X emissions. Cars and light trucks emit a substantial fraction of these emissions. Ambient PM is emitted directly from cars and light trucks; it also forms in the atmosphere from NO_X, sulfur oxides (SO_X), and VOC, all of which are emitted by motor vehicles. When ozone exceeds the air quality standards, otherwise healthy people often have reduced lung function and chest pain, and hospital admissions for people with respiratory ailments like asthma increase; for longer exposures, permanent lung damage can occur. Similarly, fine particles can penetrate deep into the lungs. Results of studies suggest a likely causal role of ambient PM in contributing to reported effects, such as: premature mortality, increased hospital admissions, increased respiratory symptoms, and changes in lung tissue. When either ozone or PM air quality problems are present, those hardest hit tend to be children, the elderly, and people who already have health problems.

The health effects of high ozone and PM levels are not the only reason for concern about continuing air pollution. Ozone and PM also harm plants and damage materials. PM reduces visibility and contributes to significant visibility impairment in our national parks and monuments and in many urban areas. In addition, air pollution from motor vehicles contributes to cancer and other health risks, acidification of lakes and streams, eutrophication of coastal and inland waters, and elevated drinking water nitrate levels. These problems impose a substantial burden on public health, our economy, and our ecosystems.

In recognition of this burden, Congress has passed and subsequently amended the Clean Air Act. The Clean Air Act requires each state to have an approved State Implementation Plan (SIP) that shows how an area plans to meet its air quality obligations, including achieving and then maintaining attainment of all of the National Ambient Air Quality Standards (NAAQS), such as those for ozone and PM. The Clean Air Act also requires EPA to periodically re-evaluate the NAAQS in light of new scientific information. Our most recent re-evaluation of the ozone and PM NAAQS led us to revise both standards (62 FR 38856, July 18, 1997 and 62 FR 38652, July 18, 1997). These revised standards reflected additional information that had become available since the previous revision of the ozone and PM standards, respectively.

On May 14, 1999, a panel of the United States Court of Appeals for the District of Columbia Circuit reviewed EPA's revisions to the ozone and PM NAAQS and found, by a 2–1 vote, that sections 108 and 109 of the Clean Air Act, as interpreted by EPA, represent unconstitutional delegations of Congressional power. *American Trucking Ass'n., Inc. et al.,* v. *Environmental Protection Agency*, 175 F.3d 1027 (D.C. Cir. 1999). Among other things the Court remanded the record

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[10] National Air Quality and Emissions Trend Report, 1997, Air Quality Trends Analysis Group, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, N.C., December 1998 (available on the World Wide Web at http://www/epa.gov/oar/aqtrnd97/).

[11] U.S. Environmental Protection Agency, *Latest Findings on National Air Quality: 1997 Status and Trends.* December 1998.

for the 8-hour ozone NAAQS and the $PM_{2.5}$ NAAQS to EPA. On October 29, 1999, EPA's petition for rehearing by the three judge panel was denied, with the exception that the panel modified its prior ruling regarding EPA's authority to implement a revised ozone NAAQS under Part D subpart 2 of Title I. EPA's petition for rehearing en banc by the full Circuit was also denied, although five of the nine judges considering the petition agreed to rehear the case.

As a result of the Court's decision, requirements on the States to implement the new 8-hour ozone standard have been suspended although the standard itself is still in force and the science behind it has generally not been contradicted. The court also did not question EPA's findings regarding the health effects of PM_{10} and $PM_{2.5}$. However, due to the uncertainty regarding the status of the new NAAQS, we will rely on the preexisting NAAQS in determining air quality need under section 202(i) of the Act.

Carbon monoxide (CO) can cause serious health effects for those who suffer from cardiovascular disease, such as angina pectoris. There has been considerable progress in attaining the longstanding NAAQS for carbon monoxide, largely through more stringent standards for CO from motor vehicles. This progress has been made despite large increases in travel by vehicle. In 1997, there were about 9 million people living in three counties with CO concentrations above the level of the CO NAAQS. In the recent past, this figure has fluctuated up and down. At the present time there are 15 counties classified as serious CO nonattainment areas, all with a recent history of NAAQS violations. At this time, prospects for these areas attaining by the serious CO area attainment deadline of December 31, 2000 are uncertain. While violations of the NAAQS have not occurred recently in most of the other 33 counties still classified as nonattainment, even these must demonstrate that they will remain safely below the NAAQS for ten years despite expected growth in vehicle travel and other sources of CO emissions before they can be reclassified to attainment. Because of the large role of motor vehicles in causing high ambient CO concentrations, where there is reason to be concerned about CO attainment and maintenance, local areas look to national emission standards for most of the solution.

As discussed below, EPA has also finalized regulations that regions and states implement plans for protecting and improving visibility in the 156 mandatory Federal Class I areas as defined in Section 162(a) of the Clean Air Act. These areas are primarily national parks and wilderness areas.

To accomplish the goal of full attainment in all areas according to the schedules for the various NAAQS, and to achieve the goals of the visibility program, the federal government must assist the states by reducing emissions from sources that are not as practical to control at the state level as at the federal level. Vehicles and fuels move freely among the states, and they are produced by national or global scale industries. Most individual states are not in a position to regulate these industries effectively and efficiently. The Clean Air Act therefore gives EPA primary authority to regulate emissions from the various types of highway vehicles and their fuels. Our actions to reduce emissions from these and other national sources are a crucial and essential complement to actions by states to reduce emissions from more localized sources.

If we were not to adopt new standards to reduce emissions from cars and light trucks, emissions from these vehicles would remain a large portion of the emissions burden that causes elevated ozone and continued nonattainment with the ozone NAAQS, which in turn would affect tens of millions of Americans. Because the contribution of cars and light trucks to both local emissions and transported pollution would be so great, and the expected emission reduction shortfall in many areas is so large, further reductions from cars and light trucks will be an important element of many attainment strategies, especially for ozone in the 2007 to 2010 time frame. The contribution of these vehicles to PM exposure and PM nonattainment would also remain significant, and would increase considerably if diesel engines are used in more cars or light trucks. Furthermore, without new standards, steady annual increases in fleet size and miles of travel would outstrip the benefits of current emission controls, and would cause ozone-forming emissions from cars and trucks to grow each year starting about 2013.

The standards being promulgated by today's actions will reduce emissions of ozone precursors and PM precursors from cars and light trucks greatly. However, even with this decrease, many areas will likely still find it necessary to obtain additional reductions from other sources in order to fully attain the ozone and PM NAAQS. Their task will be easier and the economic impact on their industries and citizens will be lighter as a result of the standards promulgated by today's actions. 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. Those that remain in nonattainment therefore will have to consider their remaining alternatives. Many of the state and local programs states may consider as alternatives are very costly, and the emissions impact from each additional emissions source subjected to new emissions controls would be considerably smaller than the emissions impact of the standards being promulgated today. Therefore, the emission reductions from these standards for gasoline, cars, and light trucks 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 connected with individual and small business activities. The emission reductions from the standards being promulgated today will also reduce the need for states to seek even deeper reductions from large and small sources already subject to emission controls.

We project that today's actions will also have important benefits for carbon monoxide, regional visibility, acid rain, and coastal water quality.

For these and other reasons discussed in this document, we have determined that significant emission reductions will still be needed by the middle of the next decade and beyond to achieve and maintain further improvements in air quality in many, geographically dispersed areas. We also believe that a significant portion of these emission reductions will be obtained by reducing emissions from cars and light trucks as a result of today's actions. We believe that such reductions are necessary (since cars and light trucks are such large contributors to current and projected ozone problems) and reasonable (since these reductions can be achieved at a reasonable cost compared to other alternative reductions).

The remainder of this section describes the health and environmental problems that today's actions will help mitigate and the expected health and environmental benefits of these actions. Ozone is discussed first, followed by PM, other criteria pollutants, visibility, air toxics, and other environmental impacts. The emission inventories and air quality analyses are explained more fully in the Regulatory Impact Analysis for today's actions.

B. Ozone

1. Background on Ozone Air Quality

Ground-level ozone is the main harmful ingredient in smog.[12] Ozone is produced by complex chemical reactions when its precursors, VOC and NO_X, react in the presence of sunlight.

Short-term (1–3 hours) and prolonged (6–8 hours) exposures to ambient ozone at levels common in many cities have been linked to a number of health effects of concerns. For example, increased hospital admissions and emergency room visits for respiratory causes have been associated with ambient ozone exposures at such levels. Repeated exposures to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate pre-existing respiratory diseases such as asthma. Other health effects attributed to ozone exposures include significant decreases in lung function and increased respiratory symptoms such as chest pain and cough. These effects generally occur while individuals are engaged in moderate or heavy exertion.

Children active outdoors during the summer when ozone levels are at their highest are most at risk of experiencing such effects. Other at-risk groups include adults who are active outdoors (*e.g.,* outdoor workers), and individuals with pre-existing respiratory disease such as asthma and chronic obstructive lung disease. In addition, longer-term exposures to moderate levels of ozone present the possibility of irreversible changes in the lungs which could lead to premature aging of the lungs and/or chronic respiratory illnesses.

Ozone also affects vegetation and ecosystems, leading to reductions in agricultural and commercial forest yields, reduced growth and survivability of tree seedlings, and increased plant susceptibility to disease, pests, and other environmental stresses (*e.g.,* harsh weather). In long-lived species, these effects may become evident only after several years or even decades, thus having the potential for long-term effects on forest ecosystems. Ground-level ozone damage to the foliage of trees and other plants also can decrease the aesthetic value of ornamental species as well as the natural beauty of our national parks and recreation areas.

Many areas which were classified as nonattainment when classifications were made under the 1990 Clean Air Act Amendments have not experienced violations more recently. However, 50 metropolitan areas had ozone design values above the NAAQS in either or both of the 1995–1997 and the 1996–1998 monitoring periods. In many urban areas, the downward trend in ozone that prevailed earlier has become less strong or stopped in the last few years, even when adjustments are made for meteorological conditions. We believe that one factor that has worked against ozone improvement in the last few years has been the growing use of light trucks with higher emissions than the cars used formerly. The predictions of future ozone concentrations used in developing today's action take account of this growing use of light trucks.

2. Additional Emission Reductions Are Needed To Attain and Maintain the Ozone NAAQS

a. Summary

We have determined that additional emission reductions are needed to attain and maintain the 1-hour ozone NAAQS. This overall conclusion is based on our prediction that 26 metropolitan areas are each certain or highly likely to need additional reductions, and that an additional 12 areas each have a moderate to significant probability of needing them.

To determine whether additional reductions are needed in order to attain and maintain the ozone NAAQS, we used ozone modeling to predict what areas would not attain the NAAQS in the future. We accounted for the emission reductions that have already been achieved, those that will be achieved in the future by actions already underway, and increases in emissions expected from increased use of sources of pollution.

In our May 13, 1999 proposal, we presented information from photochemical modeling we performed to predict what areas would meet the ozone NAAQS in 2007. The year 2007 falls after the expected date of most emission reductions which states are required to achieve or have otherwise committed to achieve, and near the attainment deadline for many ozone nonattainment areas. We presented additional information from the same photochemical modeling work in two supplemental notices, on June 30, 1999 (to better explain the basis for our proposal in light of the Court's ruling on the 8-hour ozone NAAQS), and October 25, 1999 (to explain the implications for our Tier 2/Gasoline Sulfur proposal from our more recent proposal, which we expect to make final shortly, to re-instate the 1-hour ozone NAAQS in many areas). In Response to Comments on these Federal Register notices, we made revisions to our own ozone modeling. We also obtained ozone modeling results from a number of state air planning agencies and from members of the automobile manufacturing industry. We have considered all of this information as part of our determination that the regulations promulgated in this rule are needed and appropriate.

Based on the available ozone modeling and other information, we project that there are 26 metropolitan areas which will be unable to attain and maintain the NAAQS, in the absence of additional reductions. These areas had a combined population of over 86 million in 1996, and are distributed across most regions of the U.S. We have concluded that each is certain or very likely to require additional reductions to attain the NAAQS. Taken together and considering their number, size, and geographic distribution, these areas establish the case that additional reductions are needed in order to attain and maintain the 1-hour standard.

In addition, our analysis suggests there will be other areas that will have problems attaining and maintaining compliance with the one-hour ozone standard in the future. There are 12 additional metropolitan areas with a total 1996 population of over 25 million people in this category. EPA's ozone modeling for 2007 predicts exceedances for each of these areas. However, for six of them local recent monitoring information is not indicating nonattainment. Given how close to nonattainment these areas are, EPA believes it is likely that at least a significant subset of this group of areas will face compliance problems by 2007 or beyond if additional actions to lower air emissions are not taken. This belief is based on historical experience with areas that will undergo economic and population growth over time and that are in larger regions that are also experiencing growth. The other six areas in this group are nonattainment now, and local modeling shows them reaching attainment by 2005 or 2007. Modeling uncertainties and growth beyond the attainment date make it likely that at least some of these areas will also face compliance problems if additional actions to lower air emissions are not taken. This situation further supports our determination that additional reductions in mobile source emissions are needed for attainment and maintenance.

We would like to emphasize that the advantages of the Tier 2/Gasoline Sulfur program will be enjoyed by the whole country. There are important advantages for approximately 30 more metropolitan

[12] Total column ozone, a large percentage of which occurs in the stratosphere and a smaller percentage of which occurs in the troposphere, helps to provide a protective layer against ultraviolet radiation.

areas, with close to 30 million people residing in them, whose ozone levels are now within 10 percent of violating the 1-hour NAAQS.[13] Most of these areas have been in nonattainment in the past. We believe the emission reductions from the Tier 2/Gasoline Sulfur program are an important component of an overall EPA-state approach to enable these areas to continue to maintain clean air given expected growth. EPA believes that the long term ability of the states to continue to meet the NAAQS is extremely important. In the future, EPA will be considering additional approaches for assisting in maintenance of the NAAQS. Also, we believe that the Tier 2/Gasoline Sulfur program has important benefits for other nonattainment areas which our modeling and local modeling show to be on a path to come into attainment in the next eight years. For these areas, the extra emission reductions from the program will take some of the uncertainty out of their plan to attain the standard and give them a head start on developing their plan to stay in attainment.

In every area of the country, the new standards will give transportation planning bodies and industrial development leaders more options within the area's overall emissions constraints. This will allow local and state officials to better accommodate local needs and growth opportunities. With these new standards for vehicles and gasoline, unusually adverse weather or strong local economic growth will be less likely to cause ozone levels high enough to trigger the planning requirements of the Clean Air Act. In addition, by reducing emissions and ozone levels across the nation as a whole, there will be less transport of ozone between areas, reducing the amount of ozone entering downwind areas. This will give the downwind areas a better opportunity to maintain and attain the NAAQS through local efforts.

All of our determinations presented here about the need for the Tier 2/ Gasoline Sulfur program take into account the prior NO_X reductions we expect from the Regional Ozone Transport Rule. This rule is now in litigation. If the outcome of that litigation reduces the NO_X reductions that will be achieved, the need for the Tier 2/Gasoline Sulfur program will be even greater.

[13] As measured by ozone design value.

b. Ozone Modeling Presented in Our Proposal and Supplemental Notices

The ozone modeling we presented in our proposal and the two supplemental notices was originally conducted as part of our development of the Regional Ozone Transport Rule. The ''revised budget'' emission control scenario we modeled for the Regional Ozone Transport Rule contained the right set of existing and committed emission controls for it to serve as the starting point for making our determination on the need for additional emission reductions. We added a new ''control case'' to represent the effects of our proposed vehicle and gasoline standards.

This ozone modeling provided predictions of ozone concentrations in 2007 across the eastern U.S., under certain meteorological conditions. Predictions of attainment or nonattainment are based on these predicted ozone concentrations. Two approaches to making attainment predictions have been used or advocated in the past: a rollback approach and an exceedance approach. In the NPRM of May 13, 1999, we presented predictions of attainment and nonattainment using a rollback approach. For the 1-hour standard, we reported that 8 metropolitan areas and two rural counties were predicted to be in nonattainment in 2007 under the rollback method. In the first supplemental notice of June 30, 1999 we presented a prediction that 17 areas would be nonattainment based on the exceedance method, and invited comment on all aspects of the modeling and its interpretation. Our second and last notice on October 27, 1999, presented predictions of violations using the exceedance method for additional areas which we had previously excluded because the 1-hour standard did not apply to them. This was in anticipation of the reinstatement of the 1-hour standard to these areas, which we proposed on October 25, 1999 and expect to complete very soon. 64 FR 57524. We also announced that we were conducting another round of modeling, described below. See the Response to Comments document for more discussion of the rollback and exceedance approaches.

c. Updated and Additional Ozone Modeling

We have updated and expanded our ozone modeling. We updated the ozone modeling so that it is now based on estimates of vehicle emissions that reflect the most recent data and our best understanding of several aspects of emissions estimation.[14] We also changed most of the episodes for which we modeled ozone concentrations, with all of our final episode days coming from a single calendar year. By selecting days from within a single year, we responded to a comment that the original episode periods might together contain an atypically high number of days favorable to ozone formation for some parts of the country. The new episodes are also better at representing conditions that lead to high ozone in areas along the Gulf Coast, whose ozone-forming conditions were not well represented in the episodes used for the original modeling.

While we considered these improvements necessary and appropriate in light of comments and other information available to us, the actual results of the two rounds of modeling with regard to the need for additional reductions have turned out to be similar. The latest round of modeling provided us ozone predictions for 2007 and 2030 in the eastern U.S., and for 2030 in the western U.S. There are some differences in specific results, where and when the two models can be directly compared. However, the same conclusion would be reached from either, namely that there is a broad set of areas with predicted ozone concentrations in 2007 above 0.124 ppm, in the baseline scenario without additional emission reductions.

We have compared and supplemented our own ozone modeling with other modeling studies, either submitted to us as comments to this rulemaking, as state implementation plan (SIP) revisions, or brought to our attention through our consultations with states on SIP revisions that are in development. The ozone modeling in the SIP revisions has the advantage of using emission inventories that are more specific to the area being modeled, and of using meteorological conditions selected specifically for each area. Also, the SIP revisions included other evidence and analysis, such as analysis of air quality and emissions trends, observation based models that make use of data on concentrations of ozone precursors, alternative rollback analyses, and information on the responsiveness of the air quality model. For some areas, we decided that the predictions of attainment or nonattainment from our

[14] While the use of these emissions estimates was new to our baseline ozone modeling in the latest ozone modeling, they were not new to this rulemaking, having already been used in calculations of cost-effectiveness in the draft RIA. We therefore were able to consider public comments on these estimates prior to using them in the latest ozone modeling

modeling were less reliable than conclusions that could be drawn from this additional evidence and analysis. For example, in some areas our episodes did not capture the meteorological conditions that have caused high ozone, while local modeling did so.

d. Results and Conclusions

As discussed in detail below, it is clear that the NO_X and VOC reductions to be achieved through the Tier 2/Gasoline Sulfur program are needed to attain and maintain compliance with the 1 hour ozone NAAQS. Although the general pattern observed in our modeling indicates improvements in the near term, growth in overall emissions will lead to worsening of air quality over the long term.

Based on our ozone modeling, we have analyzed ozone predictions for 52 metropolitan areas for 1996, 2007, and 2030. In addition, we reviewed ozone attainment modeling and other evidence covering 15 of these areas, from SIP submittals or from modeling underway to support SIP revisions. This local modeling addressed only the current or requested attainment date in each area. We then made attainment and nonattainment predictions from this information.

The general pattern we observed with the baseline scenario, i.e., without new emission reductions, is a broad reduction between 1996 and 2007 in the geographic extent of ozone concentrations above the NAAQS, and in the frequency and severity of exceedances. This is consistent with the national emissions inventory trend between these two years. At the same time, we also found that peak ozone concentrations and the frequency of exceedances in 2030 were generally somewhat higher than in 2007 for most areas analyzed. This too is consistent with our analysis of emission inventory trends, which shows that the total NO_X inventory from all sources will decline from 2007 to about 2015 and then begin to increase due to growth in the activity of emission sources. In 2030, our analysis predicts that NO_X emissions from all sources will be about one percent higher than in 2007. While we did not model ozone concentrations for years between 2007 and 2030, we expect that they would track the national emissions trend by showing a period of improvement after 2007 and then deterioration, although individual areas will vary due to local source mix and growth rates.[15]

Within this general pattern of ozone attainment changes between 1996 and 2030, we have determined that 26 metropolitan areas are certain or highly likely to need additional reductions to attain and maintain the 1-hour ozone NAAQS. These 26 areas are those that have current violations of the 1-hour ozone NAAQS and are predicted by the best ozone modeling we have available to still be in violation without a new federal vehicle program in 2007.[16] Based on the general trends described above, without further emissions reductions many of these areas may also have violations continuously throughout the period from 2007 to 2030, while others may briefly attain and then return to nonattainment on or before 2030. These 26 metropolitan areas are listed in Table III.B–1, along with their 1996 population which totals over 86 million. The sizes of these areas and their geographical distribution strongly support an overall need for additional reductions in order to attain and maintain under section 202(i). Because ozone concentration patterns causing violations of the 1-hour NAAQS are well established to endanger public health or welfare, this determination also supports our actions today under the general authority of sections 202(a)(1), 202(a)(3), and 202(b).

As indicated above, in reaching this conclusion about these 26 areas, we examined local ozone modeling in SIP submittals. These local analyses are considered to be more extensive than our own modeling for estimating whether there would be NAAQS nonattainment without further emission reductions, when interpreted by a weight of evidence method which meets our guidance for such modeling. One of the areas which submitted a SIP revision was a special case. We have recently proposed to approve the 1-hour ozone attainment demonstration for the nonattainment area of Washington, D.C. (but not Baltimore). We have nevertheless included this area on the list of 26 that are certain or highly likely to require further reductions to attain and maintain, because its SIP attainment demonstration assumed emission reductions from vehicles meeting the National Low Emissions Vehicle (NLEV) standards.

However, by its own terms, the NLEV standards would not extend beyond the 2003 model year if we did not promulgate Tier 2 vehicle standards at least as stringent as the NLEV standards. See 40 CFR 86.1701–99(c). Thus, the emission reductions relied upon from 2004 and later model year NLEV vehicles are themselves ''further reductions'' for the purposes of CAA section 202(i).[17] The local modeling indicating attainment with these reductions is therefore strong evidence that further reductions are needed past 2003, beyond those provided by the Tier 1 program. Based on this, and on the fact that our own ozone modeling showed the Washington, DC area to violate the NAAQS in 2007 even with full NLEV emission reductions, we have concluded that it should be included with areas that do require further reductions to attain and maintain the 1-hour ozone NAAQS.

The 1-hour ozone NAAQS presently does not apply in 12 of the 26 areas listed in Table III.B–1, but we have proposed to re-instate it and expect to complete that action shortly. These areas are indicated in the table. Our decision to include these areas on this list is based on the contingency that we will re-instate the 1-hour standard in these areas. However, even if we considered only the 14 areas where the 1-hour standard applies as of the signature date of this notice, we have concluded that our determination would be the same.

TABLE III.B–1.—TWENTY-SIX METROPOLITAN AREAS WHICH ARE CERTAIN OR HIGHLY LIKELY TO REQUIRE ADDITIONAL EMISSION REDUCTIONS IN ORDER TO ATTAIN AND MAINTAIN THE 1-HOUR OZONE NAAQS

Metropolitan area	1996 Population (millions)
Atlanta, GA MSA	3.5
Barnstable-Yarmouth, MA MSA [a]	0.2
Baton Rouge, LA MSA	0.6
Beaumont-Port Arthur, TX MSA	0.4
Birmingham, AL MSA	0.9
Boston-Worcester-Lawrence, MA–NH–ME–CT CMSA [a]	5.6
Charlotte-Gastonia-Rock Hill, NC–SC MSA [a]	1.3

[15] EPA's modeling presumed that cars and light trucks will continue to meet the emission levels of the National Low Emissions Vehicle (NLEV) program after model year 2003, even though the program will end in model year 2003 or shortly thereafter. Had our modeling not included such levels in its inventory assumptions, trends for ozone concentrations would have shown earlier increases in ozone concentrations.

[16] The date of the predicted violation was 2007 for most areas, 2010 in the case of Los Angeles, CA, and 2030 in the case of Portland-Salem, OR.

[17] With regard to eventual final action on the 1-hour attainment demonstration for Washington, DC, the issue of the continuation of the NLEV standards is mooted by the promulgation of the Tier 2/Gasoline Sulfur program. A portion of the emission reductions from this program will replace the post-2003 model year NLEV reductions assumed in the SIP.

TABLE III.B–1.—TWENTY-SIX METROPOLITAN AREAS WHICH ARE CERTAIN OR HIGHLY LIKELY TO REQUIRE ADDITIONAL EMISSION REDUCTIONS IN ORDER TO ATTAIN AND MAINTAIN THE 1-HOUR OZONE NAAQS—Continued

Metropolitan area	1996 Population (millions)
Cincinnati-Hamilton, OH–KY–IN CMSA	1.9
Dallas-Fort Worth, TX CMSA	4.6
Houma, LA MSA [a]	0.2
Houston-Galveston-Brazoria, TX CMSA	4.3
Huntington-Ashland, WV–KY–OH MSA [a]	0.3
Indianapolis, IN MSA [a]	1.5
Los Angeles-Riverside-San Bernardino CA CMSA	15.5
Louisville, KY–IN MSA	1.0
Macon, GA MSA [a]	0.3
Memphis, TN–AR–MS MSA [a]	1.1
Nashville, TN MSA [a]	1.1
New York-Northern New Jersey-Long Island, NY–NJ–CT–PA CMSA	19.9
Philadelphia-Wilmington-Atlantic City, PA–NJ–DE–MD CMSA	6.0
Pittsburgh, PA MSA	2.4
Portland-Salem, OR–WA CMSA [a]	2.1
Providence-Fall River-Warwick, RI–MA MSA [a]	1.1
Richmond-Petersburg, VA MSA [a]	0.9
St. Louis, MO–IL MSA	2.5
Washington-Baltimore, DC–MD–VA–WV CMSA	7.2
Total Population	86.3

Notes:
[a] The 1-hour ozone NAAQS does not currently apply, but we have proposed and expect to re-instate it shortly.

There are 12 additional metropolitan areas, with another 25.3 million people in 1996, for which the available ozone modeling suggests significant risk of failing to attain and maintain the 1-hour ozone NAAQS without additional emission reductions. Table III.B–2 lists the areas we put in this second category. Our own ozone modeling predicted these 12 areas to need further reductions to avoid violations in 2007. For six of these areas, recent air quality monitoring data indicate violation, but we have reviewed local ozone modeling and other evidence indicating attainment in 2007.[18] Based on this evidence, we have kept these areas separate from the previous set of 26 areas which we consider certain or highly likely to need additional reductions. However, we still consider there to be a significant risk of failure to attain and maintain in these six areas because this local modeling has inherent uncertainties, as all ozone modeling does. Moreover, the local modeling did not examine the period after initial attainment.

For the other six of the 12 areas, the air quality monitoring data shows current attainment but with less than a 10 percent margin below the NAAQS. This suggests these areas may remain without violations for some time, but we believe there is still a moderate risk of future violation of the NAAQS because meteorological conditions may be more severe in the future.

It is highly likely that at least some of these 12 areas will violate the NAAQS without additional reductions, and it is a distinct possibility that many of them will do so. We consider the situation in these areas to support our determination that, overall, additional reductions are needed for attainment and maintenance. However, we reiterate that our predictions for the 26 areas listed in Table III.B–1, and even our predictions for only the 14 of those 26 for which the 1-hour standard now applies, are a sufficient basis for our determination of an overall need for additional reductions and for our actions today.

TABLE III.B–2.—TWELVE METROPOLITAN AREAS WITH MODERATE TO SIGNIFICANT RISK OF FAILING TO ATTAIN AND MAINTAIN THE 1-HOUR OZONE NAAQS WITHOUT ADDITIONAL EMISSION REDUCTIONS

Metropolitan area	1996 Population (millions)
Benton Harbor, MI MSA [a]	0.2
Biloxi-Gulfport-Pascagoula, MS MSA [a]	0.3
Chicago-Gary-Kenosha, IL–IN–WI CMSA	8.6
Cleveland-Akron, OH CMSA [a]	2.9
Detroit-Ann Arbor-Flint, MI CMSA [a]	5.3
Grand Rapids-Muskegon-Holland, MI MSA [a]	1.0
Hartford, CT MSA	1.1
Milwaukee-Racine, WI CMSA	1.6
New London-Norwich, CT–RI MSA [a]	1.3
New Orleans, LA MSA [a]	0.3
Pensacola, FL MSA [a]	0.4
Tampa, FL MSA [a]	2.2
Total Population	25.3

Notes:
[a] The 1-hour ozone NAAQS does not currently apply, but we have proposed and expect to re-instate it shortly.

e. Issues and Comments Addressed

We received detailed comments from the automobile industry related to ozone modeling and the need for additional emission reductions in order to attain and maintain. These were of three types.

Accuracy of modeling ozone concentrations.—The automobile industry commenters pointed out that in the modeling presented with our proposal, the ozone model and exceedance predicted violations of the NAAQS in 1995 in areas where monitoring data indicated no violations. They cited these cases as examples of model inaccuracy. We have made improvements to our emissions estimates, our episodes, and other aspects of the modeling system. These changes have improved the accuracy of the predicted ozone concentrations. Also, as stated above, our list of 26 areas that support our finding that additional reductions are needed does not include any areas where recent monitoring data shows no violations. The final RIA addresses issues of model accuracy in more depth.

As explained in the final RIA, our very latest estimates of car and light truck emissions without the benefits of our new standards are actually somewhat higher than the estimates used in the final round of ozone modeling, because the most recent data indicate even more serious adverse emissions effects from sulfur in

[18] The SIP revisions for Chicago and Milwaukee demonstrated that these two areas as well as Benton Harbor and Grand Rapids areas in Michigan (which are maintenance areas but have experienced ozone NAAQS violations recently) would not experience NAAQS violations in 2007, with a strategy that relied only on Tier 1 vehicle emission standards. We have also recently proposed to approve the 1-hour attainment demonstration for Greater Connecticut, covering the Hartford and New London areas, which assumed full NLEV emission reductions. However, Connecticut is committed in its SIP to adopt California vehicle standards if NLEV does end with the 2003 model year if a more stringent federal program is not promulgated. The California standards are more stringent than NLEV. The case of one additional area whose attainment demonstration we recently proposed to approve, Western Massachusetts (Springfield), should be explained here to avoid possible confusion. Our own ozone modeling predicted that Springfield would attain the NAAQS in 2007. Massachusetts has adopted the California vehicle emission standards, so there is no issue of the continuation of the NLEV standards.

gasoline. Thus, we think our predictions of ozone nonattainment using emission estimates prepared before this most recent data on sulfur was considered, may be conservative. This topic is discussed in more detail in section III.B.3.

Prediction of attainment/ nonattainment.—For most areas, we predicted 2007 or 2030 attainment or nonattainment based on the exceedance method. The exceedance method predicts an area to be in attainment only if there are no predicted exceedances of the NAAQS during any episode day. However, for the areas for which we have received 1-hour attainment demonstrations in SIP revisions, our predictions were based on a larger and more robust set of data. When a state's modeling shows an exceedance that would otherwise indicate nonattainment, we allow the state to submit a variety of other evidence and analysis, such as locality specific meteorological conditions, analysis of air quality and emissions trends, observational based models that make use of data on concentrations of ozone precursors, a rollback analysis, and information on the responsiveness of the air quality model. We then make a weight-of-evidence determination of attainment or nonattainment based on consideration of all this local evidence. We did this in forming the set of 26 areas we consider certain or highly likely to need additional reductions to attain or maintain, in some cases concluding that attainment was demonstrated and in others that it was not.

The auto industry commenters recommended the use of rollback as the single method for making attainment and nonattainment predictions from predicted ozone concentrations. They stated that the rollback method would be more consistent than the exceedance method with the NAAQS's allowance of three exceedances in a three year period. They also believed that the rollback method would compensate for what they considered to be model over predictions of ozone concentrations. We believe that the rollback method is not appropriate for use as the sole, or even a primary, test of 1-hour ozone attainment or nonattainment. A rollback analysis may overlook violations that occur away from ozone monitors, and it may inappropriately project the effect of a recent period of favorable weather into the prediction of future attainment. In determining the attainment and maintenance prospects of numerous areas, as here, it is not possible to assemble and consider the full set of local evidence that should accompany any consideration of a rollback analysis. In such a situation, we believe that the exceedance method is the appropriate choice. A fuller explanation of our reasons for considering the exceedance method more appropriate than rollback is given in our Response to Comments document.

We have not completely excluded the rollback approach from the determinations in this rulemaking. We have considered it for those areas for which we had enough information to allow us to consider it in its proper context, i.e., for those areas covered by recent 1-hour SIP submissions. Of these areas, we concluded that some will not attain without additional reductions and some will.

While we disagree with the use of the rollback method, we have conducted a hypothetical analysis of 2007 attainment in all areas based only on our own ozone modeling, applying the rollback method recommended by the commenters. We calculated in this analysis that 15 metropolitan areas and three other counties with nearly 56 million in population in 1996 would violate the NAAQS in 2007. Moreover, these 15 metro areas are geographically spread out [19]. We believe that this result using the rollback method does not fully capture the likely nonattainment that would exist in 2007 in the absence of additional emission reductions. However, even if we were to consider the use of rollback valid, we consider this set of areas to also be an adequate basis for making the same determinations we have made based on the more appropriate exceedance-based analysis. The details of our hypothetical analysis using the rollback method are given in the final RIA and the technical support document for our ozone modeling analyses.

Ozone modeling and predictions.—Members of the automobile manufacturing industry submitted two modeling studies: (1) a repetition of our first round of modeling of the 37-state eastern U.S. domain but with their recommendations regarding estimates of motor vehicle emissions in 2007 and with the rollback method used to predict 2007 nonattainment, and (2) finer grid modeling for three smaller domains, also with their recommended estimates of emissions and with nonattainment predicted using a rollback method. Both modeling efforts showed less widespread nonattainment than we have determined and described here. Taken together, these studies predicted 2007 violations by the rollback method in or downwind of New York City, Chicago, Milwaukee, western Michigan, Baton-Rouge, and Houston.

The main difference between the automobile industry's ozone modeling and ours is in the emission estimates. We have reviewed the emissions estimates used in the industry studies. We concluded that the industry's emissions estimates employ inappropriate analytical steps in the calculation. Among the problems are that the adjustments for the benefits of inspection and maintenance programs were not consistent with the base estimate of in-use emissions, and the sales trend towards light trucks and SUVs was not properly captured. Also, as stated, we disagree with the use of the rollback approach as the sole test of attainment. As a consequence, we conclude that the industry's ozone modeling is not an appropriate basis for making predictions of future attainment or nonattainment. The final RIA explains in detail how we have addressed these and other emissions modeling issues in a manner which is more technically consistent and correct,[20] and how we have considered the results from rollback analyses but only as part of broad weight-of-evidence determinations for areas for which this was possible at this time. Our point-by-point review is given in our Response to Comments document.

The material on ozone modeling submitted by the commenters, having been prepared by the rollback method, was difficult to re-interpret according to our preferred exceedance method. However, it appears that if this modeling were interpreted by the exceedance method, it would indicate 2007 nonattainment in Baltimore and Washington, D.C. in addition to New York City, Chicago, Milwaukee, western Michigan, Baton-Rouge, and Houston. Overall, we conclude that the material submitted by the automobile industry does not contradict the facts we have used to make our determinations or the actions we are taking today.

f. 8-Hour Ozone

The predictions of ozone concentrations from the ozone modeling

[19] We did not include the Los Angeles-Riverside-San Bernardino area in this analysis, since it was not covered by our 2007 modeling, but we do believe it is rightly part of the basis for a determination on the need for additional reductions.

[20] As explained in the final RIA, our very lastest estimates of car and light truck emissions without the benefits of our new standards are actually somewhat higher than the estimates used in the final round of ozone modeling, because more recent data indicate even more serious adverse emissions effects from sulfur in gasoline. Thus, we think our predictions of ozone nonattainment may be conservative.

can be used to make predictions of attainment or nonattainment with the 8-hour ozone NAAQS. In our draft RIA, we estimated that 28 metropolitan areas and 4 rural counties with a combined population of 80 million people would violate the 8-hour ozone NAAQS in 2007 without additional emission reductions. Commenters noted differences between exact rollback procedure we had used in this projection and the steps specified in recent draft guidance we have issued on 8-hour ozone modeling. We agree with the commenters that the steps specified in our guidance are the correct ones to use. However, since we are not basing our promulgation of the Tier 2/Gasoline Sulfur Program on the 8-hour ozone NAAQS, we have not made any new predictions of 8-hour ozone nonattainment areas in 2007. Based on our findings in previous analyses of this sort, however, we believe that in the absence of the Tier 2/Gasoline Sulfur program there would be 8-hour nonattainment areas that are not also areas which we have concluded are certain or highly likely to violate the 1-hour NAAQS. If we considered it appropriate to proceed with implementation of the 8-hour standard, these areas would support our determination on the need for emission reductions, and the appropriateness and necessity of the vehicle and gasoline standards we are establishing.

3. Cars and Light-duty Trucks Are a Big Part of the NO_X and VOC Emissions, and Today's Action Will Reduce This Contribution Substantially

Emissions of VOCs and NO_X come from a variety of sources, both natural and man-made. Natural sources, including emissions that have been traced to vegetation, account for a substantial portion of total VOC emissions in rural areas. The remainder of this section focuses on the contribution of motor vehicles to emissions from human sources. Man-made VOCs are released as byproducts of incomplete combustion as well as evaporation of solvents and fuels. For gasoline-fueled cars and light trucks, approximately half of the VOC emissions come from the vehicle exhaust and half come from the evaporation of gasoline from the fuel system. NO_X emissions are dominated by man-made sources, most notably high-temperature combustion processes such as those occurring in automobiles and power plants. Emissions from cars and light trucks are currently, and will remain, a major part of nationwide VOC and NO_X emissions. In 1996, cars and light trucks comprised 25 percent of the VOC emissions and 21 percent of the NO_X emissions from human sources in the U.S.[21] The contribution in metropolitan areas was generally larger.

We have made significant improvements in the analysis used to estimate the emission inventory impacts of this action, including improving the emission factor modeling, using more detailed local modeling input, and using a more conservative (lower) estimate of VMT growth. These changes are detailed in the Regulatory Impact Analysis for this rule. The following discussion is based on this improved analysis.

In addition to the improvements which are incorporated in this analysis, we also made further improvements in the emission factor modeling after analyzing comments which we did not have time to incorporate into the detailed inventory analysis described here. The most notable change is related to data which indicates that NO_X and NMOG emissions are even more sensitive to gasoline sulfur than previously thought. This change and others are described in detail in the Response to Comments. Our early analysis of these changes indicates that incorporating them into this analysis would provide further support for this action because these changes result in both increases in the baseline emissions without Tier 2 and in the reductions that would result from Tier 2. For example, in the detailed inventory analysis we report below, we project nationwide Tier 2/Gasoline Sulfur control NO_X reductions from cars and light trucks of 856,471 tons per year in 2007. Using the version of the emission factor model that incorporates these additional changes increases the estimated Tier 2 reductions to approximately 1.0 million tons per year in 2007 (estimated baseline emissions without Tier 2 increase from 3.1 million tons per year in 2007 to approximately 3.7 million tons per year using the version of the emission factor model that incorporates these additional changes). Therefore, the estimates of the inventory reductions given here (and used as the basis for the ozone air quality analysis) are clearly conservative.

Motor vehicle emission controls have led to significant improvements in emissions released to the air (the "emission inventory") and will continue to do so in the near term[22]. In the current analysis, we continue to find that total emissions from the car and light truck fleet would continue to decline for a period, even if we were not establishing the Tier 2/Gasoline Sulfur program. This decline would result from the introduction of cleaner reformulated gasoline in 2000, the introduction of National Low Emission Vehicles (NLEVs) and vehicles complying with the Enhanced Evaporative Test Procedure and Supplemental Federal Test Procedures, and the continuing removal of older, higher-emitting vehicles from the in-use vehicle fleet. On a per mile basis, VOC and NO_X emissions from cars and light trucks combined would have continued to decline well beyond 2015, reflecting the continuing effect of fleet turnover under existing emission control programs. However, projected increases in vehicle miles traveled (VMT) will cause total emissions from these vehicles to increase. With this increase in travel and without additional controls, we project that combined NO_X and VOC emissions for cars and light trucks without the Tier 2/Gasoline Sulfur program would increase starting in 2013 and 2016, respectively, so that by 2030 they would return to levels above or nearly the same as they will be in 2000. In cities experiencing rapid growth, such as Charlotte, North Carolina, the near-term trend towards lower emissions tends to reverse sooner.[23] With additional improvements in the modeling done in Response to Comments, we now estimate that without the Tier 2/Gasoline Sulfur program, there will be a constant increase in these emission over time.

Figure III–1 illustrates this expected trend in car and light truck NO_X emissions in the absence of today's action. The figure also allows the contribution of cars to be distinguished from that of light trucks. The figure clearly shows the impact of steady growth in light truck sales and travel on overall light-duty NO_X emissions; the decrease in overall light-duty emission levels is due solely to reductions in LDV emissions. In 2000, we project that

[21] Emission Trend Report, 1997.

[22] The auto manufacturer and northeastern state commitments to the NLEV program are scheduled to end in 2004 without further EPA action on Tier 2 standards, although continued voluntary compliance by automobile manufacturers and the affected states is a possibility. Our analysis of emission trends and the emission benefits expected from today's action assumes for the base scenario a continuation of the NLEV program past 2004. If the NLEV program does not continue beyond 2004, the reductions resulting from Tier 2 would be larger than what is shown here. It also includes all other control measures assumed to be implemented in local areas, such as reformulated gasoline in all required and opt-in areas and enhanced I/M where required.

[23] Also, if the NLEV program ends in model year 2004 or shortly thereafter, as scheduled, this trend would reverse more quickly in all areas.

trucks will produce about 50 percent of combined car and light truck NO_X emissions. We project that truck emissions would actually increase after 2000, and over the next 30 years, trucks would grow to dominate light-duty NO_X emissions. By 2010, we project trucks would make up two-thirds of light-duty NO_X emissions; by 2020, nearly three-quarters of all light-duty NO_X emissions would be produced by trucks.

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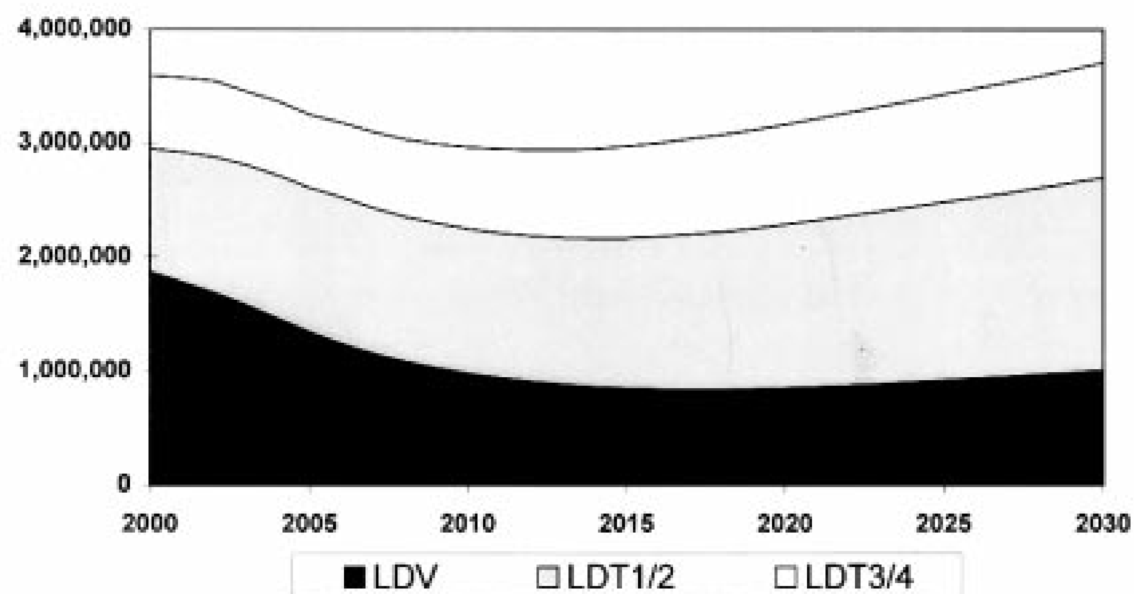
Figure III-1.

Light-Duty NOx Emissions Without Tier 2 (tons per year)

[Estimates exclude California, Alaska, and Hawaii, although reductions will occur in all three states.]



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Today's action will significantly decrease NO_X and VOC emissions from cars and light trucks, and will delay the date by which NO_X and VOC emissions will begin to increase due to continued VMT growth. With Tier 2/Gasoline Sulfur control, light-duty vehicle NO_X and VOC emissions are projected to continue their downward trend past 2020. Table III.B–3 shows the annual tons of NO_X that we project will be reduced by today's action.[24] These projections include the benefits of low sulfur fuel and the introduction of Tier 2 car and light truck standards.

TABLE III.B–3.—NO_X EMISSIONS FROM CARS AND LIGHT TRUCKS AS PERCENT OF TOTAL EMISSIONS, AND REDUCTIONS DUE TO TIER 2/GASOLINE SULFUR CONTROL (TONS PER YEAR) [a]

Year	Light-duty tons— without tier 2	Light-duty percent of total without tier 2	Light-duty tons reduced by tier 2 [c, c]
2007	3,095,698	16	856,471
2010	2,962,093	16	1,235,882
2015	2,968,707	17	1,816,767
2020	3,160,155	17	2,220,210

[24] Today's action for both vehicles and fuels will apply in 49 states and the U.S. territories, excluding only California. There will also be emissions reductions in California from vehicles that relocate or visit from other states. However, much of the emissions inventory analysis for this action was made for a 47-state region which excludes California, Alasks, and Hawaii. The latter two states were not included in the scope of ozone, PM and economic benefits modeling.

TABLE III.B–3.—NO_X EMISSIONS FROM CARS AND LIGHT TRUCKS AS PERCENT OF TOTAL EMISSIONS, AND REDUCTIONS DUE TO TIER 2/GASOLINE SULFUR CONTROL (TONS PER YEAR) [a]—Continued

Year	Light-duty tons— without tier 2	Light-duty percent of total without tier 2	Light-duty tons reduced by tier 2 [b, c]
2030	3,704,747	19	2,795,551

Notes:
[a] Estimates exclude California, Alaska, and Hawaii, although reductions will occur in all three.
[b] Does not include emission reductions from heavy-duty gasoline vehicles.
[c] These numbers represent a conservative estimate of the benefits of the Tier 2/Sulfur program. Based on the updated emission factor model developed in response to comments, the program will result in significantly larger benefits. For example, our new model projects NO_X reductions of 1,100,000 tons in 2007.

The lower sulfur levels in today's action will produce large emission reductions on pre-Tier 2 vehicles as soon as low-sulfur gasoline is introduced, in addition to enabling Tier 2 vehicles to achieve lower emission levels. Among the pre-Tier 2 vehicles, the largest per vehicle emission reductions from lower sulfur in gasoline will be achieved from vehicles which automobile manufacturers will have sold under the voluntary National Low Emission Vehicle program. These vehicles are capable of substantially lower emissions when operated on low sulfur fuel. Older technology vehicles experience a smaller but significant effect.

In 2007, when all gasoline will meet the new sulfur limit and when large numbers of 2004 and newer vehicles meeting these standards will be in use, the combined NO_X emission reduction from vehicles and fuels will be over 850,000 tons per year. After 2007, emissions will be reduced further as the fleet turns over to Tier 2 vehicles operating on low sulfur fuel. By 2020, NO_X emissions will be reduced by 70% from the levels that would occur without today's action. This reduction equals the NO_X emissions from over 164 million pre-Tier 2 cars and light trucks. This reduction represents a 12 percent reduction in NO_X emissions from all manmade sources.

VOC emissions will also be reduced by today's action, with reductions increasing as the fleet turns over. We estimate that the reductions as a percent of emissions from cars and light trucks will be 7 percent in 2007 and grow to 17 percent in 2020.

As discussed earlier, in California, smaller but still substantial reductions in both NO_X and VOC will be achieved because vehicles visiting and relocating to California will be designed to meet these standards. Also, vehicles from California visiting other states will not be exposed to high sulfur fuel. California Air Resources Board staff have estimated that Tier 2/Sulfur will reduce NO_X emissions in the South Coast Air Quality Management District by approximately 4 tons per day in 2007.[25] CARB staff plan to incorporate these reductions in their revised attainment plan for this district, which includes most of the Los Angeles-Long Beach region.

These estimates of emission reductions reflect a mixture of urban, suburban, and rural areas. However, cars and light trucks generally make up a larger fraction of the emission inventory for urban and suburban areas, where human population and personal vehicle travel is more concentrated than emissions from other sources such as heavy-duty highway vehicles, power plants, and industrial boilers. We have estimated emission inventories for three cities using the same methods as were used to project the nationwide inventories, and we present the results for 2007 below in Table III.B–4.

These results confirm that light-duty vehicles make up a greater share of the NO_X emission inventories in urban areas than they do in the nationwide inventory. While these vehicles' share of national NO_X emissions in 2007 is about 16 percent, it is estimated to be about 34 percent in the Atlanta area. There is also a range in VOC contributions, with Atlanta again being the area with the largest car and light truck contribution at 17 percent. In metropolitan areas with high car and light truck contributions, today's action will represent a larger step towards attainment since it will have a larger effect on total emissions.

TABLE III.B–4—Proportion of the Total Urban Area NO_X and VOC Inventory in 2007 Attributable to Light-Duty Vehicles[a]

Region	NO_X (percent)	VOC (percent)
Nationwide	16	13
New York urban area	18	6
Atlanta urban area	34	17
Charlotte urban area	24	15

Notes:
[a] The estimates reflect continuation of NLEV beyond 2004.

Another useful perspective from which to view the magnitude of the emission reductions from today's proposal is in terms of the additional emission reductions from all human sources that areas will need to attain the 1-hour ozone standard. For this analysis, we reviewed our proposals for action on the 1-hour attainment demonstrations submitted by the states. With these proposals, EPA identified estimates of additional emission reductions (measures in addition to those submitted by the state in their plans) necessary for attainment for some

[25] California Air Resources Board, Executive Order G–99–037, May 20, 1999, Attachment A, 6–7, 10. These NO_X reductions represent a small fraction of the emission reductions needed in the South Coast to attain the NAAQS.

of the areas. These estimates of additional emission reductions are documented in the individual **Federal Register** Notices. Using these estimates and the estimates of Tier 2 reductions developed for today's action, we have determined what portion of these additional emission reductions would be accounted for by today's action. These estimates are reported in Table III.B–5, which shows the contribution of Tier 2/Sulfur NO_X reductions to the additional emission reduction necessary for attainment for three metropolitan areas. For example, for the New York nonattainment area, 89% of the additional NO_X emission reductions needed for attainment are provided for with today's action. This leaves 11% of the additional NO_X emission reductions to be addressed by the State through other local sources.

EPA and the States already have significant efforts underway to lower ozone precursor emissions through national regulations and State Implementation Plans. Table III.B–5 shows the contribution of Tier 2 to the substantial State-led efforts to provide attainment with the ozone NAAQS. Since the Tier 2 program has evolved in the past year after much of the States' efforts were completed, many of the States were unable to estimate the benefits of Tier 2 in their areas. EPA's proposal actions on these SIPs for the ozone NAAQS addresses the need for Tier 2 in many areas. More specifically, Tier 2 is being used to help States identify additional measures, in addition to those in their plans, necessary for attainment.

These estimates are subject to change as the states review and comment on our proposed action on the SIPs. These figures show that today's proposal would make a very substantial contribution to these cities' attainment programs, but that there will still be a need for additional reductions from other sources. The emission reductions from today's proposal would clearly not exceed the reductions needed from an air quality perspective for these areas.

TABLE III.B–5.—CONTRIBUTION OF TIER 2/SULFUR NO_X REDUCTIONS TO OZONE ATTAINMENT EFFORTS OF SELECTED NONATTAINMENT AREAS

Nonattainment area (attainment date)	Percent of additional NO_X reductions necessary for attainment	
	From tier 2	Needed after tier 2
Baltimore (2005)	100	0
New York (2007)	89	11
Philadelphia (2005)	87	13

4. Ozone Reductions Expected From This Rule

The large reductions in emissions of ozone precursors from today's standards will be very beneficial to federal and state efforts to lower ozone levels and bring about attainment with the current one-hour ozone standard. The air quality modeling for the final rule shows that improvements in ozone levels are expected to occur throughout the country because of the Tier 2/Gasoline Sulfur program.[26] EPA found that the program significantly lowers model-predicted exceedances of the ozone standard. In 2007 the number of exceedances in CMSA/MSAs is forecasted to decline by nearly one-tenth and in 2030, when full turnover of the vehicle fleet has occurred, the program lowers such exceedances by almost one-third. In these same areas, the total amount of ozone above the NAAQS is forecasted to decline by about 15 percent in 2007 and by more than one-third in 2030. In the vast majority of areas, the air quality modeling predicts that the program will lower peak summer ozone concentrations for both 2007 and 2030. The reduction in daily maximum ozone is nearly 2 ppb on average in 2007 and over 5 ppb on average in 2030. These reductions contribute to EPA's assessment that the program will provide the large set of public health and environmental benefits summarized in Section IV.D of the Preamble. The forecasted impacts of the program on ozone in 2007 and 2030 are further described in the Tier 2 Air Quality Modeling Technical Support Document.

During the public comment period on the proposed rule, EPA received several comments that expressed concern about potential increases in ozone that might occur as a result of this rule. As indicated above, the air quality modeling results indicate an overall reduction in ozone levels in 2007 and 2030 during the various episodes modeled. In addition to ozone reductions, a few areas had predicted ozone increases in portions of the area during parts of the episodes modeled. In most of these cases, we observed a net reduction in ozone levels in these areas due to the program. In the very small number of exceptions to this, the Agency did find benefit from reduction of peak ozone levels. Based upon a careful examination of this issue, including EPA's modeling results as well as consideration of the modeling and analyses submitted by commenters, it is clear that the significant ozone reductions from this rule outweigh the limited ozone increases that may occur. Additional details on this issue are provided in the Response to Comments document and in the Tier 2 Air Quality Modeling Technical Support Document.

Taken together, EPA believes these results indicate that it will be much easier for States to develop State Implementation Plans which will attain and maintain compliance with the one-hour ozone standard. EPA will work with States conducting more detailed local modeling of their specific ozone situation, to ensure that their SIPs will provide attainment. Notably, there are also other upcoming federal measures to lower ozone precursors that will aid these efforts. If the State modeling of local programs shows a need, the Agency will work with states to plan further actions to produce attainment with the NAAQS in order to protect the public's health and the environment. Further details on EPA's modeling results can be found in the Agency's Response to Comments and technical support documents.

C. Particulate Matter

The need to control the contribution of cars and light trucks to ambient concentrations of particulate matter (PM) is the basis for our adoption of the new PM emission standards for vehicles. PM is also a supplemental consideration in our promulgation of

[26] EPA assessment of air quality changes for 2007 and 2030 focused on 37 states in the East because these states cover most of the areas with 1-hour nonattainment problems.

the vehicle emission standards for NO_X and VOC, and for the limits on sulfur in gasoline, because SOx, NO_X, and VOC are PM precursors.

For cars and for light trucks under 3750 pounds loaded vehicle weight, we are establishing new emission standards under the provisions of CAA section 202(i), which ties our action to the need for additional emission reductions in order to attain and maintain the NAAQS. The NAAQS relevant to the PM emission standards is the PM_{10} NAAQS. The PM_{10} NAAQS also provides additional but not essential support to our promulgation of the NO_X and VOC standards, since these standards are fully supportable on the basis of the 1-hour ozone NAAQS.

For the vehicles not subject to CAA 202(i), and for the gasoline sulfur limits, our actions are tied to determinations regarding public health and welfare risks more broadly, under CAA sections 202(a), 202(b), and 211(c). The role of NO_X, VOC, and PM emissions in contributing to atmospheric concentrations of PM_{10} is an important element of the risk that these emissions pose to public health and welfare.

PM also poses risks to public health not fully reflected in the PM_{10} NAAQS. Though EPA has not relied on the adverse health impacts of fine PM to promulgate this rule, it is well established that such impacts exist. A summary of these effects is given in the next section. In addition, based on the available science, EPA's Office of Research and Development has recently submitted to a committee of our Science Advisory Board a draft assessment document which contains a proposed conclusion that diesel exhaust is a likely human cancer hazard and is a potential cause of other nonmalignant respiratory effects. The scientific advisory committee has met to discuss this document, and we are awaiting written review comments from the committee. We expect to submit a further revision of the document to the advisory committee before we make the document final.

1. Background on PM

Particulate matter (PM) represents a broad class of chemically and physically diverse substances that exist as discrete particles (liquid droplets or solids) over a wide range of sizes. The NAAQS that regulates PM addresses only PM with a diameter less than or equal to 10 microns, or PM_{10}. The coarse fraction of PM_{10} consists of those particles which have a diameter in the range between 2.5 and 10 microns, and the fine fraction consists of those particles which have a diameter less than or equal to 2.5 microns, or $PM_{2.5}$. These particles and droplets are produced as a direct result of human activity and natural processes, and they are also formed as secondary particles from the atmospheric transformation of emissions of SO_X, NO_X, ammonia, and VOCs.

Natural sources of particles in the coarse fraction of PM_{10} include windblown dust, salt from dried sea spray, fires, biogenic emanation (*e.g.,* pollen from plants, fungal spores), and volcanoes. Fugitive dust and crustal material (geogenic materials) comprise approximately 80% of the coarse fraction of the PM_{10} inventory as estimated by methods in use today.[27] Manmade sources of these coarser particles arise predominantly from combustion of fossil fuel by large and small industrial sources (including power generating plants, manufacturing plants, quarries, and kilns), wind erosion from crop land, roads, and construction, dust from industrial and agricultural grinding and handling operations, metals processing, and burning of firewood and solid waste. Coarse-fraction PM_{10} remains suspended in the atmosphere a relatively short period of time.

Most of the emission sources listed for coarse particles also have a substantial fine particle fraction. Their share of the $PM_{2.5}$ inventory is somewhat smaller, however, because of the role of other sources that give rise primarily to $PM_{2.5}$. The other sources of $PM_{2.5}$ include carbon-based particles emitted directly from gasoline and diesel internal combustion engines, sulfate-based particles formed from SO_X and ammonia, nitrate-based particles formed from NO_X and ammonia, and carbonaceous particles formed through transformation of VOC emissions. $PM_{2.5}$ particles from fugitive dust and crustal sources comprise substantially less than their share of coarse PM emissions, approximately one-half of the directly emitted $PM_{2.5}$ inventory as estimated by methods in use today. The presence and magnitude of crustal $PM_{2.5}$ in the ambient air is much lower even than suggested by this smaller inventory share, due to the additional presence of secondary PM from non-crustal sources and the removal of a large portion of crustal emissions close to their source. This near-source removal results from crustal PM's lack of inherent thermal buoyancy, low release height, and interaction with surrounding vegetation (which acts to filter out some of these particles).

Secondary PM is dominated by sulfate particles in the eastern U.S. and parts of the western U.S., with nitrate particles and carbonaceous particles dominant in some western areas. Mobile sources can reasonably be estimated to contribute to ambient secondary nitrate and sulfate PM in proportion to their contribution to total NO_X and SO_X emissions.

The sources, ambient concentration, and chemical and physical properties of PM_{10} vary greatly with time, region, meteorology, and source category. A first step in developing a plan to attain the PM_{10} NAAQS is to disaggregate ambient PM_{10} into the basic categories of sulfate, nitrate, carbonaceous, and crustal PM, and then determine the major contributors to each category based on knowledge of local and upwind emission sources. Following this approach, SIP strategies to reduce ambient PM concentrations have generally focused on controlling fugitive dust from natural soil and soil disturbed by human activity, paving dirt roads and controlling soil on paved roads, reducing emissions from residential wood combustion, and controlling major stationary sources of PM_{10} where applicable. The control programs to reduce stationary, area, and mobile source emissions of sulfur dioxide, oxides of nitrogen, and volatile organic compounds in order to achieve attainment with the sulfur dioxide and ozone NAAQS also have contributed to reductions in the fine fraction of PM_{10} concentrations. In addition, the EPA standards for PM emissions from highway and nonroad engines are contributing to reducing PM_{10} concentrations. As a result of all these efforts, in the last ten years, there has been a downward trend in PM_{10} concentrations, with a leveling off in the later years.

Particulate matter, like ozone, has been linked to a range of serious respiratory health problems. Scientific studies suggest a likely causal role of ambient particulate matter in contributing to a series of health effects. 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), changes in lung function and increased respiratory symptoms, changes to lung tissues and structure, and altered respiratory defense

[27] U.S. EPA (1998) National Air Pollutant Emission Trends Update, 1970–1997. EPA–454/E–98–007. There is evidence from ambient studies that emissions of these materials may be overestimated and/or that once emitted they have less of an influence on monitored PM concentrations (of both PM_{10} and $PM_{2.5}$) than this inventory share would suggest.

mechanisms. PM also causes damage to materials and soiling. It is a major cause of substantial visibility impairment in many parts of the U.S.

Motor vehicle particle emissions and the particles formed by the transformation of motor vehicle gaseous emissions tend to be in the fine particle range. Fine particles are a special health concern because they easily reach the deepest recesses of the lungs. Scientific studies have linked fine particles (alone or in combination with other air pollutants), with a series of significant health problems, including premature death; respiratory related hospital admissions and emergency room visits; aggravated asthma; acute respiratory symptoms, including aggravated coughing and difficult or painful breathing; chronic bronchitis; and decreased lung function that can be experienced as shortness of breath.

These effects are discussed further in EPA's ''Staff Paper'' and ''Air Quality Criteria Document'' for particulate matter.[28]

EPA first established primary (health-based) and secondary (welfare-based) National Ambient Air Quality Standards for PM_{10} in 1987. The annual and 24-hour primary PM_{10} standards were set at 50 µg/m[33], and 150 µg/m^3, respectively.[29] In July 1997, the primary standards were revised to add two new $PM_{2.5}$ standards. At the same time, we changed the statistical form of the primary PM_{10} standard and set all the secondary standards to be the same as the primary.

On May 14, 1999, a panel of the U.S. Court of Appeals for the District of Columbia Circuit reviewed EPA's revisions to the ozone and PM NAAQS and found, by a 2–1 vote, that sections 108 and 109 of the Clean Air Act, as interpreted by EPA, represent unconstitutional delegations of Congressional power. *American Trucking Ass'ns, Inc., et al.,* v. *Environmental Protection Agency*, 175 F.3d 1027 (D.C. Cir. 1999). Among other things the Court remanded the record for the 8-hour ozone NAAQS and the $PM_{2.5}$ NAAQS to EPA. On October 29, 1999, EPA's petition for rehearing by the three judge panel was denied, with an exception regarding the revised ozone NAAQS. EPA's petition for rehearing en banc by the full Circuit was also denied, although five of the nine judges considering the petition agreed to rehear the case.

The pre-existing PM_{10} NAAQS remains in effect (except for one area—Boise, ID—where prior to the court's decision we had determined it no longer to apply). We believe that given the uncertain status of the new $PM_{2.5}$ NAAQS, it is most appropriate to rely primarily on the pre-existing PM_{10} NAAQS in establishing the Tier 2/Gasoline Sulfur program's vehicle emission standards and limits on sulfur in gasoline. However, because we believe, and the Court did not dispute, that there are very substantial public health risks from $PM_{2.5}$ and substantial health and economic benefits from reducing $PM_{2.5}$ concentrations, we have conducted analyses of the $PM_{2.5}$ changes likely to occur from the Tier 2/Gasoline Sulfur program. These analyses are summarized in the section of this preamble dealing with the economic benefits of the new standards, section IV.D.5, and corresponding sections of the final RIA.

There is additional concern regarding the health effects of PM from diesel vehicles, apart from the health effects which were considered in setting the NAAQS for PM_{10} and $PM_{2.5}$. Diesel PM contains small quantities of chemical species that are known carcinogens, and diesel PM as a whole has been implicated in occupational epidemiology studies. EPA's Office of Research and Development has considered these studies, and has recently submitted to a committee of our Science Advisory Board a draft conclusion that diesel exhaust is a ''highly likely'' human cancer hazard.[30] Because we are awaiting a formal response from our advisory committee before revising and finalizing our assessment document, we are not relying on the conclusions in this document as formal support for our action today. More information about this aspect of PM air quality is given in section III.F of this preamble.

2. Need for Additional Reductions to Attain and Maintain the PM_{10} NAAQS

The most recent PM_{10} monitoring data indicates that 15 designated PM_{10} nonattainment counties, with a population of almost 9 million in 1996, violated the PM_{10} NAAQS in the period 1996–1998. The areas that are violating do so because of exceedances of the 24-hour PM_{10} NAAQS. No areas had monitored violations of the annual standard in this period. Table III.C–1 lists the 15 counties. The table also indicates the classification for each area and the status of our review of the State Implementation Plan.

TABLE III.C–1.—FIFTEEN PM_{10} NONATTAINMENT AREAS VIOLATING THE PM_{10} NAAQS IN 1996–1998 [a]

Area	Classification	SIP approved?	1996 Population (millions)
Clark Co., NV	Serious	No	0.93
El Paso, TX	Moderate	Yes	0.67
Gila, AZ	Moderate	No	0.05
Imperial Co., CA	Moderate	No	0.14
Inyo Co., CA	Moderate	No	0.02
Kern Co., CA	Serious	No	0.62
Mono Co., CA	Moderate	No	0.01
Kings Co., CA	Serious	No	0.11
Maricopa Co., AZ	Serious	No	2.61
Power Co., ID	Moderate	No	0.01
Riverside Co., CA	Serious	No	1.41
San Bernardino Co., CA	Serious	No	1.59
Santa Cruz Co., AZ	Moderate	No	0.04
Tulare Co., CA	Serious	No	0.35

[28] U.S. EPA, 1996, Air Quality Criteria for Particulate Matter, EPA/600/P–95/001aF. Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper, EPA–452 R–96–013, July 1996.

[29] The annual average PM10 NAAQS is based on a three-year average, and the 24-hour NAAQS is based on expected exceedances over a three-year period.

[30] Health Assessment Document for Diesel Emissions, SAB Review Draft EPA/600/8–90/057D. November 1999. The document is available electronically at http://www.epa.gov/ncea/diesel.htm.

TABLE III.C–1.—FIFTEEN PM_{10} NONATTAINMENT AREAS VIOLATING THE PM_{10} NAAQS IN 1996–1998 [a]—Continued

Area	Classification	SIP approved?	1996 Population (millions)
Walla Walla Co., WA	Moderate	Yes	0.05
Total Population			8.61

[a] Although we do not believe that we are limited to considering only designated nonattainment areas in implementing CAA section 202(i), we have focused on the designated areas in the case of PM_{10}. An official designation of PM_{10} nonattainment indicates the existence of a confirmed PM_{10} problem that is more than a result of a one-time monitoring upset or a results of PM_{10} exceedances attributable to natural events. In addition to these designated nonattainment areas, there are 15 unclassified counties in 12 geographically spread out states, with a 1996 population of over 4 million, for which the state has reported PM_{10} monitoring data for this period indicating a PM_{10} NAAQS violation. We have not yet excluded the possibility that a one-time monitoring upset or a natural event(s) is responsible for the monitored violations in 1996–1998 in the 15 unclassified counties. We adopted a policy in 1996 that allows areas whose PM_{10} exceedances are attributable to natural events to remain unclassified if the state is taking all reasonable measures to safeguard public health regardless of the source of PM_{10} emissions. Areas that remain unclassified areas are not required to submit attainment plans, but we work with each of these areas to understand the nature of the PM_{10} problem and to determine what best can be done to reduce it. The Tier 2/Gasoline Sulfur program will reduce PM_{10} concentrations in these 15 unclassified counties, because all have car and light truck travel that contributes to PM_{10} and precursor emissions loadings. This reduction will assist these areas in reducing their PM_{10} nonattainment problem, if a problem is confirmed upon closer examination of each local situation. Boise, ID, had also been classified as a PM_{10} nonattainment area at one time and was monitored to have a PM_{10} NAAQS violation in 1996–1998. However, the pre-existing PM_{10} NAAQS does not presently apply in Boise, ID, because in the period between our revision of the old PM_{10} NAAQS and the Court's decision to vacate the revised PM_{10} NAAQS, we determined that Boise was in attainment with the old PM_{10} NAAQS and that it therefore no longer applied in that area.

Because the types and sources of PM_{10} are complex and vary from area to area, the best projections of future PM_{10} concentrations are the local emission inventory and air quality modeling analyses that states have developed or are still in the process of developing for their PM_{10} attainment plans. We do employ a modeling approach, known as the source-receptor matrix approach, for relating emission reductions to PM_{10} reductions on a national scale. This approach is one of our established air quality models for purposes of quantifying the health and welfare related economic benefits of PM reductions from major regulatory actions. One application of this modeling approach was for the Regulatory Impact Analysis for the establishment of the new PM NAAQS [31]. This model is also the basis for the estimates of PM_{10} (and $PM_{2.5}$) concentrations reductions we have used to estimate the economic benefits of the Tier 2/Gasoline Sulfur program in 2030. Its use for this purpose is described in the final RIA. In both applications, we modeled an emissions scenario corresponding to controls currently in place or committed to by states. As such, this scenario is an appropriate baseline for determining if further reductions in emissions are needed in order to attain and maintain the PM_{10} NAAQS.

In the RIA for the establishment of the PM NAAQS, we projected that in 2010 there will be 45 counties not in attainment with the original PM^{10} NAAQS . We cited these modeling results in our proposal for the Tier 2/ Gasoline Sulfur program and in our first supplemental notice. After reviewing public comments on our presentation of these modeling results, we have concluded that while the source-receptor matrix approach is a suitable model for estimating PM concentration reductions for economic benefits estimation, it is not a tool we can use with high confidence for predicting that individual areas that are now in attainment will become nonattainment in the future. However, we believe the source-receptor matrix approach is appropriate for, and is a suitable tool for, determining that a current designated nonattainment area has a high risk of remaining in PM_{10} nonattainment at a future date. Therefore, we have cross-matched the results for 2030 from our final RIA for Tier 2 and the list of current PM_{10} nonattainment areas with monitored violations in 1996 to 1998 shown in Table III.C–1.[32] Based on this, we conclude that the 8 areas shown in Table III.C–2 have a high risk of failing to attain and maintain without further emission reductions. These areas have a population of nearly 8 million. Included in the group are the counties that are part of the Los Angeles, Phoenix, and Las Vegas metropolitan areas, where traffic from cars and light trucks is substantial. California areas will benefit from the Tier 2/Gasoline Sulfur program because of travel within California by vehicles originally sold outside the state, and by reduced poisoning of catalysts from fuel purchased outside of California.

TABLE III.C–2.—EIGHT AREAS WITH A HIGH RISK OF FAILING TO ATTAIN AND MAINTAIN THE PM_{10} NAAQS WITHOUT FURTHER REDUCTIONS IN EMISSIONS

Area	1996 population (millions)
Clark Co., NV	0.93
Imperial Co., CA	0.14
Kern Co., CA	0.62
Kings Co., CA	0.11
Maricopa Co., AZ	2.61
Riverside Co., CA	1.41
San Bernardino Co., CA	1.59
Tulare Co., CA	0.35
Total population	7.76

Table III.C–2 is limited to designated PM_{10} nonattainment areas which both had monitored violations of the PM_{10} NAAQs in 1996–1998 and are predicted to be in nonattainment in 2030 in our PM_{10} air quality modeling. This gives us high confidence that these areas require further emission reductions to attain and maintain, but does not fully

[31] Regulatory Impact Analyses for the Particulate Matter and Ozone National Ambient Air Quality Standards and Proposed Regional Haze Rule, Innovative Strategies and Economics Group, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, N.C., July 16, 1997.

[32] We used the more recent modeling for 2030 rather than the earlier modeling for 2010, because the modeling the 2030 incorporates more recent estimates of emissions inventories. Our emission estimates in our final RIA indicate that PM_{10} emissions under the basline scenario increase steadily between 1996 and 2030, for 47 states combined and for four specific cities, suggesting that areas in nonattainment in both 1996–1998 and 2030 will be in nonatainment in the intermediate years as well assuming no further emission reductions. A factor tending to make Table III.C–2 shorter is that we have not relied on the source-receptor matrix model's prediction of 24-hour nonattainment, as those predictions on an individual areas basis are less reliable than the predictions of annual average nonattainment.

consider the possibility that there are other areas which are now meeting the PM_{10} NAAQS which have at least a significant probability of requiring further reductions to continue to maintain it. Our air quality modeling predicted 2030 violations of the annual average PM_{10} NAAQS in five additional counties that in either 1997 or 1998 had single-year annual average monitored PM_{10} levels of at least 90 percent of the NAAQS, but did not exceed the formal definition of the NAAQS over the three-year period ending in 1998 [33]. These areas are shown in Table III.C–3. They have a combined population of almost 17 million, and a broad geographic spread. Unlike the situation for ozone, for which precursor emissions are generally declining over the next 10 years or so before beginning to increase, we estimate that emissions of PM_{10} will rise steadily unless new controls are implemented. The small margin of attainment which these areas currently enjoy will likely erode; the PM air quality modeling suggests that it will be reversed. We therefore consider these areas to each individually have a significant risk of failing to maintain the NAAQS without further emission reductions. There is a substantial risk that at least some of them would fail to maintain without further emission reductions. The emission reductions from the Tier 2/Gasoline Sulfur program will help to keep them in attainment.

TABLE III.C–3.—FIVE AREAS WITH A SIGNIFICANT RISK OF FAILING TO ATTAIN AND MAINTAIN THE PM_{10} NAAQS WITHOUT FURTHER REDUCTIONS IN EMISSIONS

Area	1996 population (millions)
New York Co., NY	1.33
Cuyahoga Co., OH	1.39
Harris, Co., TX	3.10
San Diego Co., CA	2.67
Los Angeles Co., CA	8.11
Total population	16.6

Taken together and considering their number, size, and geographic distribution, these 13 areas are sufficient to establish the case that additional reductions are needed in order to attain and maintain the PM_{10} NAAQS. This determination provides additional support for the NOx and VOC standards and for the limits on gasoline sulfur, which are also fully supported on ozone attainment and health effects considerations. The sulfate particulate, sulfur dioxide, NO_X, and VOC emission reductions from the Tier 2/Gasoline Sulfur program will help the 8 areas in Table III.C–2 and the 5 areas in Table III.C.–3 to attain and maintain the PM_{10} NAAQS. The new PM standards for gasoline and diesel vehicles are also supported by this PM_{10} determination.

We are also establishing the new PM emissions standard today to avoid the possibility that PM_{10} concentrations in these and other areas do get even worse due to an increase in sales of diesel vehicles, which could create a need for further reductions which would be larger and would affect more areas of the country. At the present time, virtually all cars and light trucks being sold are gasoline fueled. The ambient PM_{10} air quality data for 1996 to 1998 reflects that current situation, and this data was an important factor in what areas are listed in Tables III.C–2 and III.C–3. Also, the predictions of future PM_{10} air quality, used to develop the Tables III.C–2 and III.C–3 lists of areas with high or significant risk of being unable to attain and maintain, are based on an assumption that this will continue to be true. However, we are concerned over the possibility that diesels will become more prevalent in the car and light-duty truck fleet, since automotive companies have announced their desire to increase their sales of diesel cars and light trucks. Because current diesel vehicles emit higher levels of PM_{10} than gasoline vehicles, a larger number of diesel vehicles could dramatically increase levels of exhaust PM_{10}, especially if more stringent PM emissions standards are not in place. The new PM emissions standards will ensure that an increase in the sales of diesel cars and light trucks will not increase PM emissions from cars and light trucks so substantially as to endanger PM_{10} attainment and maintenance on a more widespread basis. Given this potential, it is appropriate to establish the new PM emissions standards now on the basis of the increase in sales of diesel vehicles being a reasonable possibility without such standards. Establishing the new PM emissions standards now avoids the public health impact and industry disruption that could result if we waited until an increase in sales of diesels with high PM emissions had already occurred.

In order to assess the potential impact of increased diesel sales penetration on PM emissions, we analyzed the increase in PM_{10} emissions from cars and trucks under a scenario in which the use of diesel engines in cars and light trucks increases. We used projections developed by A.D. Little, Inc. as part of a study conducted for the American Petroleum Institute. The ''Most Likely'' case projected by A.D. Little forecasts that diesel engines'' share of the light truck market will grow to 24 percent by the 2015 model year. Diesel engines' share of the car market would grow somewhat more slowly, reaching 9 percent by 2015. The A.D. Little forecasts did not address the period after 2015; we have assumed that diesel sales stabilize at the level reached in 2015, with the fraction of in-use vehicles with diesel engines continuing to increase through turnover. We believe these projections are more realistic than the scenario of even higher sales of diesels described in the notice for the proposed Tier 2/Gasoline Sulfur program, though the A.D. Little forecasts still show much higher percentages of diesel vehicles in the light-duty fleet than have ever existed historically in the U.S.

The A.D. Little scenario of increased diesels, and even more so the scenario described in our proposal, would result in dramatic increases in direct PM_{10} emissions from cars and light trucks, if there were no change in these vehicles' PM standards. The increase in diesel exhaust PM_{10} emissions would more than overcome the reduction in direct PM_{10} attributable to the sulfur reduction in gasoline. With no change in the existing PM standards for cars and light trucks, our analysis of this scenario shows that direct PM_{10} emissions in 2020 would be approximately 98,000 tons per year, which is nearly two times the 50,000 tons projected if diesel sales do not increase. The portion of ambient PM_{10} concentrations attributable to cars and light trucks would climb steadily. The final RIA presents alternative estimates of the amount by which future PM_{10} concentrations could increase due to such an emissions increase, based on extrapolations from several studies' estimates of the contribution that heavy-duty diesel vehicles have made to recent or PM_{10} concentrations. The increase is estimated to range from 0.6 to 20 µg/m3.

The added PM_{10} emissions from cars and trucks due to an increase in diesel sales without action to reduce PM_{10} from new diesel vehicles would exacerbate the PM_{10} nonattainment problems of the areas listed in Tables

[33] In fact, in two of these areas, New York Co., NY and Harris Co., TX, the average PM_{10} level in 1998 was above the 50 µg/m^3 value of the NAAQS. These two areas are not included in the Table III.C–2 list of areas with a high risk of failing to attain and maintain because lower PM_{10} levels in 1996 and 1997 caused their three-year average PM_{10} level to be lower than the NAAQS. Official nonattainment determinations for the annual PM_{10} NAAQS are made based on the average of 12 quarterly PM_{10} averages.

III.C–2 and III.C–3, for which our air quality modeling predicted future nonattainment even without an increase in diesel sales. Moreover, it might cause PM_{10} nonattainment in additional areas. In addition to the counties already listed in Tables III.C–2 and III.C–3, there are other areas for which 1997 and 1998 data indicate that maintenance of the PM_{10} NAAQS is at risk if diesel sales of cars and light truck increase. Table III.C–4 lists additional counties for which either 1997 or 1998 monitoring data, or both, indicated a second-high PM_{10} concentration for the single year within 10 percent of the PM_{10} 24-hour NAAQS or an annual average PM_{10} concentration within 10 percent of the annual average PM_{10} NAAQS. Only counties which are part of metropolitan statistical areas are listed in Table III.C–4, in order to focus on those in which traffic densities are high. Considering both the annual and 24-hour NAAQS, there were 13 areas within 10 percent of the standard. Increases in PM_{10} emissions from more diesel vehicles would put these areas in greater risk of violating the PM_{10} NAAQS, especially if growth in other sources is high or meteorological conditions are more adverse than in the 1996 to 1998 period.

TABLE III.C–4.—THIRTEEN METROPOLITAN STATISTICAL AREA COUNTIES WITH 1997 AND/OR 1998 AMBIENT PM_{10} CONCENTRATIONS WITHIN 10 PERCENT OF THE ANNUAL OR 24-HOUR THE PM_{10} NAAQS [a]

	1996 population (millions)
Areas within 10 percent of the annual PM_{10} **NAAQS:**	
Lexington Co., SC	0.20
Union Co., TN	0.02
Washoe Co., NV	0.30
Madison Co., IL	0.26
Dona Ana Co., NM	0.16
El Paso Co., TX	0.68
Ellis Co., TX	0.97
Fresno Co., CA	0.74
Philadelphia Co., PA	1.47
Areas within 10 percent of the 24-hour PM_{10} **NAAQS:**	
Lexington Co., SC	0.20
El Paso Co., TX	0.68
Union Co., TN	0.02
Mobile Co., AL	0.40
Dona Ana Co., NM	0.16
Lake Co., IN	0.48
Philadelphia Co., PA	1.47
Pennington Co., SD	0.09
Ventura Co., CA	0.71
Total Population of all 13 areas	6.48

Notes:

[a] These areas are listed based on their second high 24-hour concentration and annual average concentration in 1997, 1998, or both. Official nonattainment determinations are made based on three years of data, and on estimates of expected exceedances of the 24-hour standard.

Fortunately, the standards included in today's actions will result in a steady decrease in total direct PM_{10} from cars and light trucks even if this increase in the use of diesel engines in these vehicles were to occur. If the A.D. Little ''Most Likely'' scenario for increased diesel engines in light trucks were to occur, today's actions would reduce diesel PM_{10} from cars and light trucks by over 75 percent in 2020. Stated differently, by 2030 today's actions would reduce 98,000 tons of the potential increase in PM_{10} emissions from passenger cars and light trucks. The result would be less direct PM_{10} than is emitted today, because the increase in diesel PM_{10} would be more than offset by the reduction in PM_{10} emissions from gasoline vehicles resulting from lower gasoline sulfur levels.

We are establishing tighter PM standards for cars and light trucks to help avoid the adverse impact of greater diesel PM emissions on PM_{10} attainment and public health and welfare if diesel sales increased in the future without the protection of the tighter standards. Because diesel vehicles will essentially be performing the same functions as the gasoline vehicles they will replace, it is appropriate for the new PM standards to also apply equally to gasoline and diesel vehicles. We expect that gasoline vehicles will need little or no redesign to meet the new PM standards when free of defects and properly operating. However, the new vehicle and gasoline sulfur standards may achieve some reduction in real world PM emissions from gasoline vehicles by encouraging more durable designs and by ensuring that these vehicles are operated on lower-sulfur fuel. The new standards for PM will also prevent any changes in gasoline engine design which would increase PM emissions. These changes would otherwise be possible because the current PM standard is so much higher than the current performance on the gasoline vehicles.

3. $PM_{2.5}$ Discussion

We are not basing our promulgation of the Tier 2 vehicle standards on a finding on the need for additional emission reductions in order to attain and maintain the NAAQS for $PM_{2.5}$. We are providing this information to explain that this program will result in substantial benefit in reduction of $PM_{2.5}$ concentrations, to an even broader set of geographic areas than will benefit in terms of PM_{10} attainment.

The annual and 24-hour $PM_{2.5}$ NAAQS set in 1997 are numerically much lower than the corresponding PM_{10} standards: 15 versus 50 $\mu g/m^3$ for the annual average standards and 65 versus 150 $\mu g/m^3$ for the 24-hour average standards. While geographically broad $PM_{2.5}$ monitoring is just now reaching the end of the first of three years of operation needed to determine compliance, our best analysis from the more limited $PM_{2.5}$ conducted in some areas indicates that many areas that are in compliance with the PM_{10} standards will be found to be in violation of the annual average $PM_{2.5}$ standard. Violations of the 24-hour $PM_{2.5}$ standard appear to be infrequent.

Therefore, if we considered it appropriate to proceed with implementing the $PM_{2.5}$ NAAQS, we are confident that there would be a larger set of areas for which we would determine that further reductions in emissions are needed in order to attain and maintain the NAAQS.

Moreover, gasoline and diesel cars and light trucks have a more important contributing role for ambient $PM_{2.5}$ concentrations, and other emission sources that play a major role in ambient PM_{10} concentrations will be relatively less important. Cars and light trucks contribute essentially the same absolute amount to ambient concentrations of PM_{10} and of $PM_{2.5}$. However, most other sources contribute much more to PM_{10} than to $PM_{2.5}$, so the relative contribution from cars and light trucks is larger. In addition, the absolute contribution from cars and light trucks is larger in relationship to the numerically lower $PM_{2.5}$ standard, making them more important to attainment and maintenance. This is also true for the potential contribution that more diesel cars and light trucks would make to ambient $PM_{2.5}$ concentrations.

4. Emission Reductions and Ambient PM Reductions

The NO_X and VOC emission reductions from the Tier 2/Gasoline Sulfur program are presented in the ozone section above. The SO_X and PM reductions are presented in our final RIA, and are essentially unchanged from those presented in our proposal, except for the revision of the diesel sales scenario discussed above.

Because virtually all of the PM reduction from the Tier 2/Gasoline

Sulfur program is in the fine fraction of PM_{10}, our estimates of the $PM_{2.5}$ and PM_{10} reductions are essentially the same. Estimates of the ambient PM reductions in 2030 in different parts of the nation, after full phase in of the vehicle standards, are presented in the final RIA. The reductions in ambient PM are largest in the parts of the country with more vehicle travel, i.e, larger in the east than in the west and larger in urban areas than in rural areas. In the eastern half of the nation, the reductions in annual average PM concentrations range from 0.2 to over 1.2 micrograms per cubic meter.

D. Other Criteria Pollutants: Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide

The standards being promulgated today will help reduce levels of three other pollutants for which NAAQSs have been established: carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). As of 1998, every area in the United States has been designated to be in attainment with the NO_2 NAAQS. As of 1997, one area (Buchanan County, Missouri) did not meet the primary SO_2 short-term standard, due to emissions from the local power plant. There are currently 20 designated CO nonattainment areas, with a combined population of 33 million. There are also 24 designated maintenance areas with a combined population of 22 million. However, the broad trends indicate that ambient levels of CO are declining. In 1997, 6 of 537 monitoring sites reported ambient CO levels in excess of the CO NAAQS.

The reductions in SO_2 precursor emissions from today's actions are essentially equal to the SO_X reductions described in Section III.B. and III.C., respectively. The impact of today's actions on NO_2 emissions depends on the specific emission control technologies used to meet the Tier 2 vehicle emission standards. However, essentially all of the NO_X emitted by cars and light trucks converts to NO_2 in the atmosphere; therefore, it is reasonable to assume that today's actions will substantially reduce ambient NO_2 levels by the same proportion. Today's rule also will require light trucks to meet more stringent CO standards. These more stringent standards will help extend the trend towards lower CO emissions from motor vehicles and thereby help the remaining CO nonattainment areas reach attainment while helping other areas remain in attainment with the CO NAAQS. Our analysis of CO reductions from today's program is found in Chapter III of the RIA. The analysis of economic benefits and costs found in Section IV.D.–5. does not account for the economic benefits of the CO reductions expected to result from today's proposal.

E. Visibility

Visibility impairment occurs as a result of the scattering and absorption of light by particles and gases in the atmosphere. It is most simply described as the haze that obscures the clarity, color, texture, and form of what we see. The principal cause of visibility reduction is fine particles between 0.1 and 1 μm in size. Of the pollutant gases, only NO_2 absorbs significant amounts of light; it is partly responsible for the brownish cast of polluted skies. While the contribution of NO_2 to visibility impairment varies from area to area, it is generally responsible for less than ten percent of visibility reduction.

The CAA requires EPA to protect visibility, or visual air quality, through a number of programs. These programs include the national visibility program under Sections 169a and 169b of the Act, the Prevention of Significant Deterioration program for the review of potential impacts from new and modified sources, and the secondary NAAQS for PM_{10} and $PM_{2.5}$. The national visibility program established in 1980 requires the protection of visibility in 156 mandatory federal Class I areas across the country (primarily national parks and wilderness areas). More than 65 million visitors travel each year to these parks and wilderness areas. The CAA established as a national visibility goal, "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory federal Class I areas in which impairment results from manmade air pollution." The Act also calls for state programs to make "reasonable progress" toward the national goal. In addition, a recent national opinion poll on the state of the national parks found that more than 80 percent of Americans believe air pollution affecting these parks should be cleaned up for the benefit of future generations.[34]

There has been improvement in visibility in the western part of the country over the last ten years. However, visibility impairment remains a serious problem in Class I areas. Visibility in the East does not seem to have improved. As one part of addressing this national problem, EPA has required states to adopt and implement effective plans for protecting and improving visibility in Class I federal areas (64 FR 35714, July 1, 1999).

Today's actions will result in visibility improvements due to the reduction in local and upwind PM and PM precursor emissions. Since mobile source emissions contribute to the formation of visibility-reducing PM, control programs that reduce the mobile source emissions of direct and secondary PM would have the effect of improving visibility. The Grand Canyon Visibility Transport Commission's final recommendations report[35] found that reducing total mobile source emissions is an essential part of any program to protect visibility in the Western U.S. The Commission found that motor vehicle exhaust is responsible for about 14 percent of human-caused visibility reduction (excluding road dust). A substantial portion of motor vehicle exhaust comes from cars and light trucks. In light of that impact, the Commission's recommendations in 1996 supported federal Tier 2/Gasoline Sulfur standards, as EPA is proposing today. More recently, a number of Western Governors noted the importance of controlling mobile sources as part of efforts to improve visibility in their comments on the Regional Haze Rule and on the need to protect the 16 Class I areas on the Colorado Plateau. In their joint letter dated June 29, 1998, they stated that, "* * * the federal government must do its part in regulating emissions from mobile sources that contribute to regional haze in these areas. * * *" and called on EPA to make a "binding commitment * * * to fully consider the Commission's recommendations related to the * * * federal national mobile source emission control strategies." These recommendations included Tier 2 vehicle standards and reductions in gasoline sulfur levels.

The recent Northern Front Range Air Quality Study provides another indication of how important car and light truck emissions can be to fine PM and visibility. This study reported findings that indicate that cars and light trucks are responsible for 39 percent of fine PM at a site within the metropolitan Denver area, and for 40 percent at a downwind rural site. This contribution includes both direct PM and indirect PM formed from sulfur dioxide and NO_X from these vehicles.

[34] "National Parks and the American Public: A National Public Opinion Survey on the National Park System," Summary Report, National Parks and Conservation Association, June 1998.

[35] "Recommendations for Improving Western Vistas," Report of the Grand Canyon Visibility Transport Commission to the United States Environmental Protection Agency, June 10, 1996.

The analysis of economic benefits and costs found in Section IV.D.5. accounts for the economic benefits of the visibility improvements expected to result from today's actions.

F. Air Toxics

Section 202(a) provides that EPA may promulgate standards regulating any air pollutants that in the Administrator's judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. Section 202(l) provides specific provisions for regulation of hazardous air pollutants from motor vehicles and fuels, and states that at a minimum such regulations should apply to emissions of benzene and formaldehyde.

Emissions from cars and light trucks include a number of air pollutants that are known or suspected human or animal carcinogens or that are known or suspected to have other, non-cancer health impacts. These pollutants include benzene, formaldehyde, acetaldehyde, 1,3-butadiene, and diesel particulate matter. 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 present in exhaust emissions; benzene is also found in evaporative emissions from gasoline-fueled vehicles.

The health effects of diesel particulate matter are of particular relevance to today's actions, because of the possibility for increased diesel-powered truck sales and the more stringent PM standard that will apply to these trucks as a result of today's actions. While we have not finalized our decision about the carcinogenicity of diesel exhaust, we are in the process of addressing this question. The Agency's recently released draft assessment [36] concludes that diesel exhaust is a highly likely human lung cancer hazard, but that the data are currently unsuitable to make a confident quantitative statement of risk. The draft report concludes, however, that this risk is applicable to ambient exposures and that the risk may be in the range of regulatory interest (greater than one in a million over a lifetime). Several other agencies and governing bodies have designated diesel exhaust or diesel PM as a ''potential'' or ''probable'' human carcinogen.[37] The California Air Resources Board (ARB), for example, found that diesel particulate matter constituted a toxic air contaminant and estimated a potency range of 1.3×10^{-4} to 2.4×10^{-3} per µg/m^3.[38] The ARB's findings suggest that 130 to 2400 persons in one million exposed to 1 µg/m^3 of diesel exhaust particulate continuously for their lifetime (70 years) would develop cancer as a result of their exposure.

Because our assessment for diesel exhaust is not complete, we are not presenting absolute estimates of how potential cancer risks from diesel particulate matter could be affected by today's rule. However, we can offer a qualitative or relative discussion of these risks. Diesel engines used in nonroad equipment and heavy-duty highway vehicles currently constitute a far larger source of diesel PM than cars and light-duty trucks, since diesel engines are used in a very small portion of the cars and light-duty trucks in service today. However, engine and vehicle manufacturers have projected that diesel engines are likely to be used in an increasing share of cars and light trucks, and some manufacturers have announced capital investments to build such engines.

If these projections are valid, then the proportion of cars and light trucks powered by diesel engines, and the associated potential health risks from diesel PM, could increase substantially. We modeled the most likely level of increase in light duty diesel engine sales developed for the American Petroleum Institute.[39] We found that the greater diesel engine usage in cars and light trucks resulted in an 80 percent increase in emissions from all diesel-powered highway vehicles by 2020—emissions that have been implicated in potential cancer risks—assuming no change in the current light-duty diesel PM standards.

Today's rule would limit the increase in the potential cancer risks from cars and light trucks associated with any potential increase in light-duty diesel engines. Using the same sales projections discussed above, we have estimated that today's rule would limit the increase in total highway diesel PM emissions in 2020 due to growth in light duty diesels to under 10 percent, in contrast to the 80 percent increase projected to occur without the Tier 2 PM standards. An analogous analysis that accounted for exposure patterns, but that assumed even more widespread use of diesels in the car and light truck fleet, found that today's rule would limit the increase in total highway diesel PM exposure to about 8 percent. This analysis is discussed more fully in Chapter III.F.2 of the Regulatory Impact Analysis. In addition, the VOC emission reductions resulting from today's rule would reduce the potential cancer risk posed by air pollutants other than diesel PM emitted by cars and light trucks, since many of these pollutants are themselves VOCs. Furthermore, the rule would align the formaldehyde standards for all Tier 2 LDVs and LDTs with the formaldehyde standards for LDVs and LDT1s from the NLEV program, thereby helping to harmonize the Federal and California formaldehyde standards.

The analysis of economic benefits and costs found in Section IV.D.5. does not account for the economic benefits of the reduction in cancer risk from air toxics that could result from today's rule. Although we have completed a peer reviewed assessment of the impact of today's rule on exposure to toxic emissions, we have not engaged in a peer-reviewed assessment of the baseline air toxics risks (including a final quantitative risk assessment of the diesel particulate risks) or of the reductions that would be achieved by today's rule.

We plan to complete our analysis of air toxics risks as part of our responsibilities under section 202(l)(2) of the Clean Air Act, which requires EPA to establish regulations for the control of hazardous air pollutants from motor vehicles. The regulations may address vehicle emissions or fuel properties that influence emissions, or both. We plan to issue a proposal to address this requirement in April 2000, and a final rule in December 2000.

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[36] EPA's diesel health assessment (Health Assessment Document for Diesel Emissions, SAB Review Draft, U.S. Environmental Protection Agency, Washington, DC. EPA/600/8–90/057D, November 1999) can be found at the following EPA website: *http://www.epa.gov/ncea/diesel.htm.*

[37] National Institute for Occupational Safety and Health (1988) Carcinogenic effects of exposure to diesel exhaust. NIOSH Current Intelligence Bulletin 50. DHHS (NIOSH) Publication No. 88–116. Centers for Disease Control, Atlanta, GA.

International Agency for Research on Cancer (1989) Diesel and gasoline engine exhausts and some nitroarenes, Vol. 46. Monographs on the evaluation of carcinogenic risks to humans. World Health Organization, International Agency for Research on Cancer, Lyon, France.

World Health Organization (1996) Diesel fuel and exhaust emissions: International program on chemical safety. World Health Organization, Geneva, Switzerland.

California Environmental Protection Agency, Office of Environmental Health Hazard Assessment: Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Part B Health Risk Assessment for Diesel Exhaust. April 22, 1998.

[38] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment: Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Part B Health Risk Assessment for Diesel Exhaust. April 22, 1998.

[39] ''U.S. Light-Duty Dieselization Scenarios—Preliminary Study'', report to the American Petroleum Institute, July 2, 1999. Prepared by Arthur D. Little, Inc.

G. Acid Deposition [40]

Acid deposition, or acid rain as it is commonly known, occurs when SO_2 and NO_X react in the atmosphere with water, oxygen, and oxidants to form various acidic compounds that later fall to earth in the form of precipitation or dry deposition of acidic particles. It contributes to damage of trees at high elevations and in extreme cases may cause lakes and streams to become so acidic that they cannot support aquatic life. In addition, acid deposition accelerates the decay of building materials and paints, including irreplaceable buildings, statues, and sculptures that are part of our nation's cultural heritage. To reduce damage to automotive paint caused by acid rain and acidic dry deposition, some manufacturers use acid-resistant paints, at an average cost of $5 per vehicle—a total of $61 million per year if applied to all new cars and trucks sold in the U.S. The general economic and environmental effects of acid rain are discussed at length in the RIA.

Acid deposition primarily affects bodies of water that rest atop soil with a limited ability to neutralize acidic compounds. The National Surface Water Survey (NSWS) investigated the effects of acidic deposition in over 1,000 lakes larger than 10 acres and in thousands of miles of streams. It found that acid deposition was the primary cause of acidity in 75 percent of the acidic lakes and about 50 percent of the acidic streams, and that the areas most sensitive to acid rain were the Adirondacks, the mid-Appalachian highlands, the upper Midwest and the high elevation West. The NSWS found that approximately 580 streams in the Mid-Atlantic Coastal Plain are acidic primarily due to acidic deposition. Hundreds of the lakes in the Adirondacks surveyed in the NSWS have acidity levels incompatible with the survival of sensitive fish species. Many of the over 1,350 acidic streams in the Mid-Atlantic Highlands (mid-Appalachia) region have already experienced trout losses due to increased stream acidity. Emissions from U.S. sources contribute to acidic deposition in eastern Canada, where the Canadian government has estimated that 14,000 lakes are acidic. Acid deposition also has been implicated in contributing to degradation of high-elevation spruce forests that populate the ridges of the Appalachian Mountains from Maine to Georgia. This area includes national parks such as the Shenandoah and Great Smoky Mountain National Parks.

The SO_X and NO_X reductions from today's actions will help reduce acid rain and acid deposition, thereby helping to reduce acidity levels in lakes and streams throughout the U.S. These reductions will help accelerate the recovery of acidified lakes and streams and the revival of ecosystems adversely affected by acid deposition. Reduced acid deposition levels will also help reduce stress on forests, thereby accelerating reforestation efforts and improving timber production. Deterioration of our historic buildings and monuments, and of buildings, vehicles, and other structures exposed to acid rain and dry acid deposition, also will be reduced, and the costs borne to prevent acid-related damage may also decline.

While the reduction in sulfur and nitrogen acid deposition will be roughly proportional to the reduction in SO_X and NO_X emissions, respectively, the precise impact of today's vehicle and fuel standards will differ across different areas. Each area is affected by emissions from different source regions, and the mobile source contribution to the total SO_X and NO_X emission inventory will differ across different source regions. Nonetheless, the projected impact of today's actions on SO_X and NO_X emission inventories provides a rough indicator of the likely effect of the Tier 2/Gasoline Sulfur standards on acid deposition. Our analysis indicates that today's actions will reduce SO_X emissions by 1.8 percent and NO_X emissions by 14.5 percent in 2030.

The analysis of economic benefits and costs found in Section IV.D.5. did not account for the economic benefits of the reduction in acid deposition expected to result from today's actions.

H. Eutrophication/Nitrification

Nitrogen deposition into bodies of water can cause problems beyond those associated with acid rain. The Ecological Society of America has included discussion of the contribution of air emissions to increasing nitrogen levels in surface waters in a recent major review of causes and consequences of human alteration of the global nitrogen cycle in its Issues in Ecology series [41]. Long-term monitoring in the United States, Europe, and other developed regions of the world shows a substantial rise of nitrogen levels in surface waters, which are highly correlated with human-generated inputs of nitrogen to their watersheds. These nitrogen inputs are dominated by fertilizers and atmospheric deposition.

Human activity can increase the flow of nutrients into those waters and result in excess algae and plant growth. This increased growth can cause numerous adverse ecological effects and economic impacts, including nuisance algal blooms, dieback of underwater plants due to reduced light penetration, and toxic plankton blooms. Algal and plankton blooms can also reduce the level of dissolved oxygen, which can also adversely affect fish and shellfish populations. This problem is of particular concern in coastal areas with poor or stratified circulation patterns, such as the Chesapeake Bay, Long Island Sound, or the Gulf of Mexico. In such areas, the ''overproduced'' algae tends to sink to the bottom and decay, using all or most of the available oxygen and thereby reducing or eliminating populations of bottom-feeder fish and shellfish, distorting the normal population balance between different aquatic organisms, and in extreme cases causing dramatic fish kills.

Collectively, these effects are referred to as eutrophication, which the National Research Council recently identified as the most serious pollution problem facing the estuarine waters of the United States (NRC, 1993). Nitrogen is the primary cause of eutrophication in most coastal waters and estuaries [42]. On the New England coast, for example, the number of red and brown tides and shellfish problems from nuisance and toxic plankton blooms have increased over the past two decades, a development thought to be linked to increased nitrogen loadings in coastal waters. Airborne NO_X contributes from 12 to 44 percent of the total nitrogen loadings to United States coastal water bodies. For example, approximately one-quarter of the nitrogen in the Chesapeake Bay comes from atmospheric deposition.

Excessive fertilization with nitrogen-containing compounds can also affect terrestrial ecosystems [43]. Research suggests that nitrogen fertilization can alter growth patterns and change the

[40] Much of the information in this section was excerpted from the EPA document, Human Health Benefits from Sulfate Reduction, written under Title IV of the 1990 Clean Air Act. Amendments, U.S. EPA, Office of Air and Radiation, Acid Rain Division, Washington, DC, November 1995.

[41] Vitousek, Peter M., John Aber, Robert W. Howarth, Gene E. Likens, et al. 1997. Human Alteration of the Global Nitrogen Cycle: Causes and Consequences. Issues in Ecology. Published by Ecological Society of America, Number 1, Spring 1997.

[42] Much of this information was taken from the following EPA documenta: Deposition of Air Pollutants to the Great Waters-Second Report to Congress, Office of Air Quality Planning and Standards, June 1997, EPA–453/R–97–011.

[43] Terrestrial nitrogen deposition can act as a fertilizer. In some agricultural areas, this effect can be beneficial.

balance of species in an ecosystem. In extreme cases, this process can result in nitrogen saturation when additions of nitrogen to soil over time exceed the capacity of the plants and microorganisms to utilize and retain the nitrogen. This phenomenon has already occurred in some areas of the U.S.

Deposition of nitrogen from cars and light trucks contributes to these problems. As discussed in Section III.B. above, today's actions will reduce total NO_X emissions by 4.5 percent in 2007 and by 14.5 percent in 2030. The NO_X reductions should reduce the eutrophication problems associated with atmospheric deposition of nitrogen into watersheds and onto bodies of water, particularly in aquatic systems where atmospheric deposition of nitrogen represents a significant portion of total nitrogen loadings. Since air deposition accounts for 12–44 percent of total nitrogen loadings in coastal waters, the reduction in NO_X from today's actions is projected to reduce nitrogen loadings by 0.5–2.0 percent in 2007 and 1.7–6.4 percent in 2030. To put these reductions in perspective, the reductions expected in the Chesapeake Bay area would amount to about 9 percent of the total reduction in nitrogen loading needed to maintain the reduction in nutrient loads agreed to by the signatory states in the Chesapeake Bay Agreement (40 percent of ''controllable nutrient loads'' by the year 2000).

The analysis of economic benefits and costs found in Section IV.D.5. does not account for the economic benefits of reduced eutrophication or reduced terrestrial nitrogen deposition expected to result from today's actions.

I. Cleaner Cars and Light Trucks Are Critically Important to Improving Air Quality

Despite continued progress in reducing ozone and PM levels, tens of millions of Americans are still exposed to levels of these pollutants that exceed the National Ambient Air Quality Standards. Our projections show that without further action to reduce these pollutants, tens of millions of Americans will continue to breathe unhealthy air for decades to come. Our projections also show that emissions from cars and light trucks will continue to contribute a substantial share of the ozone and PM precursors in current and projected nonattainment areas, and in upwind areas whose emissions contribute to downwind nonattainment, unless additional measures are taken to reduce their emissions. Cars and light trucks also contribute substantially to ambient concentrations of CO. These vehicles will also continue to contribute to the ambient PM that affects visibility in Class I federal areas and some urban areas. Emissions from cars and light trucks also play a significant role in a wide range of health and environmental problems, including known and potential cancer risks from inhalation of air pollutants (a problem that could become more significant if sales of diesel-powered cars and light trucks were to increase), health risks from elevated drinking water nitrate levels, acidification of lakes and streams, and eutrophication of inland and coastal waters.

Today's actions will reduce NO_X, VOC, CO, PM, and SO_X emissions from these vehicles substantially. These reductions will help reduce ozone levels nationwide and reduce the extent and severity of violations of the 1-hour ozone standard. These reductions will also help reduce PM levels, both by reducing direct PM emissions and by reducing emissions that give rise to secondary PM. The CO reductions will help extend the downward trend in carbon monoxide levels, thereby helping the remaining CO nonattainment areas attain the CO standard and helping other areas stay in attainment with the CO standard despite continued increases in vehicle miles traveled. The NO_X and SO_X reductions will help reduce acidification problems, and the NO_X reductions will help reduce eutrophication problems and drinking water nitrate levels. The PM standards included in today's actions will help improve visibility and would help mitigate adverse health effects in the event of increases in light-duty diesel engine sales.

IV. What Are the New Requirements for Vehicles and Gasoline?

A. Why Are We Proposing Vehicle and Fuel Standards Together?

1. Feasibility of Stringent Standards for Light-Duty Vehicles and Light-Duty Trucks.

a. Gasoline Fueled Vehicles

We believe that the standards being promulgated today for gasoline-fueled vehicles are well within the reach of existing control technology. Our determination of feasibility is based on the use of catalyst-based strategies that are already in use and are well proven on the existing fleet of vehicles. In fact, as you will see below, many current engine families are already certified to levels at or below the new final Tier 2 requirements. All of the certification and research testing discussed below was performed on low-sulfur test fuel (nominally 30 ppm).

i. LDVs and LDT1s–LDT4s

Certainly, larger vehicles and trucks, which are heavier and have larger frontal areas, will face the biggest challenges in meeting the final Tier 2 standards. However, conventional technology will be sufficient for even these vehicles, especially in light of the extra leadtime we have provided before LDT3s and LDT4s have to meet Tier 2 levels. We are also changing the test conditions for these trucks from ''adjusted loaded vehicle weight'' to ''loaded vehicle weight.'' Adjusted loaded vehicle weight, suitable for commercial truck operation, loads the truck to half of its full payload. Loaded vehicle weight, on the other hand, represents curb weight plus 300 pounds. This change more accurately reflects how these vehicles are used and makes heavy LDT testing consistent with passenger car and light LDT testing. This change is consistent with treating these vehicles as they were designed, *i.e.,* for light-load use.

Emission control technology has evolved rapidly in recent years. Emission standards applicable to 1990 model year vehicles required roughly 90 percent reductions in exhaust HC and CO emissions and a 75 percent reduction in NO_X emissions compared to uncontrolled emissions. Today, some vehicles currently in production are well below these levels, showing even greater overall emissions reductions of all three of these pollutants. These vehicles' emissions are well below those necessary to meet the current federal Tier 1 and even California Low-Emission Vehicle (LEV–I) standards. The reductions have been brought about by ongoing improvements in engine air-fuel management hardware and software plus improvements in catalyst designs, all of which are described fully in the RIA.

The types of changes being seen on current vehicles have not yet reached their technological limits, and continuing improvement will allow both LDVs and LDTs to meet the final standards. The RIA describes a range of specific techniques that we believe could be used. These range from improved computer software and engine air-fuel controls to increases in precious metal loading and other exhaust system/catalyst system improvements. All of these technologies are currently used on one or more production vehicle models. There is no need to invent new approaches or technologies. The focus of the effort is primarily development, application, and optimization of these existing technologies.

We can gain significant insight into the difficulty of meeting the final new standards by looking at current full-life certification data. There are at least 48 engine family-control systems combinations, out of approximately 400, certified in 1999 at levels below the Tier 2 NO_X standard of 0.07 g/mi. Of these, 35 also have hydrocarbon levels of 0.09 g/mi or below. Looking at a somewhat higher threshold to identify vehicles certified near the final standard, there are an additional 113 car and light truck families certified at levels between 0.07 g/mi and 0.10 g/mi NO_X. Although not yet complete at this time, we also examined the 2000 model year certification data and found that there are at least 60 engine family-control systems combinations certified at levels below the Tier 2 NO_X standard of 0.07 g/mi and of those, 52 also have hydrocarbon levels of 0.09 g/mi or below.

All of the above vehicles are already able, or close to being able, to certify to our final standards. The further reductions needed are those to provide a compliance margin, or cushion, between the certified level and the emission standard. The degree of compliance margin required is a function of a variety of factors designed to provide the manufacturer a high confidence that production vehicles will meet the standards in-use over their useful life. Historically, these determinations are manufacturer specific, with cushions generally growing smaller as standards decline (reflecting more precision and repeatability in vehicle performance as more sophisticated controls are developed). The certification data reflects compliance cushions from as little as 20 percent below the standard to as high as 80 percent below the standard.

The manufacturers commented that the most difficult vehicles to bring into compliance with the Tier 2 standards would be the larger light-duty trucks, specifically those trucks currently certified under the LDT3 and LDT4 weight categories. Because of this, we undertook a technology demonstration program aimed at lowering the emissions of several large 1999 light-duty trucks. Two LDT3 Chevrolet Silverado pick-up trucks were tested, one internally and one under contract. Two LDT4 Ford Expedition sport-utility vehicles were also tested, also with one tested internally and one under contract. Both types of vehicles were tested with optional high horsepower engines (270 hp for the Silverado and 230 hp for the Expedition) and were equipped with four-wheel drive. The vehicles had curb weights of 4,500 pounds (GVWR of 6,100 lbs) for the Silverados and 5,800 pounds (GVWR of 7,200 lbs) for the Expeditions.

Figures IV.A.–1 and IV.A.–2 show the results to date of the emissions tests performed during this demonstration program at our National Vehicle and Fuel Emissions Laboratory (NVFEL) and also for emissions tests conducted in parallel by and under contract at Southwest Research Institute (SwRI) using similar Ford Expeditions and GM Chevrolet Silverados. During the evaluation, the trucks were equipped with a variety of catalysts that typically featured higher volume, higher precious metal loading, and higher cell-densities than the original hardware used by the vehicles to meet California LEV–I standards. Details of the catalysts tested are included in the RIA. Different exhaust manifolds featuring an insulating air-gap and low thermal mass were also evaluated. Finally, calibration changes were made to the powertrain control modules[44] to better match engine operating characteristics to the new catalyst systems, and to lower engine-out NOx emissions. The Silverado and Expedition had very similar results. Similar results were also achieved by us and SwRI, but by fairly different methods. The SwRI work on both trucks relied primarily on engine calibration changes and secondary air injection. The advanced catalyst systems used by SwRI contained advanced washcoat formulations with only minor changes to catalyst volume and precious metal content compared to the manufacturer's original configuration. The work we conducted on the Expedition also relied primarily on engine calibration changes with no secondary air injection. The catalyst system also contained advanced washcoat formulations with modest changes to catalyst volume and precious metal content. The work we conducted on the Silverado relied primarily on an advanced catalyst system with volume and precious metal content changes, with only minor changes to engine calibration.

As can be seen in the charts, the emissions of the vehicles tested clearly show the feasibility of the Tier 2 standards on the most difficult to certify vehicle categories. All vehicles reached emission levels well below the Tier 2 full-life NOx and NMOG standards. At the same time, there were no significant impacts on either fuel economy or performance of the vehicles.

Compared to the intermediate (50,000 mile) standards, the Ford Expedition tested at NVFEL consistently emitted NOx at less than one-third of the intermediate useful life standard.[45] NMHC/NMOG emissions were slightly below the intermediate standard level with no use of secondary-air-injection for cold-start hydrocarbon control. The Silverado tested at NVFEL met the intermediate standards with primarily hardware (catalyst) changes and only very minor calibration changes. The trucks tested at SwRI differed from those tested at NVFEL in their combination of emissions control hardware and calibration strategies, but achieved approximately the same emissions levels.

The above results point out that not only are the Tier 2 standards feasible for larger trucks, but there are multiple means that can be taken in order to achieve the necessary emissions levels. All of those paths involve fairly simple enhancements to current technology systems. Furthermore, the testing was conducted with a very limited budget over a limited amount of time. With the interim program for heavy trucks under Tier 2, the manufacturers will have 9 years from the publishing of the Tier 2 rule to bring the largest trucks into compliance with the Tier 2 standards. Manufacturers will also have considerably more resources with respect to calibration changes and hardware design to bring trucks of this type within compliance than were available within this limited, but successful, demonstration.

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[44] Powertrain control modules are computers used to control engine, transmission, and other vehicle functions on newer automobiles and trucks. The changes involved software changes in the case of the EPA-NVFEL work, or the use of alternate means of engine control in the case of the SwRI work.

[45] Although this testing was done on vehicles with catalysts aged to 50,000, we belive the overall experiments also strongly suggest that the Tier 2 full-life standards would be achieved by high-mileage vehicles.

Figure IV.A.-1:

Emissions After an Equivalent of 50,000 Miles for Various Tested Configurations of Ford Expedition LDT4 SUVs with 5.4L V8 Engines

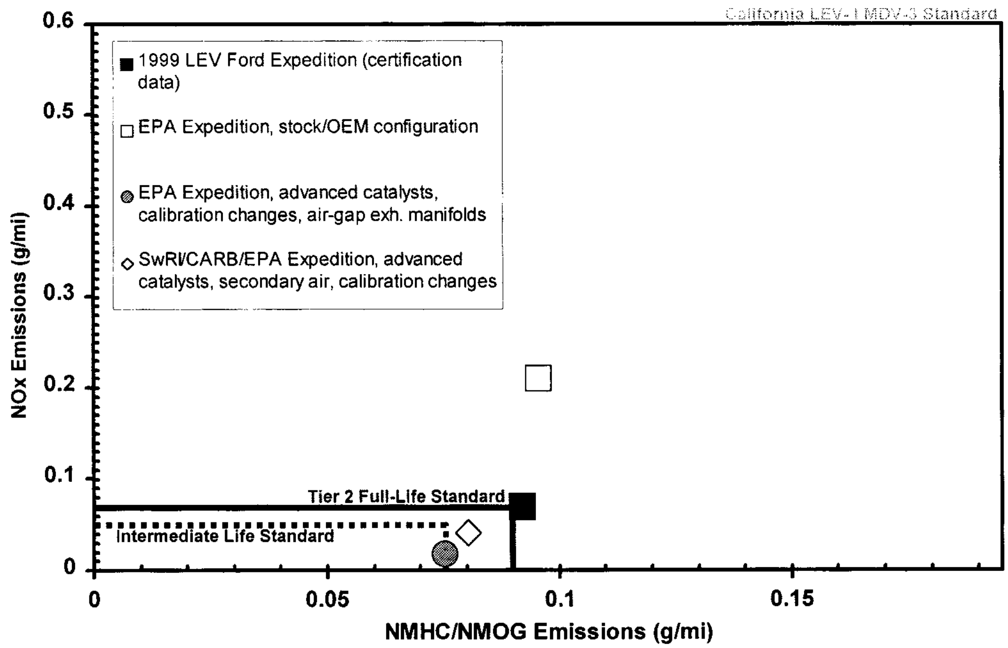
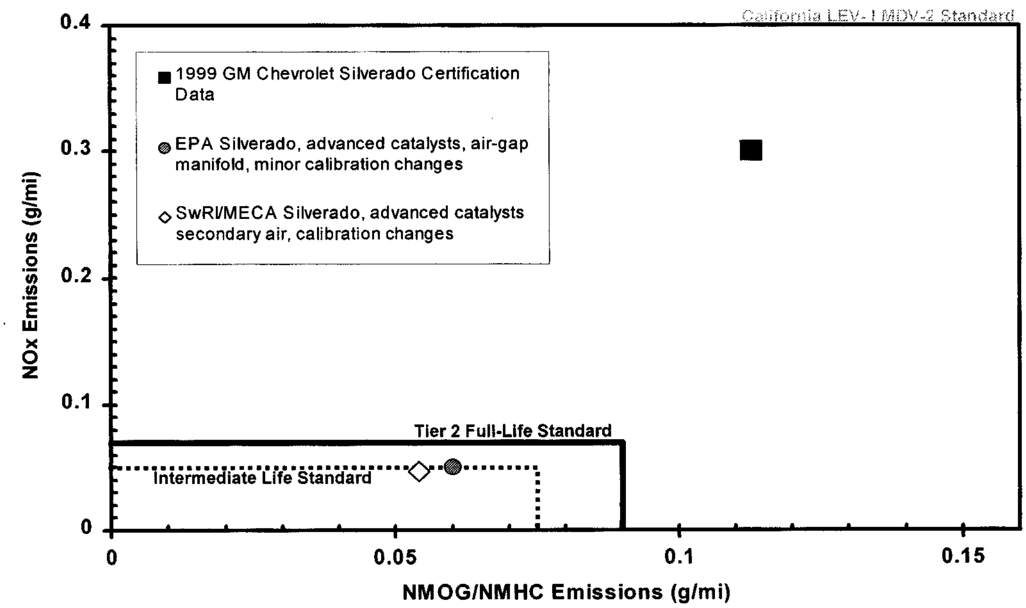


Figure IV.A.-2:

Emissions After an Equivalent of 50,000 Miles for Various Tested Configurations

of 1999 GM Chevrolet Silverado LDT3 Pickups with 5.3L V8 Engines.



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The Manufacturers of Emission Controls Association (MECA) sponsored a program that took two LDVs (a Crown Victoria and a Buick LeSabre) and one LDT2 (a Toyota T100) certified to the federal Tier 1 standards and replaced the original catalytic converter systems with more advanced catalytic converters, thermally aged to approximately 50,000 miles. With these systems and some related emission control modifications, the LeSabre and T100 emissions were well below our intermediate (50,000 mile) useful life standards, and the Crown Victoria was well below the NMOG standard and very close to the NO_X standard.

Finally, the California Air Resources Board (ARB) tested five different production LEV light-duty vehicle models. Three of the five models met the Tier 2 standards for NMOG and NO_X prior to any modifications. After installing low mileage advanced catalytic converters and making some minor adjustments to fuel bias, air injection, and spark timing, all of the vehicles had emission levels well below the Tier 2 intermediate useful life NMOG and NO_X standards. ARB also tested several Ford Expeditions (LDT4) equipped with advanced catalytic converters. By adjusting several parameters, they were able to reduce NO_X emissions to 0.06 g/mi and NMOG to 0.07 g/mi with a catalyst aged to 50,000 miles of use.

A more expanded analysis of the feasibility of the Tier 2 standards for gasoline fueled vehicles can be found in the RIA, considering the types of changes that will allow manufacturers to extend effective new controls to the entire fleet of affected vehicles. That analysis includes discussion of gasoline direct-injection engines, as well as the feasibility of the CO, formaldehyde and evaporative emission standards. The conclusion of all of our analyses is that the standards are feasible for gasoline-fueled vehicles. As gasoline-fueled vehicles represent the overwhelming majority of the LDV and LDT population (*i.e.,* over 99%), EPA concludes that the Tier 2 standards are feasible overall for LDVs and LDTs under 8500 lbs GVWR.

ii. Medium-Duty Passenger Vehicles (MDPVs)

The technologies and emission control strategies that will be used for LDT3 and LDT4 vehicles with a GVWR less than 8,500 pounds should apply directly to MDPV vehicles that have a GVWR greater than 8,500 pounds. In our LDT technology demonstration program discussed above, we found that a combination of calibration changes and improvements to the catalyst system resulted in emission levels for NO_X well below and NMHC/NMOG approximately at the Tier 2 intermediate useful life standards. The catalyst improvements consisted of increases in volume and precious metal loading, and higher cell-densities than those found in the original hardware. We are confident that the use of secondary-air-injection will greatly help cold-start hydrocarbon control, making the NMOG standards achievable.

The most significant difference between LDT4s less than 8,500 pounds GVWR and MDPVs greater than 8,500 pounds GVWR is that MDPVs have a vehicle weight up to 800 pounds more than LDT4s. MDPVs will also be typically equipped with larger displacement engines. The potential impact of these differences is higher engine-out emissions than LDT4s due to the larger engine displacement and greater load that the engine will be operated under due to the extra weight. However, neither of these preclude manufacturers from applying the same basic emission control technologies and strategies as used by LDVs and LDTs. The only difference will likely be the need for larger catalysts with higher precious metal loading than found in LDT4s. We are confident that MDPVs will be capable of meeting the final Tier 2 standards.

We are currently testing a Ford Excursion as part of our LDT technology demonstration program. Preliminary baseline results with a 'green'' (*i.e.,* nearly new) catalyst indicate that emission levels are higher than baseline emissions for the Ford Expedition. These results, although with a green catalyst, are well below our interim Tier 2 upper bin standards. In fact, the majority of these vehicles certified on the chassis dynamometer in California have certification levels well below our interim upper bin standards. While this testing is ongoing, we feel that the preliminary results are encouraging since they suggest that the difference in emissions between the Excursion and Expedition suggest that the strategies used on the Expedition can be successful with the Excursion. Therefore, we believe that by using technologies and control strategies similar to what will be used by LDVs and LDTs, combined with larger catalysts, MDPVs will be able to meet our Tier 2 emission standards.

b. Diesel Vehicles

As discussed above, the Tier 2 standards are intended to be ''fuel neutral.'' In today's document, we establish that the Tier 2 standards are technologically feasible and cost-effective for LDVs and LDTs overall, based on the discussion in Section IV.A.1.a. above. Under the principle of fuel neutrality, all cars and light trucks, including those using diesel engines, will be required to meet the Tier 2 standards. Contrary to some of the comments received on our proposal, given that the overwhelming majority of vehicles in these classes are gasoline-fueled, we do not believe it is appropriate to provide less stringent standards for diesel-fueled vehicles. Manufacturers of LDVs and LDTs today provide consumers with a wide choice of vehicles that are overwhelmingly gasoline-fueled. Less stringent standards for diesels would create provisions that could undermine the emission reductions expected from this program, especially given the expectation that some manufacturers may intend to greatly increase their diesel sales.

As with gasoline engines, manufacturers of diesels have made abundant progress over the past 10 years in reducing engine-out emissions from diesel engines. In heavy trucks and buses, PM emission standards, which were projected to require the use of exhaust aftertreatment devices, were actually met with only engine modifications. Indeed, emissions and performance of lighter diesel engine are rapidly approaching the characteristics of gasoline engines, while retaining the durability and fuel economy advantages that diesels enjoy. Against this background of continuing progress, we believe that the technological improvements that would be needed could be made in the time that would be available before diesels would have to meet the new Tier 2 standards.

Manufacturers may take advantage of the flexibilities in today's rulemaking to delay the need for diesel LDVs and LDTs to meet the final Tier 2 levels until late in the phase-in period (as late as 2007 for LDVs/LLDTs and 2009 for HLDTs), giving manufacturers a relatively large amount of leadtime. In a recent public statement, Cummins Engine Company has indicated that the interim Tier 2 standards in effect for vehicles and trucks in the early years of the Tier 2 program are feasible for diesel equipped models through further development of currently available engine and exhaust aftertreatment technology.[46]

While reductions in ''engine-out'' emissions, including incorporation of EGR strategies, may continue to be made, increasing emphasis is being placed on various aftertreatment devices for diesels. We believe that the use of aftertreatment devices will allow diesels to comply with the Tier 2 standards for NO_X and PM.

For NO_X emissions, potential aftertreatment technologies include lean NO_X catalysts, NO_X adsorbers and selective catalytic reduction (SCR). Lean NO_X catalysts are still under development, but generally appear capable of reducing NO_X emissions by about 15–30%. This efficiency is not likely to be sufficient to enable compliance with the final Tier 2 standards, but it could be used to meet the interim standards that would begin in 2004, with current diesel fuel.

NO_X adsorbers appear capable of reaching efficiency levels as high as 90%. Efficiency in this range is likely to be sufficient to enable compliance with the proposed Tier 2 standards. NO_X adsorbers temporarily store the NO_X and thus the engine must be run periodically for a brief time with excess fuel, so that the stored NO_X can be released and converted to nitrogen and oxygen using a conventional three-way catalyst, like that used on current gasoline vehicles.

There is currently a substantial amount of development work being directed at NO_X adsorber technology. While there are technical hurdles to be overcome, progress is continuing and it is our judgement that the technology should be available by the time it would be needed for the final Tier 2 standards.

One serious concern with current NO_X adsorbers is that they are quickly poisoned by sulfur in the fuel. Some manufacturers have strongly emphasized their belief that, in order to meet the final Tier 2 levels, low sulfur diesel fuel would also be required to mitigate or prevent this poisoning problem. In its comments on the NPRM, Navistar indicated that the Tier 2 standards may be achievable given low sulfur fuel and other programmatic changes such as those included in this Final Rule. Navistar has also been quoted publically as describing the Tier 2 standards as ''challenging but achievable'' given appropriate low sulfur fuel.[47] We intend to issue a Notice of Proposed Rulemaking early in the year 2000 intended to reduce sulfur in highway diesel fuel as a step to enable the technology most likely to be used to meet the Tier 2 standards.

SCR has been demonstrated commercially on stationary diesel engines and can reduce NO_X emissions by 80–90%. This efficiency would be sufficient to enable compliance with the proposed Tier 2 standards. However, SCR requires that the chemical urea be injected into the exhaust before the catalyst to assist in the destruction of NO_X. The urea must be injected at very precise rates, which is difficult to achieve with an on-highway engine, because of widely varying engine operating conditions. Otherwise, emissions of ammonia, which have a very objectionable odor, can occur. Substantial amounts of urea are required, meaning that vehicle owners would have to replenish their vehicles' supply of urea frequently, possibly as often as every fill-up of fuel. As the engine and vehicle would operate satisfactorily without the urea (only NO_X emissions would be affected), some mechanism would be needed to ensure that vehicle owners maintained their supply of urea. Otherwise, little NO_X emission reduction would be expected in-use.

[46] ''Cummins Sees Diesel Feasible for Early Years of Tier 2''. Hart Diesel Fuel News, Sept. 20, 1999, p.2.

[47] Harts Diesel Fuel News, August 9, 1999, p4.

Regarding PM, applicable aftertreatment devices tend to fall into two categories: Oxidation catalysts and traps. Diesel oxidation catalysts can reduce total PM emissions by roughly 15–30%. They would need to be used in conjunction with further reductions in PM engine-out emissions in order to meet the proposed Tier 2 standards. Diesel particulate traps, on the other hand, can eliminate up to 90% of diesel PM emissions. However, some of the means of accomplishing the regeneration of particulate traps involve catalytic processes that also convert sulfur dioxide in the exhaust to sulfate. These techniques, if used, would also require a low sulfur fuel.

In summary, we believe that the structure of our final program, including the available bins and phase-in periods, will allow the orderly development of clean diesel engine technologies. We believe that the interim standards are feasible for diesel LDV/LDTs, within the bin structure of this rule and without further reductions in diesel fuel sulfur levels. And, as indicated earlier, at least one major diesel engine manufacturer (Cummins) has publicly agreed with this assessment. We further believe that in the long-term, the final standards will be within reach for diesel-fueled vehicles in combination with appropriate changes to diesel fuel to facilitate aftertreatment technologies. Manufacturers have argued that low sulfur diesel fuel will be required to permit diesels to meet the final Tier 2 standards, and we agree. At least one major manufacturer (Navistar) has indicated its belief that the final Tier 2 standards may be achievable for diesel engines with low sulfur diesel fuel.

2. Gasoline Sulfur Control Is Needed to Support the Proposed Vehicle Standards

As we discussed in the previous section, we believe that the stringent standards in this final rule are needed to meet air quality goals and are feasible for LDVs and LDTs. At the same time, we believe that for these standards to be feasible for gasoline LDVs and LDTs, low sulfur gasoline must be made available. The following paragraphs explain why we think gasoline sulfur control must accompany Tier 2 vehicle standards.

Catalyst manufacturers generally use low sulfur gasoline in the development of their catalyst designs. Vehicle manufacturers then equip their vehicles with these catalysts and EPA certifies them to the exhaust emission standards, usually based on testing the manufacturer does using low sulfur gasoline. However, fundamental chemical and physical characteristics of exhaust catalytic converter technology generally result in a significant degradation of emission performance when these vehicles use gasoline with sulfur levels common in most of the country today. This sensitivity of catalytic converters to gasoline sulfur varies somewhat depending on a number of factors, some better understood than others. Clearly, however, as we discuss in the following paragraphs, gasoline sulfur's impact is large, especially in vehicles designed to meet very low emission standards.

This is the reason EPA has decided to adopt a comprehensive approach to addressing emissions from cars and light trucks, including provisions to get low sulfur gasoline into the field in the same time frame needed for Tier 2 vehicles.

a. How Does Gasoline Sulfur Affect Vehicle Emission Performance?

We know that gasoline sulfur has a negative impact on vehicle emission controls. Vehicles depend on the catalytic converter to reduce emissions of HC, CO, and NO_X. Sulfur and sulfur compounds attach or ''adsorb'' to the precious metal catalysts that are required to convert these emissions. Sulfur also blocks sites on the catalyst designed to store oxygen that are necessary to optimize NO_X emissions conversions. While the amount of sulfur contamination can vary depending on the metals used in the catalyst and other aspects of the design and operation of the vehicle, some level of sulfur contamination will occur in any catalyst.

Sulfur sensitivity is impacted not only by the catalyst formulation (the types and amounts of precious metals used in the catalyst) but also by factors including the following:

- The materials used to provide oxygen storage capacity in the catalyst, as well as the general design of the catalyst,
- The location of the catalyst relative to the engine, which impacts the temperatures inside the catalyst,
- The mix of air and fuel entering the engine over the course of operation, which is varied by the engine's computer in response to the driving situation and affects the mix of gases entering the catalyst from the engine, and
- The speeds the car is driven at and the load the vehicle is carrying, which also impact the temperatures experienced by the catalyst.

Since these factors vary for every vehicle, the sulfur impact varies for every vehicle to some degree. There is no single factor that guarantees that a vehicle will be very sensitive or very insensitive to sulfur. We now believe that there are not (and will not be in the foreseeable future) emission control devices available for gasoline-powered vehicles that can meet the proposed Tier 2 emission standards that would not be significantly impaired by gasoline with sulfur levels common today.

b. How Large Is Gasoline Sulfur's Effect on Emissions?

High sulfur levels have been shown to significantly impair the emission control systems of cleaner, later technology vehicles. The California LEV standards and Federal NLEV standards, as well as California's new LEV–II standards and our Tier 2 standards, require catalysts to be extremely efficient to adequately reduce emissions over the full useful life of the vehicle. In the NPRM we estimated that, based on data from test programs conducted by EPA and the automotive and oil industries, LEV and ULEV vehicles could experience, on average, a 40 percent increase in NMHC and 134 percent increase in NO_X emissions when operated on 330 ppm sulfur fuel (our estimate in the NPRM of the current national average sulfur level) compared to 30 ppm sulfur fuel. New data generated since the NPRM on similar LEVs and ULEVs show that when these vehicles were driven on high sulfur (330 ppm) fuel for a few thousand miles (as opposed to less than 100 miles for the previous data), the NMHC and NO_X emission increase due to high sulfur fuel increased by 149 percent and 47 percent, respectively. In other words, instead of the previous estimated 40 percent and 134 percent increases in NMHC and NO_X emissions, respectively, more realistic estimates would be 100 percent and 197 percent, respectively.[48] Also, new data generated since the NPRM for late model LEV and ULEV vehicles that meet the federal and California supplemental federal test procedure (SFTP) standards and also have very low FTP emission levels, indicate that, on average, a 51 percent increase in NMHC and a 242 percent increase in NO_X emissions when operated for a short period of time on 330 ppm compared to 30 ppm could be realized.

This level of emissions increase is significant enough on its own to cause a vehicle to exceed the full useful life emission standards when operated on sulfur levels that are substantially higher than the levels required by today's rule, even with the margin of

[48] The air quality impacts discussed above under Section III above do not reflect these new estimates.

safety that auto manufacturers generally include. Average sulfur levels in the U.S. are currently high enough to significantly impair the emissions control systems in new technology vehicles, and to potentially cause these vehicles to fail emission standards required for vehicles up through 100,000 miles (or more) of operation.

For older vehicles designed to meet Tier 0 and Tier 1 emission standards, the effect of sulfur contamination is somewhat less. Still, testing shows that gasoline sulfur increases emissions of NMHC and NO_X by almost 17% when one of these vehicles is operated on gasoline for less than 100 miles containing 330 ppm sulfur compared to operation on gasoline with 30 ppm sulfur. Thus, Tier 0 and Tier 1 vehicles can also have higher emissions when they are exposed to sulfur levels substantially higher than the proposed sulfur standard. This increase is generally not enough to cause a vehicle to exceed the full useful life emission standards in practice, but it can result in in-use emissions increases since the vehicle could emit at levels higher than it would if it operated consistently on 30 ppm sulfur gasoline.

As discussed in the RIA, NLEV and Tier 2 vehicles are significantly more sensitive to sulfur poisoning than Tier 1 and Tier 0 vehicles. Because of this, even in the absence of Tier 2 standards, gasoline sulfur control to 30 ppm would achieve about 700,000 tons of NO_X reductions per year from LDVs and LDTs by 2020. This represents about a third of the national NO_X emission reductions otherwise available from these vehicles. Without these potential emission reductions, many states would face the potentially unmeetable challenge of finding enough other cost-effective sources of NO_X emission reductions to address their ozone nonattainment and maintenance problems.

Sulfur reductions will result in reductions of other pollutants as well. For example, the increase in CO emissions at 330 ppm compared to 30 ppm were very similar to the results above for NMHC. Thus, sulfur reductions would greatly reduce CO emissions. Another example is sulfur reductions will help reduce emissions of particulate matter, providing some benefit to PM nonattainment areas (which may or may not coincide with ozone nonattainment areas) as well as with visibility problems. Sulfur reductions will also have benefits for areas across the country with acid deposition problems. Furthermore, sulfur reduction, by enabling tighter Tier 2 standards and by improving emissions performance of the vehicles already on the road, will lead to fewer NMOG emissions, since, as explained in the RIA, NMOG emissions are also impacted by gasoline sulfur (although to a lesser extent than NO_X emissions). Some of the NMOG emissions reduced are air toxics. As described in Section III above, air toxics, also known as hazardous air pollutants, or HAPs, contribute to a variety of human health problems.

c. Sulfur's Negative Impact on Tier 2 Catalysts

As we discussed in the last section, sulfur contaminates the catalyst. In addition, essentially all vehicles that have been tested show that this effect is not reversible for one or more pollutants. The ability to reverse sulfur's negative effect on catalyst performance is dependent on a number of factors. The same factors that impact sulfur sensitivity also impact the irreversibility of the sulfur effect. For example, the location of the catalyst relative to the engine, the materials used to provide oxygen storage capacity in the catalyst, and the general design of the catalyst and the mix of air and fuel (A/F) entering the engine over the course of operation affect irreversibility, to name a few.

Perhaps the most significant factors for reversibility are the mixture of air and fuel entering the engine and catalyst temperature. The results of numerous studies and test programs show that rich exhaust (absence of oxygen) mixtures in addition to high catalyst temperatures (in excess of 700°C) can remove sulfur from the catalyst. Rich exhaust mixtures can occur intentionally and unintentionally, depending on the level of sophistication of the fuel control system. An intentional rich exhaust mixture is known as fuel ''enrichment.'' There are different types of enrichment. For example, there is ''commanded'' enrichment, which is used to provide extra power when the engine is under a load (*e.g.,* accelerations), as well as a means to cool the catalyst. Also, there is enrichment which results from the normal fluctuations in A/F that occur during typical ''closed-loop'' FTP operating conditions. The amount of enrichment necessary for sulfur removal is a function of several factors: the ''magnitude'' of the enrichment event, the duration of the enrichment event, and the frequency of which the enrichment event occurs.

While the amount of fuel enrichment is critical in the removal of sulfur from the catalyst, high catalyst temperature is equally as important. In order to meet strict Tier 2 standards, manufacturers are going to have to balance tight A/F control with improved catalyst performance, with an eye towards better catalyst thermal management. Many manufacturers are going to have to depend more on the precious metal palladium for oxidation of NMOG and CO emissions, as well as the reduction of NO_X, because palladium is more tolerant to high temperatures. Since the vast majority of emissions still occur immediately following a cold start when the catalyst is still cool, further reductions to cold start emissions can be achieved by locating the catalysts very close to the engine. The closer proximity to the engine helps to activate the catalyst sooner by taking advantage of the additional heat supplied to the catalyst by the exhaust manifolds. Palladium is very sensitive to sulfur and, consequentially, catalyst systems that rely heavily on this metal tend to be more sensitive to sulfur and less reversible. The precious metal platinum, although usually a little more effective at oxidizing NMOG and CO and slightly less sensitive to sulfur than palladium, is too sensitive to high temperature to survive the close proximity to the engine and is not anticipated to be used for close-coupled applications.

As discussed above, manufacturers will need to make modifications to their emission system calibrations by optimizing fuel control, spark timing, EGR and other parameters in conjunction with improvements to catalyst systems, in order to meet Tier 2 emission standards. This combination of emission control strategies can result in significant trade-offs between NMOG and NO_X control. There can be considerable uncertainty associated with balancing these trade-offs at very low emissions levels if the vehicle is periodically operated on high sulfur fuels.

Our federal supplemental federal test procedure (SFTP) standards, as well as California's SFTP standards, both of which take effect in the 2001 model year, can further exacerbate this problem. The SFTP standards are intended to better address and control emissions under driving conditions not captured when compliance with our FTP-based exhaust emissions standards is demonstrated, such as operation with the air conditioning turned on or driving at very high rates of acceleration and vehicle speeds (hereafter referred to simply as aggressive driving). This is an important factor in assessing sulfur irreversibility, because Tier 2 vehicles will have to meet more stringent exhaust emission standards and will have to meet these standards over the wider variety of operating conditions included in the SFTP provisions. Hence, they will have to be designed to meet the emission standards under all such operating conditions; these design changes may influence how irreversible the sulfur effect will be, as explained below.

Since wide variations in the A/F ratio help to remove sulfur from the catalytic surface, there is concern that vehicles which meet the SFTP standards, when driven aggressively, will experience insufficient enrichment to purge sulfur from the catalyst. Currently, when driven aggressively, the A/F ratio for most vehicles (those not certified to SFTP standards) is quite variable. Meeting the SFTP standards will ensure that manufacturers carefully control the A/F ratio over essentially all in-use driving conditions. This absence of widely varying A/F could therefore inhibit the removal of sulfur from the catalyst once operation on high sulfur fuel ceased.

In order to quantify how irreversible the sulfur effect would be when catalysts exposed to high sulfur fuel are then exposed to lower sulfur fuel, several test programs were developed by EPA and industry. The vehicles in these test programs consisted of LDVs and LDTs that met either EPA Tier 1 or California LEV and ULEV emission standards. All of the vehicles were first tested at a low sulfur level (*e.g.,* 30 or 40 ppm) to establish a baseline. The vehicles were then re-tested with high sulfur fuel (*e.g.,* 350 to 540 ppm). After emission results had stabilized, the vehicles were again re-tested with low sulfur fuel. Prior to each of the second series of low sulfur tests, the vehicles were operated over a short driving cycle to help purge (*i.e.,* remove) sulfur from the catalyst. Two different cycles were used to purge sulfur, representing different types of driving: moderate urban conditions and aggressive conditions. The FTP cycle, which represents moderate urban driving, and the REP05 [49] cycle, which represents very aggressive driving (*e.g.,* hard accelerations, high speed cruises), were the two cycles used.

The vehicles tested exhibited a wide range of irreversibility, for reasons that are not fully understood. The data published in the NPRM, showed that the effect of operation on high sulfur fuel was irreversible on one or more pollutants after operation on low sulfur fuel. NO_X emissions were 15 percent irreversible. None of the vehicles were designed or modified to meet either the California or federal SFTP emissions standards. The only data used in an attempt to quantify the effect of aggressive operation on sulfur reversibility was from a catalyst manufacturer that performed some vehicle testing with catalysts which were bench aged with low and high sulfur fuel that appeared to closely approximate the impact aggressive operation would have on sulfur irreversibility. It was this data on which we based our projection of sulfur irreversibility for Tier 2 vehicles at 50 percent for NMHC and NO_X emissions. Subsequent comments on the validity of these estimates after the publishing of the NPRM prompted several additional test programs on sulfur irreversibility.

The sulfur irreversibility test programs that followed the NPRM focused on vehicles that had emission levels that met or were close to Tier 2 emission standards and also met the US06 or aggressive driving portion of the SFTP emission standards. Although numerous vehicles were tested, only four met both of the above criteria. (We had tried to supplement the data base, but we were only able to add a limited number of vehicles.) We also decided to quantify irreversibility for NMHC and NO_X emissions together instead of independently, because per our discussion above, sensitivity and irreversibility of either pollutant appears to be very dependent on the particular strategy chosen to reduce these emissions (particularly engine calibration and catalyst loading of precious metals and oxygen storage).

The new data exhibited a range of variability among vehicles and pollutants, similar to the data presented in the NPRM. The most important distinction between the new FRM data and the old NPRM data was that the new data showed that, on average, NMHC+NO_X emissions in three out of four vehicles were not fully reversible after aggressive driving. Based on this data, we project that NMHC+NO_X emissions will be 20 to 65 percent irreversible for Tier 2 vehicles under typical in-use driving, including aggressive driving.

As discussed above, the combination of calibration changes and emission system hardware modifications needed to meet our stringent Tier 2 emissions standards, can result in significant trade-offs between NMHC/NMOG and NO_X control. There can be considerable uncertainty associated with balancing these trade-offs at very low emissions levels if the vehicle is periodically operated on high sulfur fuels, making the ability to remove sulfur from the catalyst highly uncertain. For example, a given catalyst today may be fully reversible for one pollutant and only partially reversible for another. However, because of the trade-off in NMOG and NO_X performance, the modifications necessary to get that vehicle to meet both emission standards may result in the opposite effect for reversibility; *i.e.,* full reversibility for NMOG and partial reversibility for NO_X. There is no technical certainty that both the NMOG and NO_X emission standards can be met without compromising reversibility performance. Therefore, we continue to believe that sulfur's negative impact on Tier 2 catalysts is a substantial concern.

The preceding discussion focused on the irreversibility of the sulfur impact on emissions from current gasoline engine technologies. There are new technologies under development, which could be sold in the U.S. in the middle of the next decade (the same time that Tier 2 vehicles are being introduced), which also appear to be very sensitive to sulfur and largely unable to reverse this sulfur impact. One of these technologies is the direct injection gasoline (GDI) engine. These engines utilize much more air than is needed to burn the fuel, unlike conventional gasoline engines that operate under conditions where only just enough air to completely burn the fuel is introduced into the engine. This GDI technology allows these engines to be up to 25% more fuel efficient than current gasoline engines and to emit up to 20% less carbon dioxide. GDI engines are currently being introduced in both Japan and Europe (which have or will soon require low sulfur gasolines). Because of the significant operating differences with GDI engines, these vehicles will likely require emission control technology substantially different from that used on conventional gasoline engines. For example, a GDI engine may require a NO_X adsorber to meet the proposed Tier 2 NO_X standard. High fuel sulfur levels quickly and permanently degrade the performance of these NO_X adsorbers. Thus, to enable the sale of advanced, high efficiency GDI engines in the U.S. under the Tier 2 standards, it appears that low sulfur gasoline would have to be available nationwide by the time this technology becomes available.

The fuel cell is another promising propulsion system that is being developed for possible introduction to

[49] The FTP (Federal Test Procedure) is the basic driving cycle used for federal emissions testing; the LA4 cycle is a component of the FTP. The REP05 cycle developed by EPA is representative of all driving that occurs outside the LA4 or FTP cycle. All but one of the aggressive accelerations found in the US06 cycle were taken from the REP05. While each segment of the US06 cycle was taken from actual in-use driving, the timing and combination of these segments is not representative of in-use driving in the way REP05 is representative.

consumers early in the next century. Fuel cells are being designed to operate on a variety of fuels, including gasoline and diesel fuel. The basic fuel cell technology is highly sensitive to sulfur. Almost any level of sulfur in the fuel will disable the fuel cell. One possible solution is to install a technology that essentially filters out the sulfur before it enters the fuel cell. However, such sulfur ''guards'' are costly and could not practically be used like a disposable filter (requiring the vehicle owner to change the sulfur guard frequently, much like changing an oil filter) in situations where constant exposure to high sulfur levels occurs. (Even exposure to relatively low sulfur levels will likely require periodic replacement of the sulfur guard to ensure adequate protection for the fuel cell.) Therefore, the amount of sulfur in the fuel must be limited to that which can be removed by one or at most two sulfur guards over the life of the vehicle. Thus, in order for fuel cells operating on gasoline to be feasible in the U.S., low sulfur fuels would have to be available nationwide by the time this technology becomes available.

d. Sulfur Has Negative Impacts on OBD Systems

As discussed in more detail in the RIA, EPA believes that sulfur in gasoline can adversely impact the onboard diagnostic (OBD) systems of current vehicles as well as vehicles meeting the Tier 2 standards. This is an important factor supporting the need for a national sulfur control program. EPA's onboard diagnostics (OBD) regulations require that all vehicles be equipped with a system that monitors, among other things, the performance of the catalyst and warns the owner if the catalyst is not functioning properly. The OBD catalyst monitor is designed to identify those catalysts with pollutant conversion efficiencies that have been reduced to the extent that tailpipe emissions would exceed a specified multiple of the applicable hydrocarbon emissions standard. For California LEV and federal NLEV vehicles, that multiple is 1.75 times the applicable hydrocarbon emissions standard; for federal Tier 1 vehicles, that multiple is 1.5 times the applicable hydrocarbon standard added to the 4,000 mile emission level.

We want to ensure that OBD systems operate correctly, and thus the possibility that gasoline sulfur may interfere with these systems was another consideration when evaluating the need for a national sulfur program. Our evaluation of sulfur's effect on OBD systems was summarized in a staff paper in 1997.[50] We concluded that sulfur can affect the decisions made by the OBD systems. Sulfur appears to affect the oxygen sensor downstream of the catalyst, which is used in the OBD systems, and it is not clear that the conditions that seem to reverse sulfur's effect on the catalyst will also reverse any sulfur impact on the downstream oxygen sensors. Indirectly, sulfur impacts OBD systems because it can impair a catalyst that would otherwise be operating satisfactorily, thereby triggering the OBD warning lights. While this would indicate a properly operating OBD system, auto manufacturers have expressed the concern that consumers using high sulfur fuel may experience OBD warnings much more frequently than they would if operating on low sulfur gasoline, and that this could lead to a loss of consumer confidence in or support for OBD systems. Consumers may then ignore the OBD warning system and drive a potentially high emitting vehicle (which may have nothing to do with exposure to sulfur), contributing even more to air quality problems. Another possible scenario is that the OBD system may be impaired by sulfur in such a way that it does not register an improperly functioning catalyst, even if the catalyst is impaired for reasons unrelated to exposure to sulfur. This would defeat the purpose of OBD systems.

The reduction of sulfur levels for gasoline should resolve any concerns over the ability of the OBD system to make proper decisions. The use of low sulfur fuel should ensure that the OBD warning light goes on when it is supposed to and is not influenced by sulfur contamination of the catalyst and/or OBD system.

B. Our Program for Vehicles

The program we are establishing today for cars, light trucks, and large passenger vehicles will achieve the same large NO_X reductions that we projected for the proposed program. The program is very similar to our proposed program in all major respects. We have been able to retain the general structure, stringency, and emissions benefits of the proposal in this final rule. Where we have made adjustments to the proposed program, we have done so in ways that improve the implementation of the program without changing the overall environmental benefits that the program will achieve. And by creating a new category of vehicles subject to the Tier 2 standards, medium-duty passenger vehicles, the final rule will ensure that all passenger vehicles expected to be on the road in the foreseeable future will be very clean.

We have seriously considered the input of all stakeholders in developing our final rule and believe the program finalized below balances the concerns of all stakeholders while achieving the needed air quality benefits. In general, the adjustments we have made are aimed at improving the implementation efficiency of the program by better aligning the federal Tier 2 program with the NLEV program and with California's program especially during the interim program.[51] Extensive comments from manufacturers led us to conclude that better harmony between the two programs would reduce the engineering, testing and certification workload related to our interim program. Where we could make changes to increase the overlap of the two programs while maintaining the NO_X reductions of the proposal, we have done so. These changes are discussed in detail in this section IV.B. and in sections V.A. and V.B.

Our final rule also includes provisions to regulate complete heavy-duty passenger vehicles (primarily SUVs and passenger vans) of less than 10,000 pounds GVWR within the Tier 2 program. Standards for these vehicles were not included in the Tier 2 NPRM, but were proposed in a subsequent NPRM on October 29, 1999 (64 FR 58472). The final provisions for these vehicles are addressed in section IV.B.4.g. These heavier vehicles have been recategorized as medium duty passenger vehicles (MDPVs). They are included in the Tier 2 program starting with model year 2004 and will be treated similarly to HLDTs, unless otherwise noted.

The next sections of the preamble describe our final program in detail and include changes and adjustments from the NPRM that we believe address many concerns raised by the Alliance and others. While these changes ease the burden on manufacturers, they have little or no impact on the air quality benefits of the Tier 2 program.

[50] U.S. EPA, ''OBD & Sulfur Status Report: Sulfur's Effect on the OBD Catalyst Monitor on Low Emission Vehicles,'' March 1997, updated September 1997.

[51] In this section and also in section V, we make various references to the Tier 2 program, the interim program (or standards) and the final Tier 2 standards. The Tier 2 program includes the interim program (or standards) and the final Tier 2 standards. Some discussion is applicable to the entire Tier 2 program, some to the interim program (or standards) only and some is only applicable to the final Tier 2 standards. As the program is complex, we advise you to read carefully to discern the applicability of the text to the proper model years and categories of vehicles.

In a number of places in the following text, we mention that changes are being made ''in response to comments''. For a full summary of the comments and for our responses to those comments, we refer you to the Response to Comments document contained in the docket for this rulemaking or available from the Office of Mobile Sources web site (see web address at the beginning of this document).

1. Overview of the Vehicle Program

The vehicle-related part of today's final rule covers a wide range of standards, concepts, and provisions that affect how vehicle manufacturers will develop, certify, produce, and market Tier 2 vehicles. This Overview subsection provides readers with a broad summary of the major vehicle-related aspects of the rule. Readers for whom this Overview is sufficient may want to move on to the discussion of the key gasoline sulfur control provisions (Section IV.C.). Readers wishing a more detailed understanding of the vehicle provisions can continue beyond the Overview to deeper discussions of key issues and provisions (Sections IV.B.–2, 3, and 4) as well as discussions of additional provisions (Section V.A.). Readers should refer to the regulatory language found at the end of this preamble for a complete compilation of the requirements.

To understand how the program will work, it is useful to review EPA's classification system for light-duty vehicles and trucks. The light-duty category of motor vehicles includes all vehicles and trucks at or below 8500 pounds gross vehicle weight rating, or GVWR (*i.e.,* vehicle weight plus rated cargo capacity). Table IV.B.–1 shows the various light-duty categories and also shows our new medium-duty passenger vehicle (MDPV) category, discussed in section IV.B.4.g.. In the discussion below, we make frequent reference to two separate groups of light vehicles: (1) LDV/LLDTs, which include all LDVs and all LDT1s and LDT2s; and (2) HLDTs, which include LDT3s and LDT4s. We also make mention of MDPVs although the details of our program for those vehicles are deferred to IV.B.4.g. at the end of section IV.B.

TABLE IV.B.—1 LIGHT-DUTY VEHICLES AND TRUCKS AND MEDIUM-DUTY PASSENGER VEHICLES; CATEGORY CHARACTERISTICS

	Characteristics
LDV	A passenger car or passenger car derivative seating 12 passengers or less.
Light LDT (LLDT)	Any LDT rated at up through 6,000 lbs GVWR. Includes LDT1 and LDT2.
Heavy LDT (HLDT).	Any LDT rated at greater than 6,000 lbs GVWR. Includes LDT3 and LDT4s.
MDPV	A heavy-duty passenger vehicle rated at less than 10,000 lbs GVWR. (The inclusion of MDPVs is discussed primarily in Section IV.B.4.g.)

a. Introduction

Today's final rule incorporates concepts from the federal NLEV program which began phase-in in the 1999 model year for LDV/LLDTs.[52] The program in today's rule takes the corporate averaging concept and other provisions from NLEV but changes the focus from NMOG to NO_X and applies them to all LDVs and LDTs. The final rule is compatible with the California LEV II (CalLEV II) program scheduled to take effect in 2004. The emission standard ''bins'' used for this average calculation are different in several respects from those of the CalLEV II program, yet still allow harmonization of federal and California vehicle technology.

The Tier 2 corporate average NO_X level to be met through these requirements ultimately applies to all of a manufacturer's LDVs and LDTs (subject to two different phase-in schedules) regardless of the fuel used. Meanwhile, until the final Tier 2 standards are completely phased in, separate interim standards apply to LDV/LLDTs and HLDTs.

As proposed in the NPRM and finalized in today's document, the Tier 2 program will take effect in 2004, with full phase in occurring by 2007 for LDV/LLDTs and 2009 for HLDTs. During the phase-in years of 2004–2008, vehicles not certified to Tier 2 requirements will meet interim requirements also using a bins system, but with less stringent corporate average NO_X standards.

[52] The NLEV program is a voluntary program, adopted by all major LDV and LDT manufacturers. It applies only to LDVs, LDT1s and LDT2s. It does not apply to HLDTs.

In the discussions below, we set forth different Tier 2 phase-in schedules for the two different groups of vehicles (LDV/LLDTs and HLDTs) as well as two different interim fleet average NO_X standards for 2004 and later model year vehicles awaiting phase-in to the Tier 2 standards.

In the NPRM, we set forth separate tables of full life standard bins for the interim programs and the final Tier 2 program, but we proposed that manufacturers could use all bins for interim or Tier 2 vehicles during the phase-in years.[53] We also proposed similar sets of tables for intermediate life standards. In this final rule, for simplicity and to accommodate additional bins, including some suggested by the Alliance, we have combined all of the full life bins into one table and all of the intermediate life bins into one table. The bins system and the choice of the individual bins is discussed in detail below.

References to California LEV II Program

Throughout this preamble, we make reference to California's LEV II program and its requirements. The LEV II program was approved by the California ARB at a hearing of November 5, 1998. Numerous draft documents were prepared by ARB staff in advance of that hearing and made available to the public. Those documents were referenced in our NPRM and included in the docket. Some of those documents were modified as a result of changes to the proposed program made at the hearing and due to comments received after the hearing. ARB prepared final documents without significant change. The final program was approved by California's Office of Administrative Law on October 28, 1999 and filed with the Secretary of State to become effective on November 27, 1999.

We have placed copies of the latest available documents, some of which we used in the preparation of this final rule, in the docket. You may also obtain these documents and other information about California's LEV II program from ARB's web site: (www.arb.ca.gov/regact/levii/levii.htm).

In the regulatory text that follows this preamble, we incorporate by reference a number of documents related to LEVII and California test procedures under

[53] Throughout this text, the term ''full life'' is used in reference to vehicle standards to mean ''full useful life'' which is currently 10 years/100,000 miles for LDVs and LLDTs, but 11 years/120,000 miles for HLDTs. Similarly, ''intermediate life'' refers to intermediate useful life standards which apply for the period of 5 years/50,000 miles. In this rulemaking we are retaining the current full useful life period for interim LDVs and LLDTs, but raising it for Tier 2 vehicles to 10 years/120,000 miles.

LEVII. These documents are available in the docket for today's rulemaking.

b. Corporate Average NO_X Standard

The program we are finalizing today will ultimately require each manufacturer's average full life NO_X emissions over all of its Tier 2 vehicles to meet a NO_X standard of 0.07 g/mi each model year. Manufacturers will have the flexibility to certify Tier 2 vehicles to different sets of exhaust standards that we refer to as ''bins,'' but will have to choose the bins so that their corporate sales weighted average full life NO_X level for their Tier 2 vehicles is no more than the 0.07 g/mi. (We discuss the bins in the next subsection.)

A corporate average standard enables the program's air quality goals to be met while allowing manufacturers the flexibility to certify some models above and some models below the standard. Manufacturers can apply technology to different vehicles in a more cost-effective manner than under a single set of standards that all vehicles have to meet.

Each manufacturer will determine its year-end corporate average NO_X level by computing a sales-weighted average of the full life NO_X standards from the various bins to which it certified any Tier 2 vehicles. The manufacturer will be in compliance with the standard if its corporate average NO_X emissions for its Tier 2 vehicles meets or falls below 0.07 g/mi. In years when a manufacturer's corporate average is below 0.07 g/mi, it can generate credits. It can trade (sell) those credits to other manufacturers or use them in years when its average exceeds the standard (i.e. when the manufacturer runs a deficit). The averaging program is described in detail in later text.

c. Tier 2 Exhaust Emission Standard ''Bins''

We are finalizing a Tier 2 bin structure having eight emission standards bins (bins 1–8), each one a set of standards to which manufacturers can certify their vehicles. Table IV.B.–2a shows the full useful life standards that will apply for each bin in our final Tier 2 program, i.e. after full phase-in occurs for all LDVs and LDTs. Two additional bins, bins 9 and 10, will be available only during the interim program and will be deleted before final phase-in of the Tier 2 program. Table IV.B.–2b shows all the bins from Table IV.B.–2a and also shows extra bins and higher available standards for certain pollutants that are available prior to full Tier 2 phase-in. An eleventh bin, only for MDPVs is discussed in section IV.B.4.g.

Many bins have the same values as bins in the California LEV II program as a means to increase the economic efficiency of the transition to as well as model availability. Further, we added bins that are not a part of the California program to modestly increase the flexibility of the program for manufacturers without compromising air quality goals. As discussed in Section IV.B.4. below, we believe these extra bins will help provide incentives for manufacturers to produce vehicles with emissions below 0.07 g/mi NO_X. The two highest of the ten bins shown in Table IV.B.2b. are designed to provide flexibility only during the phase-in years and will terminate after the standards are fully phased in, leaving eight bins in place for the duration of the Tier 2 program.

The NPRM full life standards contained seven Tier 2 bins as well as two separate tables of bins for interim vehicles. We proposed that manufacturers would be able to use all the bins during the phase in years regardless of whether they were certifying Tier 2 vehicles or interim vehicles.

The program we are finalizing today:

- Combines the bins from the NPRM;
- Omits two bins that were included in the NPRM for harmony with California but which are unlikely to be used; [54];
- Adds 2 bins to increase compliance flexibility without reducing environmental benefits;
- Adds a temporary bin only for MDPVs that expires after 2008. This bin is in addition to the 10 bins shown in tables of bins in this preamble;
- Establishes a PM value for the highest bin available during the interim program (bin 10) that is more stringent than the corresponding standard in the NLEV program;
- Provides temporary higher NMOG standards that expire after 2006 for certain interim LDT2s and LDT4s produced by qualifying manufacturers.

Tables IV.B.–2a and 2b show the bins for full life standards. Table IV.B.–2b is repeated later in the text where intermediate life standards are also shown. These tables omit the temporary bin for MDPVs. This bin is usable only by MDPVs and is addressed separately in section IV.B.4.g.

TABLE IV.B.–2A.—FINAL TIER 2 LIGHT-DUTY FULL USEFUL LIFE EXHAUST EMISSION STANDARDS

[Grams per mile]

Bin No.	NO_X	NMOG	CO	HCHO	PM
8	0.20	0.125	4.2	0.018	0.02
7	0.15	0.090	4.2	0.018	0.02
6	0.10	0.090	4.2	0.018	0.01
5	0.07	0.090	4.2	0.018	0.01
4	0.04	0.070	2.1	0.011	0.01
3	0.03	0.055	2.1	0.011	0.01
2	0.02	0.010	2.1	0.004	0.01
1	0.00	0.000	0.0	0.000	0.00

[54] These bins are unlikely to be used in the Federal program because they contain the same NO_X standard as the Federal bins, but contain more stringent NMOG standards than the Federal bins. These bins, which provide extra opportunity for a manufacturer to gain NMOG credits in California are not needed or useful in the Federal program where there is no NMOG corporate average standard. The two deleted bins are bin 4 from the proposed Tier 2 bins and bin 3 from the proposed interim bins for LDV/LLDTs. Dropping these bins does not affect harmonization with California standards because the federal program includes bins having the same NO_X standard with higher NMOG standards.

TABLE IV.B.–2B.—TIER 2 LIGHT-DUTY FULL USEFUL LIFE EXHAUST EMISSION STANDARDS—INCLUDING BINS APPLICABLE DURING INTERIM PROGRAM ONLY

[Grams per mile]

Bin No.	NO_X	NMOG	CO	HCHO	PM	Comments
10	0.6	0.156/0.230	4.2/6.4	0.018/0.027	0.08	a b c d
9	0.3	0.090/0.180	4.2	0.018	0.06	a b c
8	0.20	0.125/0.156	4.2	0.018	0.02	b f

Notes:
[a] Bin deleted at end of 2006 model year (2008 for HLDTs).
[b] The higher of the two temporary NMOG, CO and HCHO values apply only to HLDTs.
[c] An additional higher temporary bin restricted to MDPVs is discussed in section IV.B.4.g.
[d] Optional temporary NMOG standard of 0.280 g/mi applies for qualifying LDT4s and MDPVs only, see text.
[e] Optional temporary NMOG standard of 0.130 g/mi applies for qualifying LDT2s only, see text.
[f] Higher temporary NMOG value of 0.156g/mi deleted at end of 2008 model year.

The corporate average concept using bins will provide a program that gets essentially the same emission reductions we would expect from a straight 0.07 g/mi standard for all vehicles because all NO_X emissions from Tier 2 vehicles in bins above 0.07 g/mi will need to be offset by NO_X emissions from Tier 2 vehicles in bins below 0.07 g/mile. This focus on NO_X allows NMOG[55] emissions to ''float'' in that the fleet NMOG emission rate depends on the mix of bins used to meet the NO_X standard. However, as you can see by examining the bins, any combination of vehicles meeting the 0.07 g/mi average NO_X standard will have average NMOG levels below 0.09 g/mi. The actual value will vary by manufacturer depending on the sales mix of the vehicles used to meet the 0.07 g/mi average NO_X standard. In addition, there will be overall improvements in NMOG since Tier 2 incorporates HLDTs, which are not covered by the NLEV program. Tier 2 also imposes tighter standards on LDT2s than the NLEV program by making them average with the LDVs and LDT1s. NLEV has separate, higher standards for LDT2s. We did not adopt any bins for LDVs and LDTs with standards higher than we proposed.

[55] In the NPRM, we proposed that hydrocarbon standards would be measured in terms of ''non-methane organic gases'' (NMOG) regardless of fuel. For reasons explained elsewhere in this preamble we will permit non-methane hydrocarbons (NMHC) as an option in the final rule for all fuels except alcohol fuels and compressed natural gas . NMHC and NMOG are very similar for gasoline and diesel fuel emissions.

d. Schedules for Implementation

We recognize that the Tier 2 standards pose greater technological challenges for larger light duty trucks (HLDTs) than for LDVs and smaller trucks (LDT1s and LDT2s). We believe that additional leadtime is appropriate for HLDTs. HLDTs have historically been subject to less stringent vehicle-based standards than lighter trucks and LDVs. Also, HLDTs were not subject to the voluntary emission reductions implemented for LDVs, LDT1s and LDT2s in the NLEV program. Consequently we are finalizing as proposed, separate phase-in programs for HLDTs and LDV/LLDTs . Our phase-in approach will provide HLDTs with extra time before they need to begin phase-in to the final Tier 2 standards and will also provide two additional years for them to fully comply. Table IV.B–3 provides a graphical representation of how the phase-in of the Tier 2 program will work for all vehicles. This table shows several aspects of the program:

- Phase-in of the Tier 2 standards;
- Phase-in/phase-out requirements of the interim programs;
- Phase-in requirements of new evaporative standards;
- Years that can be included in alternative phase-in schedules;
- Years in which manufacturers can bank NO_X credits through ''early banking'' and
- ''Boundaries'' on averaging sets in the Tier 2 and interim programs.
- Averaging provisions for MDPVs (see section IV.B.4.g. for discussion)

We discuss each of these topics in detail below and make numerous references to Table IV.B–3.

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Table IV.B-3
TIER 2 AND INTERIM NON-TIER 2 PHASE-IN AND EXHAUST AVERAGING SETS
(Bold lines around shaded areas indicate averaging sets)

	2001	2002	2003	2004 %	2005 %	2006 %	2007 %	2008 %	2009+ later %	NOx STD. (g/mi)
LDV/LLDT (INTERIM)	NLEV	NLEV	NLEV	75 max	50 max	25 max				0.30 avg
LDV/LLDT (TIER 2 +evap)	*early banking* b	b	b	25	50	75	100	100	100	0.07 avg
HLDT (TIER 2 +evap)	*early banking* b	b	b	b	b	b	b	50	100	0.07[d] avg
HLDT (INTERIM)	TIER 1 b	TIER 1 b	TIER 1 b	25 c,e	50 e	75 e	100 e	50 max		0.20[a,d] avg
MDPVs (INTERIM)	HDE	HDE	HDE							
MDPVs (TIER 2 + evap)	*early banking* b	b	b	b	b	b	b	50	100	0.07[d] avg

NOTES

a. 0.6 NOx cap applies to balance of LDT3s/LDT4s, respectively, during the 2004-2006 phase-in years

b. Alternative phase-in provisions permit manufacturers to deviate from the 25/50/75% 2004-2006 and 50% 2008 phase-in requirements and provide credit for phasing in some vehicles during one or more of these model years.

c. Required only for manufacturers electing to use optional NMOG values for LDT2s or LDT4s and MDPV flexibilities during the applicable interim program and for vehicles whose model year commences on or after the fourth anniversary date of the signature of this rule. See discussion in preamble text.

d. HLDTs and MDPVs must be averaged together.

e. Diesels may be engine-certified through the 2007 model year. See discussion in preamble text.

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As described in detail in the Response to Comments document, the Alliance proposal would have delayed final implementation of Tier 2 standards until 2011. We are not adopting the Alliance's time schedule, because we believe the shorter schedule we proposed is feasible and that there is no reason to delay the final benefits of the Tier 2 standards. In fact, numerous commenters representing state, environmental and health groups argued that our original proposal gave manufacturers too much time to bring the HLDTs into line with LDVs and LLDTs. We believe the two extra years proposed in the NPRM remain appropriate. HLDTs will face greater challenges than LDVs/LLDTs because their emission control systems will need to be durable under potentially heavier loads and tougher operating conditions than LDV/LLDTs. Their sales are small relative to the rest of the light duty fleet (they will comprise about 14% of the light duty fleet in 2004), and they will benefit from industry experience with the lighter vehicles. In addition, HLDTs will not remain at high Tier 1 levels until they phase-in to Tier 2. Rather, they will have to meet interim standards that impose a NO_X cap of 0.60 g/mi and phase-in a corporate average NO_X standard of 0.20 g/mi. These standards represent a significant reduction from applicable Tier 1 standards.[56] Interim standards are discussed in detail later in this preamble.

i. Implementation Schedule for Tier 2 LDVs and LLDTs

We are finalizing the implementation schedule for the Tier 2 standards as proposed in the NPRM. Thus, the standards will take effect beginning with the 2004 model year for light duty vehicles and trucks at or below 6000 pounds GVWR (LDV/LLDTs). Manufacturers will phase their vehicles into the Tier 2 standards beginning with 25 percent of LDV/LLDT sales that year, 50 percent in 2005, 75 percent in 2006, and 100 percent in 2007. Manufacturers will be free to choose which vehicles are phased-in each year. However, in each year during (and after) the phase-in, the manufacturer's average NO_X for its Tier 2 vehicles must meet the 0.07 g/mi corporate average standard. This phase-in schedule, which is consistent with that of the California LEV II program, provides between four and seven years of leadtime for the manufacturers to bring all of their LDV/LLDT production into compliance. These vehicles constitute about 86 percent of the light duty fleet.

To increase manufacturer flexibility and provide incentives for early introduction of Tier 2 vehicles, we are also finalizing provisions from the NPRM that permit manufacturers to use alternative phase-in schedules that will still require 100 percent phase-in by 2007, but recognize the benefits of early introduction of Tier 2 vehicles, and allow manufacturers to adjust their phase-in to better fit their own production plans. (See section IV.B.4.b.ii. below.)

ii. Implementation Schedule for Tier 2 HLDTs

The Tier 2 phase-in schedule for HLDTs is also being finalized as proposed. The phase-in for final Tier 2 standards for HLDTs will start later and end later than that for LDVs and LLDTs. Fifty percent of each manufacturer's HLDTs must meet Tier 2 standards in 2008, and 100 percent must meet Tier 2 standards in 2009. As with the LDV/LLDTs, the Tier 2 HLDTs must meet a corporate average NO_X standard of 0.07 g/mi. This delayed phase-in schedule:

- Provides significant interim emission reductions starting in 2004 (discussed separately below);
- Recognizes the relatively high emission standards that currently apply to HLDTs;
- Provides manufacturers with adequate lead time before they must bring HLDTs into compliance with final Tier 2 standards;
- Provides manufacturers the opportunity to apply and evaluate Tier 2 technology on LDV/LLDTs before having to apply it to HLDTs; and
- Provides manufacturers the opportunity to apply and evaluate Tier 2 technology on HLDTs on a relatively small scale to meet California LEV II requirements before having to apply it to HLDTs nationwide.

As with the LDV/LLDTs above, to encourage early introduction of Tier 2 HLDTs and to provide manufacturers with greater flexibility, we are finalizing provisions to permit manufacturers to generate early Tier 2 NO_X credits and to use alternative phase-in schedules that still result in 100% phase-in by 2009. (See sections IV.B.4.d.iv. and IV.B.4.b.ii, respectively, below.)

e. Interim Standards

The interim standards discussed below are a major source of emission reductions in the early years of the vehicle control program. The NO_X emission standards for LDT2s and LDT4s, which comprise about 40 percent of the fleet, are more stringent than the corresponding standards in the NLEV and CAL LEV I programs. These standards also are important because they set the stage for a smooth transition to the final Tier 2 standards.

The two groups of vehicles (LDV/LLDTs and HLDTs) will be approaching the Tier 2 standards from quite different emission ''backgrounds''. LDV/LLDTs will be at NLEV levels, which require NO_X emissions of either 0.3 or 0.5g/mi on average,[57] while HLDTs will be at Tier 1 levels facing NO_X standards of either 0.98 or 1.53 g/mi, depending on truck size. These Tier 1 NO_X levels for HLDTs are very high (by a factor of 14–22) relative to our 0.07 g/mi Tier 2 NO_X average. To address the disparity in emission ''backgrounds'', while gaining air quality benefits from vehicles during the phase-in period, we proposed and are finalizing separate interim average NO_X standards for the two vehicle groups during the phase-in period. The provisions described below will apply in 2004 for all LDVs and LDTs not certified to Tier 2 standards. The relationship of the interim programs to the final Tier 2 standards is shown in Table IV.B–3.

Interim vehicles will certify to the same bins as Tier 2 vehicles. As described earlier in this preamble, we have merged the tables of bins from the NPRM for simplicity and added a few bins. Bins 9 and 10 were drawn from the tables of interim bins in the NPRM, and are intended only for use during the phase-in years. Therefore, these two bins will be discontinued after 2006 (2008 for HLDTs).

i. Interim Exhaust Emission Standards for LDV/LLDTs

Beginning with the 2004 model year, all new LDVs, LDT1s and LDT2s not incorporated under the Tier 2 phase-in will be subject to an interim corporate average NO_X standard of 0.30 g/mi. This is effectively the LEV NO_X emission standard for LDVs and LDT1s under the NLEV program.[58] This interim program will hold LDVs and LLDTs to NLEV levels if they are not yet subject to Tier 2 standards during the phase-in. By implementing these interim standards for LDVs and LLDTs we will ensure that the accomplishments of the NLEV program continue. Additionally, this program will bring about substantial and important NO_X emission reductions from LDT2s in the early years of the program. LDT2s will be held to a 0.3 g/mi NO_X average in contrast to a 0.5 g/mi average in the NLEV program.

Because the Tier 2 standards are phased-in beginning in the 2004 model year, the interim standards for LDVs and LLDTs apply to fewer vehicles each year, *i.e.,* they are ''phase-out'' standards. Table IV.B–2 shows the maximum percentage of LDVs and LLDTs subject to the interim standards each year— 75% in 2004, 50% in 2005, 25% in 2006 and 0% in 2007.

As mentioned above, the interim program for LDV/LLDTs is designed to hold these vehicles to the NLEV NO_X level for LDVs and LDT1s, and a few of our bins are derived from the NLEV program. Our proposal to bring LDT2s into line with the LDVs and LDT1s during the interim program by requiring all LDVs, LDT1s and LDT2s to meet the same average NO_X standard (0.30) g/mi was of concern to industry commenters. In the final rule, we are retaining this requirement, but we are providing an optional NMOG standard of 0.130 for LDT2s certified to bin 9 when the manufacturers of those LDT2s elect to bring all of their 2004 model year

[56] Under Tier 1 standards, LDT3s are subject to a 0.98 g/mi NO_X standard while LDT4s are subject to an even higher NO_X standard of 1.53 g/mi.

[57] The NLEV program imposes NMOG average standards that translate into full useful life NO_X levels of about 0.3 g/mi for LDV/LDT1s and 0.5 g/mi for LDT2s.

[58] The NLEV program does not impose average NO_X standards, but the NMOG average standards that it does impose will lead to full useful life NO_X levels of about 0.3 g/mi for LDV/LDT1s.

HLDTs under our interim program and phase 25% of those HLDTs into the 0.20 g/mi average NO_X standard. (See ii. below). These provisions are discussed in detail below and also in the Response to Comments document.

ii. Interim Exhaust Emission Standards for HLDTs

Our interim standards for HLDTs will begin in the 2004 model year similar to our proposal in the NPRM. The Interim Program for HLDTs will require compliance with a corporate average NO_X standard of 0.20 g/mi that will be phased in between 2004 and 2007. The interim HLDT standards, like those for LDV/LLDTs will make use of the bins in Tables IV.B. –4 and –5. We believe that our interim standards, which start in 2004, will produce significant emission reductions from HLDTs produced during the interim period. For example, HLDTs will have to reduce emissions in the interim program relative to the NLEV program. These standards, by themselves, represent a major reduction in emission standards and we believe it is likely that some manufacturers will apply their Tier 2 technology to HLDTs in order to comply with the interim standards.

As shown in Table IV.B.–3, the phase-in schedule for HLDTs to the 0.20 g/mi corporate average NO_X standard will be 25 percent in the 2004 model year (except as noted below), 50 percent in 2005, 75 percent in 2006, and 100 percent in 2007. As for the Tier 2 standards, alternative phase-in schedules (see Section IV.B.4.b.ii.) will be available. The interim program will remain in effect through 2008 to cover those HLDTs not yet phased into the Tier 2 standards (a maximum of 50%). Interim HLDTs not subject to the interim corporate average NO_X standard during the applicable phase-in years (2004–2006 or 2005–2006) will be subject to the least stringent bins so their NO_X emissions will be effectively capped at 0.60 g/mi. These vehicles will be excluded from the calculation to determine compliance with the interim 0.20 g/mi average NO_X standard.

This approach will allow more time for manufacturers to bring the more difficult HLDTs to Tier 2 levels while achieving real reductions from those HLDTs that may present less of a challenge.

Due to statutory leadtime considerations, we were not able to finalize the HLDT standards to be in effect by the time the 2004 model year begins. For this reason, we are providing incentives for HLDTs to comply with the Tier 2 standards for all 2004 model year HLDTs. This change and the leadtime issue are discussed further under section IV.B.4.e. below and also in the Response to Comments document.

iii. Interim Programs Will Provide Reductions Over Previous Standards

As is the case with the primary Tier 2 standard structure, the interim programs will focus on NO_X but will also provide reductions in NMOG beyond the NLEV program. This is because the interim programs will reduce emissions from LDT2s and HLDTs compared to their previous standards. Without the interim standards, HLDTs could be certified to the Tier 1 NMHC levels (0.46 g/mi or 0.56 g/mi). With the interim standards, however, exhaust NMOG [59] should average approximately 0.09 g/mi for all non-Tier 2 LDV/LLDTs and 0.24 g/mi or less for HLDTs. CO under Tier 1 could be as high as 7.3 g/mi for LDT4s. Under the interim program, CO standards for most bins will be well below 7.3 g/mi.

f. Generating, Banking, and Trading NO_X Credits

As proposed in the NPRM and finalized in this notice, manufacturers will be permitted to average the NO_X emissions of their Tier 2 vehicles and comply with a corporate average NO_X standard. In addition, when a manufacturer's average NO_X emissions fall below the corporate average NO_X standard, it can generate NO_X credits for later use (banking) or to sell to another manufacturer (trading). NO_X credits will be available under the Tier 2 standards, the interim standards for LDVs and LLDTs, and the interim standards for HLDTs. These NO_X credit provisions will facilitate compliance with the fleet average NO_X standards and be very similar to those currently in place for NMOG emissions under California and federal NLEV regulations.

A manufacturer with an average NO_X level for its Tier 2 vehicles in a given model year below the 0.07 gram per mile corporate average standard can generate Tier 2 NO_X credits that it can use in a future model year when its average NO_X might exceed the 0.07 standard. Manufacturers must calculate their corporate average NO_X emissions at year end and then compute credits generated based on how far below 0.07 g/mi the corporate average falls.

Manufacturers will be free to retain any credits they generate for future use or to trade (sell) those credits to other manufacturers. Credits retained or purchased can be used by manufacturers with corporate average Tier 2 NO_X levels above 0.07 g/mi. Under provisions described in Section IV.B.4.d.iv., manufacturers can implement NO_X emission reductions as early as the 2001 model year and earn early Tier 2 NO_X credits to help LDVs and LLDTs meet Tier 2 standards. Similarly, manufacturers can earn early credits for HLDTs as early as the 2001 model year. In model years up through 2005, manufacturers can earn extra credits when they certify vehicles to bins 1 or 2.

Banking and trading of NO_X credits under the interim non-Tier 2 standards will be similar to that under the Tier 2 standards, except that a manufacturer must determine its credits based upon the 0.30 or 0.20 gram per mile corporate average NO_X standard applicable to vehicles in the interim programs. As we proposed in the NPRM, interim credits from LDVs/LLDTs and interim credits from HLDTs will not be permitted to be used interchangeably due to the differences in the interim corporate average NO_X standards. As proposed in the NPRM, there will be no provisions for early banking under the interim standards and manufacturers will not be allowed to use interim credits to address the Tier 2 NO_X average standard. This is because we remain concerned that credits can be generated relatively easily under less stringent standards (the Tier 1 or interim standards) and then used in such a way to delay implementation of the Tier 2 standards.

Banking and trading of NO_X credits and related issues are discussed in greater detail in Section IV.B.4.d. below.

2. Why Are We Finalizing the Same Set of Standards for Tier 2 LDVs and LDTs?

Before we provide a more detailed description of the vehicle program, we want to review two overarching principles of today's rule. The first is our goal to bring all LDVs and LDTs under the same set of emission standards. Historically, LDTs—and especially the heavier trucks in the LDT3 and LDT4 categories—have been subject to less stringent emission standards than LDVs (passenger cars). In recent years the proportion of light truck sales has grown to approximately 50 percent. Many of these LDTs are minivans, passenger vans, sport utility vehicles and pick-up trucks that are used primarily or solely for personal transportation; *i.e.,* they are used like passenger cars.

As vehicle preferences have increasingly shifted from passenger cars to light trucks there has been an

[59] In the Tier 1 program, exhaust hydrocarbon standards are in terms of NMHC, not NMOG. However, as we have explained elsewhere in this preamble, NMHC and NMOG results are very similar for gasoline and diesel-fueled vehicles.

accompanying increase in emissions over what otherwise would have occurred because of the increase in miles traveled by LDTs and the less stringent standards for LDTs as compared to LDVs. As Section III. above makes clear, reductions in these excess emissions (and in other mobile and stationary source emissions) are seriously needed. Since both LDVs and LDTs are within technological reach of the standards in the Tier 2 bin structure, and since none of the comments have been persuasive that manufacturers can not meet the standards, we are finalizing our proposal to equalize the regulatory useful life mileage for LDVs and LDTs and apply the same Tier 2 exhaust emission standard bins to all of them. This program will ensure that substantial reductions occur in all portions of the light-duty fleet and that the movement from LDVs to LDTs will not counteract these reductions.

Once the phase in periods end for all vehicles in 2009, manufacturers will include all LDVs and LDTs together in calculating their corporate average NO_X levels.[60] As mentioned above and described in more detail in Section IV.B.–4. below, manufacturers can choose the emission bin for any test group of vehicles provided that, on a sales weighted average basis, the manufacturer meets the average NO_X standard of 0.07 g/mi for its Tier 2 vehicles that year.

Some manufacturers have suggested that a program with different requirements is needed for heavy LDTs. Recognizing that compliance will be most challenging for HLDTs, the delay in the start of the phase-in and the additional phase-in years for those vehicles will allow manufacturers to delay the initial impact of the Tier 2 standards until the 2008 model year. This represents four additional model years of leadtime beyond the time when passenger cars and LDT1s and LDT2s will achieve Tier 2 standards in substantial numbers. We believe this phase-in and other provisions of this rule respond to these concerns. Note that in the NPRM, we requested comments on the need for different hydrocarbon standards for these vehicles recognizing that a tradeoff often exists between HC and NO_X emissions. We also proposed that several bins have higher hydrocarbon standards for HLDTs during the interim program. We are finalizing these bins as proposed. Also, as an option, we are permitting the use of NMOG values similar to those in the NLEV program for bins 9 and 10 only for certain LDT2s and LDT4s during the interim program (see section IV.B.1.e.ii. above for details).

We are not adopting the Alliance's proposed phase-in schedule which would have provided a phase-in lasting until 2011. At the end of the Alliance's proposed phase-in, all vehicles would comply with an average NO_X standard of 0.07 g/mi. A fixed 0.09 NMHC standard would apply to LDVs and LLDTs while a fixed 0.156 NMHC standard would apply to HLDTs.[61] Our final program provides HLDTs until 2008 before any have to meet 0.07 g/mi on average and permits them to be averaged with LDV/LLDTs beginning in 2009, when all must meet 0.07 g/mi NO_X on average. We believe that eight years is a significant amount of leadtime to apply Tier 2 technology. We heard clearly from the public hearings and written comments that the public sees no justification for and does not want even more time provided for HLDTs. Furthermore, we see no technological need for more time than we proposed. Indeed, many believe that HLDTs should meet the Tier 2 standards in step with the LDV/LLDTs.

We are not promulgating the fixed NMHC standards suggested by the Alliance, but are sticking with the concept of bins containing lower NMOG standards connected to lower NO_X (and other) standards. We believe that providing final exhaust emission standards for HLDTs that deviate from those for LDV/LLDTs would violate one of the overarching principles of the Tier 2 program, i.e. that all LDVs and LDTs should be subject to the same exhaust emission standards. Further, the idea of NMOG values that differ from California's runs counter to other arguments raised by the Alliance that EPA should align bins with California's to promote 50 state certification of test groups.

3. Why Are We Finalizing the Same Standards for Both Gasoline and Diesel Vehicles?

The second overarching principle of our vehicle program is the use of the same Tier 2 standards for all LDVs and LDTs, regardless of the fuel they are designed to use. The same exhaust emission standards and useful life periods we are finalizing today will apply whether the vehicle is built to operate on gasoline or diesel fuel or on an alternative fuel such as methanol or natural gas. Diesel powered LDVs and LDTs tend to be used in the same applications as their gasoline counterparts, and thus we believe they should meet the same standards. Less stringent standards for diesels could create incentives for manufacturers to build more diesel vehicles, thus endangering the emission reductions expected by this program.

Manufacturers have expressed concerns that diesel-fueled vehicles would have difficulty meeting NO_X and particulate matter levels like those contained in today's rule. Clearly, these standards will be challenging. As discussed in Section IV.A.–1. above, we expect that the Tier 2 NO_X and NMOG standards will be challenging for gasoline vehicles, but that major technological innovations will not be required. For diesels, however, the final Tier 2 NO_X and PM standards will likely require applications of aftertreatment, most likely accompanied by changes in diesel fuel as such devices are sensitive to diesel fuel quality, particularly sulfur content. We do not believe such devices will be necessary to meet the top bin for our interim standards.[62] Given the small percentage of diesel vehicles and the phase-in of the standards, that bin should be sufficient for any manufacturer to market diesels and still comply with the interim program. We anticipate that manufacturers that choose to build diesel vehicles for the final Tier 2 standards will adopt aftertreatment technologies such as NO_X adsorber catalysts and continuously regenerating particulate traps to meet Tier 2 requirements. We issued an Advanced Notice of Proposed Rulemaking to seek input on potential diesel fuel quality changes on May 13, 1999 (64 FR 26142). We anticipate issuing a Notice of Proposed Rulemaking to reduce the sulfur limit on diesel fuel in the spring of 2000 followed by a final rule in late 2000. Our goal in that rulemaking is to have low sulfur diesel fuel available which will allow diesel vehicles to meet the Tier 2 standards, within the bin structure, by the time the Tier 2 standards are required for the entire fleet.

[60] Because of the different phase-in percentages and phase-in schedules for the two groups, during the duration of the phase-in (through 2008), manufacturers will average Tier 2 LDV/LLDTs separately from HLDTs.

[61] The Alliance proposed NMHC standards in lieu of the NMOG standards we proposed and are finalizing today. We are including a provision in the final rule to accept NMHC results, subject to an adjustment factor, to demonstrate compliance with NMOG standards, although we are not adopting the fixed standards proposed by the Alliance.

[62] The interim PM standard in this new bin, which represents a reduction from the NLEV PM standards, should be feasible without aftertreatment. The technologies needed to meet the PM standard we proposed for this bin would likely have required low sulfur diesel fuel, which may not be widely available during the interim program. This change is also discussed in section V.A.

Today, diesels comprise less than one-half of one percent of all LDV/LDT sales. While this is a small fraction, the potential exists for diesels to gain a considerable market share in the future. All one need do is review the dramatic increase in recent years of diesel engine use in the lightest category of heavy duty vehicles (8500–10,000 pounds GVWR) to see the potential for significant diesel engine use in LDTs, and perhaps LDVs, in the future. Just ten years ago, diesels made up less than 10 percent of this class of vehicles. In 1998, this fraction approached 50 percent.

The potential impact of large-scale diesel use in the light-duty fleet underscores the need for the same standards to apply to diesels as other vehicles. Given the health concerns associated with diesel PM emissions (see Section III. above), we believe that it is prudent to address PM emissions from diesel LDVs and LDTs while their numbers are relatively small. In this way the program can minimize the PM impact that would accompany significant growth in this market segment while allowing manufacturers to incorporate low-emission technology into new light-duty diesel engine designs.

4. Key Elements of the Vehicle Program

The previous subsections IV.B.–1.2. and 3. provide an overview of the Tier 2 vehicle program and the two key principles it is built on. This subsection elaborates on the major vehicle-related elements of today's rule. Later in this preamble, Section V.A. discusses the rest of the vehicle provisions.

a. Basic Exhaust Emission Standards and ''Bin'' Structure

Our final Tier 2 program contains a basic requirement that each manufacturer meet, on average, a full useful life NO_X standard of 0.07 g/mi for all its Tier 2 LDVs and LDTs. Manufacturers will have the flexibility to choose the set of standards that a particular test group [63] of vehicles must meet. For a given test group of LDVs or LDTs, manufacturers will select a set of full useful life [64] standards from the same row (''emission bin'' or simply ''bin'') in Table IV.B.–4. below. Each bin contains a set of individual NMOG, CO, HCHO, NO_X, and PM standards. For technology harmonization purposes, our proposed emission bins include or otherwise cover all of those adopted in California's LEV II program.[65,66]

In the NPRM, we proposed that interim vehicles and Tier 2 vehicles (except for those Tier 2 vehicles in the lowest bins) would also have to meet intermediate useful life standards, *i.e.,* standards that apply for 5 years or 50,000 miles. We are finalizing these intermediate useful life standards as proposed. Where we have added new full life bins, we have included corresponding intermediate life bins as appropriate. Our intermediate life standards are generally aligned with California's, they only impact the higher bins, and we do not believe they add substantial burden to the program. Further, they provide a check on the allowed emission deterioration during the life of the vehicle. For the final rule, we have made two changes involving intermediate life standards. First, we are providing that diesel vehicles, which will likely certify to bin 10 during the interim program, may opt not to meet the intermediate life standards associated with this bin. Low sulfur diesel fuel may be needed for diesels to meet our interim intermediate life standards and it is not likely to be widely available during the time frame of the interim program. Secondly, for all vehicles, we are finalizing a provision that will make intermediate life standards optional for any test group that is certified to a full useful life of 150,000 miles. This provision is described in more detail with other useful life issues in section V.B.

TABLE IV.B–4.—TIER 2 LIGHT–DUTY FULL USEFUL LIFE EXHAUST EMISSION STANDARDS

[Grams per mile]

Bin No.	NO_X	NMOG	CO	HCHO	PM	Comments
10	0.6	0.156/0.230	4.2/6.4	0.018/0.027	0.08	(a,b,c,d)
9	0.3	0.090/0.180	4.2	0.018	0.06	(a,b,e)
The above temporary bins expire in 2006 (for LDVs and LLDTs) and 2008 (for HLDTs)						
8	0.20	0.125/0.156	4.2	0.018	0.02	(b,f)
7	0.15	0.090	4.2	0.018	0.02	
6	0.10	0.090	4.2	0.018	0.01	
5	0.07	0.090	4.2	0.018	0.01	
4	0.04	0.070	2.1	0.011	0.01	
3	0.03	0.055	2.1	0.011	0.01	
2	0.02	0.010	2.1	0.004	0.01	
1	0.00	0.000	0.0	0.000	0.00	

Notes:
[a] Bin deleted at end of 2006 model year (2008 for HLDTs).
[b] The higher temporary NMOG, CO and HCHO values apply only to HLDTs and expire after 2008.
[c] An additional temporary higher bin restricted to MDPVs is discussed in section IV.B.4.g.
[d] Optional temporary NMOG standard of 0.280 g/mi applies for qualifying LDT4s and MDPVs only.
[e] Optional temporary NMOG standard of 0.130 g/mi applies for qualifying LDT2s only, see text.
[f] Higher temporary NMOG standard is deleted at end of 2008 model year.

[63] A ''test group'' is the basic classification unit for certification of light-duty vehicles and trucks under EPA certification procedures for the CAP2000 program. ''Test group'' is a broader classification unit than ''engine family'' used prior to the implementation of the CAP2000 program. We discuss the CAP2000 program in more detail in section V.A.9. of this preamble.

[64] The regulatory ''useful life'' value for Tier 2 vehicles is specifically addressed in Section V.A.2. of this preamble. Full useful life will be 10 years or 120,000 miles for all vehicles except LDT3s and LDT4s, for which it is 11 years or 120,000 miles. Intermediate useful life, where standards are applicable, is 5 years or 50,000 miles.

[65] EPA's current standards for Clean Fuel Vehicles are less stringent than the Tier 2 standards. *See* 40 CFR 88.104–94. The Tier 2 standards will supercede the current CFV standards, and the Agency intends to undertake a rulemaking to revise the CFV standards accordingly.

[66] In some cases our bins do not match California's exactly, because they have higher NMOG standards. These bins ''cover'' the California bin in that a vehicle certified to the California standards will comply with the standards in these bins.

TABLE IV.B.–5.—LIGHT-DUTY INTERMEDIATE USEFUL LIFE (50,000 MILE) EXHAUST EMISSION STANDARDS

[Grams per mile]

Bin No.	NO_X	NMOG	CO	HCHO	PM	Comments
10	0.4	0.125/0.160	3.4/4.4	0.015/0.018		(a,b,c,d,f,h)
9	0.2	0.075/0.140	3.4	0.015		(a,b,e,h)
The above temporary bins expire in 2006 (for LDVs and LLDTs) and 2008 (for HLDTs)						
8	0.14	0.100/0.125	3.4	0.015		(b,g,h)
7	0.11	0.075	3.4	0.015		(h)
6	0.08	0.075	3.4	0.015		(h)
5	0.05	0.075	3.4	0.015		(h)

Notes:
[a] Bin deleted at end of 2006 model year (2008 for HLDTs).
[b] The higher temporary NMOG, CO and HCHO values apply only to HLDTs and expire in 2008.
[c] An additional higher temporary bin restricted to MDPVs is discussed in section IV.B.4.g.
[d] Optional temporary NMOG standard of 0.195 g/mi applies for qualifying LDT4s and MDPVs only.
[e] Optional temporary NMOG standard of 0.100 g/mi applies for qualifying LDT2s only, see text.
[f] Intermediate life standards are optional for diesels certified to bin 10.
[g] Higher temporary NMOG value deleted at end of 2008 model year.
[h.] Intermediate life standards are optional for any test group certified to a 150,000 mile useful life (if credits are not claimed).

Under a ''bins'' approach, a manufacturer may select a set of emission standards (a bin) to comply with, and a test group must meet all standards within that bin. Ultimately, the manufacturer must also ensure that the emissions of a targeted pollutant—NO_X in this case—from all of its vehicles taken together meet a ''corporate average'' emission standard. This corporate average emission standard ensures that a manufacturer's production yields the required overall emission reductions. (See Section IV.B.–4.c. below for more discussion of the corporate average NO_X standard.)

In addition to the Tier 2 standards described above, we are also finalizing an interim average NO_X standard derived from the LDV/LDT1 NLEV program to cover all non-Tier 2 LDVs and LLDTs during the Tier 2 phase-in. We are finalizing a separate interim average NO_X standard for HLDTs. As in the Tier 2 program, manufacturers will select bins from Table IV.B.–4 to use to comply with the interim standards. Bins with NO_X values at or above 0.07 g/mi also have associated intermediate life standards which are shown in Table IV.B.–5. (We describe the interim standards in detail in Section IV.B.4.e. below.)

i. Why Are We Including Extra Bins?

Compared to the CalLEV II program, our Tier 2 proposal included additional bins. The California program contains no bins that will allow NO_X levels above the 0.07 g/mi level. Therefore, under the California program, no engine family can be certified above 0.07 g/mi, even with the application of offsetting credits. We proposed to add two bins (with NO_X values of 0.15 and 0.20) above the 0.07 bin and another below (with a NO_X value of 0.04) to provide manufacturers with additional flexibility. Based upon comments received from the Alliance and others that additional bins provide important added flexibility, we are finalizing a total of three bins above the LEV level (the additional bin has a NO_X value of 0.10 g/mi) and are adding one more below the LEV level (this additional bin has a NO_X value of 0.03 g/mi). Due to the NO_X averaging requirement of this rule, these bins will not result in any increase in NO_X emissions. Further, these bins will address concerns raised by some that a wider variety of bins, and bins with higher NO_X values, are needed to avoid a situation where the Tier 2 program discourages the development of advanced technology high fuel economy vehicles, which may, at least in their earliest years, have NO_X emissions higher than more conventional vehicles.

In our NPRM we proposed that during the Tier 2 phase-in years (through 2006 for LDV/LLDTs and 2008 for HLDTs), bins from the applicable interim program would be available to enhance the flexibility of the program by providing manufacturers with additional bins having NO_X standards above 0.07 g/mi. In the NPRM, we showed the interim bins in separate tables for LDV/LLDTs and HLDTs. There was considerable overlap across the two tables and with the Tier 2 bins. In this final rule, we have consolidated the interim bins and the Tier 2 bins into one table for simplicity and ease of reference. The interim programs for non-Tier 2 vehicles are described in detail in section IV.B.4.e.

While some commenters were concerned about the existence of bins above NO_X = 0.07 g/mi, we believe that the additional higher bins actually provide incentive for manufacturers to produce vehicles below 0.07 g/mi of NO_X. We believe this incentive exists because manufacturers will have some vehicles (especially larger LDTs) that they might find more cost effective to certify to levels above the 0.07 g/mi average standard. However, to do this they will have to offset those vehicles in our NO_X averaging system with vehicles certified below 0.07 g/mi. The bins at NO_X = 0.04 g/mi and NO_X = 0.03 g/mi will provide greater opportunity to do this. Thus, the extra bins serve two purposes; they provide additional flexibility to manufacturers to address technological differences and costs, and they provide those manufacturers with incentives to produce cleaner vehicles and thus advance emission control technology.

We are finalizing a bins approach with the bins shown in Tables IV.B.4 and 5 to provide adequate and appropriate emission reductions and manufacturer flexibility. This structure will help to accelerate technological innovation. We requested comment on whether we should include up to two additional bins between NO_X = 0.07 and NO_X = 0.15. Based upon manufacturer comment, we have added an additional bin (bin 6) with NO_X = 0.10. This bin will provide greater flexibility for manufacturers who may find it more cost-effective to produce some vehicles slightly above 0.07 but have difficulties meeting a 0.07 g/mi average NO_X standard if they must certify them to a NO_X level of 0.15 g/mi.

We requested comment on whether our Tier 2 bin in the NPRM with NO_X = 0.20 (our final bin 8) should be eliminated when the Tier 2 phase-in is completed (after 2007 for LDV/LLDTs and after 2009 for HLDTs). Numerous commenters argued that our highest bins were too lenient. Comments from manufacturers were opposed to eliminating bin 8 and we see little downside to having bins higher than the 0.07 NO_X standard, given that, for all of the vehicles that will use this bin, manufacturers will have to offset the excess emissions by selling vehicles certified below 0.07 g/mi NO_X under the averaging requirement. Thus, we are retaining bin 8.

b. The Program Will Phase in the Tier 2 Vehicle Standards Over Several Years

i. Primary Phase-In Schedule

We are finalizing as proposed our plan to phase in the Tier 2 standards for LDV/LLDTs over a four year period beginning in 2004 and we are also finalizing as proposed a delayed two year phase-in beginning in 2008 for HLDTs. These phase-in schedules are shown in Table IV.B.–2 and are also shown separately in Tables IV.B.–6 and 7. We believe the flexibility of this dual phase-in approach is appropriate because the Tier 2 program will encompass all light-duty vehicles and trucks and will result in widespread applications of upgraded and improved technology across the fleet. The program will require research, development, proveout, and certification of all light-duty models, and manufacturers may need longer lead time for some vehicles, especially HLDTs. Also, manufacturers may wish to time compliance with the Tier 2 standards to coincide with other changes such as the roll out of new engines or new models. In order to begin the introduction of very clean vehicles as soon as possible while avoiding imposing unnecessary inefficiencies on vehicle manufacturers, we believe this practical but aggressive phase-in schedule effectively balances air quality, technology, and cost considerations.

In each year, manufacturers will have to ensure that the specified fraction of their U.S. sales: [67]

- Meets Tier 2 standards for exhaust emissions, including Supplemental Federal Test Procedure (SFTP) standards (discussed in Section V.A.–3. below);
- Meets Tier 2 standards for evaporative emissions (discussed in Section IV.B.–4.f. below); and
- Meets the corporate average Tier 2 NO_X standard.

[67] For Tier 2 vehicles (and for interim vehicles), the term ''U.S. sales'' means, for a given model year, those sales in states other than California and any states that have adopted the California program.

Manufacturers will have to meet the Tier 2 exhaust requirements (i.e., all the standards of a particular bin plus the SFTP standards) using the same vehicles. Vehicles not covered by the Tier 2 standards during the phase-in years (2004–2008) will have to meet interim standards described in Section IV.B.4.e. below and the existing evaporative emission as well as the applicable SFTP standards.

Manufacturers can elect to meet the percentage phase-in requirements for evaporative and exhaust emissions using two different sets of vehicles. We believe that because of interactions between evaporative and exhaust control strategies, manufacturers will generally address the Tier 2 evaporative phase-in with the same vehicles that they use to meet the exhaust phase-in. However, the primary focus of today's proposal is on exhaust emissions, and the flexibility for manufacturers to use different sets of vehicles in complying with the phase-in schedule for evaporative standards and for the exhaust standards will have no environmental down side that we are aware of. It is possible that some exhaust emission improvements might even occur sooner than they otherwise would if a manufacturer is able to move ahead with the roll-out of a model with cleaner exhaust emissions without having to wait for the development of suitable evaporative controls to be completed for that model.

TABLE IV.B.–6.—PRIMARY PHASE-IN SCHEDULE FOR SALES OF TIER 2 LDVS AND LLDTS

Model year	Required percentage of light-duty vehicles and light light-duty trucks (percent)
2004	25
2005	50
2006	75
2007	100

TABLE IV.B.–7.—PRIMARY PHASE-IN SCHEDULE FOR SALES OF TIER 2 HLDTS

Model year	Required percentage of heavy light-duty trucks (percent)
2008	50
2009	100

We are finalizing our proposed phase-in approach, in which vehicle sales will be determined according to the ''point of first sale'' method outlined in the NLEV rule. Vehicles with points of first sale in California or a state that has adopted the California LEV II program (if any) will be excluded from the calculation. The ''point of first sale'' method recognizes that most vehicle sales will be to dealers and that the dealers' sales will generally be to customers in the same geographic area. While some sales to California residents (or residents of states that adopt California standards) may occur from other states and vice-versa, we believe these sales will be far too small to have any significant impact on the air quality benefits of the Tier 2 program or the manufacturers' ability to demonstrate compliance.

ii. Alternative Phase-In Schedule

We are finalizing, as proposed, that manufacturers may introduce vehicles earlier than required to earn the flexibility to make offsetting adjustments, on a one-for one basis, to the phase-in percentages in later years. However, they will still need to reach 100% of sales in the 2007 model year (2009 for HLDTs). Manufacturers will have the option to use this alternative to meet phase-in requirements for LDV/LLDTs and/or HLDTs. They can use separate alternative phase-in schedules for exhaust and evaporative emissions, or an alternative phase-in schedule for one set of standards and the primary (25/50/75/100% or 50%/100%) schedule for the other.

Under these alternative schedules, manufacturers will have to introduce vehicles that meet or surpass the 0.07 g/mi Tier 2 NO_X average standard before they are required to do so, or else introduce vehicles that meet or surpass the 0.07 standard in greater quantities than required. Alternative phase-in schedules essentially credit the manufacturer for its early or accelerated efforts and allow the manufacturer greater flexibility in subsequent years during the phase-in. Thus, the alternative phase-in schedule provisions provide incentive and flexibility to manufacturers to introduce Tier 2 vehicles before 2004 (or 2008 for HLDTs).

As outlined in the NPRM, an alternative phase-in schedule will be acceptable if it passes a specific mathematical test. We have designed the test to provide manufacturers benefit from certifying to the Tier 2 standards early while ensuring that significant numbers of Tier 2 vehicles are introduced during each year of the alternative phase-in schedule. To test an alternative schedule, a manufacturer must sum its yearly percentages of Tier 2 vehicles beginning with model year 2001 and compare the result to the sum that results from the primary phase-in schedule. If an alternative schedule scores as high or higher than the base option, then the alternative schedule is acceptable. The mathematical technique to evaluate alternative phase-in schemes is somewhat similar to that used in our NLEV rule and in California rules.

For LDV/LLDTs, the final sum of percentages must equal or exceed 250—the sum that results from a 25/50/75/100 percent phase-in. For example, a 10/25/50/65/100 percent phase-in that begins in 2003 will have a sum of 250 percent and is acceptable. In this example, assuming constant levels of production, each Tier 2 vehicle sold early (*i.e.* in 2003) will permit the manufacturer to sell one less Tier 2 vehicle in the last phase-in year (2006). A 10/20/40/70/100 percent phase-in that begins the same year has a sum of 240 percent and is not acceptable. For HLDTs, the sum must equal or exceed 150 percent.

To ensure that significant numbers of Tier 2 vehicles are introduced in the 2004 time frame, manufacturers will not be permitted to use alternative phase-in schedules that delay the implementation of the Tier 2 LDV/LLDT requirements, even if the sum of the phase-in percentages meets or exceeds 250. Such a situation could occur if a manufacturer delayed implementation of its Tier 2 production until 2005 and began a 75/85/100 percent phase-in that year. To protect against this possibility, we are finalizing the proposed requirement that for any alternative phase-in schedule, a manufacturer's phase-in percentages from the 2004 and earlier model years sum to at least 25%. In the final rule we are including an additional measure of flexibility to the requirements for alternative phase-in schedules. We will permit manufacturers to achieve a 2004 phase-in of less than 25%, but no less than 20%, provided that in 2005 they make up the shortfall in a two-for-one manner. So, as an example, a manufacturer that phased in 5% in 2003 and 15% in 2004 would achieve a total of 20% through the 2004 model year and would need to comply with Tier 2 requirements for at least 60% of its LDV/LLDTs in 2005. We believe that this flexibility is appropriate because the required response for 2005 model year vehicles more than makes up for the environmental loss from the 2004 model year vehicles.

We requested comment on whether alternative phase-in schedules should be structured to permit manufacturers to extend phase in past the final year of the primary phase-in schedule (2007 or 2009). While the Alliance proposal and comments clearly support phase-ins that run past 2007 and 2009, other commenters were opposed to any extensions of the phase-in period. In fact most commenters who addressed the length of the phase-in indicated, as previously discussed, that the phase-in for HLDTs should be moved ahead to 2007 to coincide with LDV/LLDTs. We are not finalizing any provisions that will permit alternative phase-in schedules to provide additional time for manufacturers to meet any final 100% compliance year.

In the NPRM, we pointed out that phase-in schedules, in general, add little flexibility for manufacturers with limited product offerings because a manufacturer with only one or two test groups can not take full advantage of a 25/50/75/100 percent or similar phase-in. For manufacturers meeting EPA's definition of ''small volume manufacturer,'' we proposed to exempt those manufacturers from the phase-in schedules and require them to simply comply with the final 100% compliance requirement. We are finalizing this provision for small volume manufacturers. This provision is only intended to apply to small volume manufacturers and not to small test groups of larger manufacturers.

For larger manufacturers having a limited product line, we recognize that our phase-in schedule may lack flexibility, however, we are not including any provisions to address this issue as we are for small volume manufacturers because we do not believe these manufacturers need the relief and we do not want to sacrifice any air quality benefits of the program.

c. Manufacturers Will Meet a ''Corporate Average'' NO_X Standard

While the manufacturer will be free to certify a test group to any applicable bin of standards in Table IV.B.–2, it will have to ensure that the sales-weighted average of NO_X standards from all of its test groups of Tier 2 vehicles meet a full useful life standard of 0.07 g/mi.[68] Using a calculation similar to that for the NMOG corporate average standard in the California and NLEV programs, manufacturers must determine their compliance with the corporate average NO_X standard at the end of the model year by computing a sales weighted average of the full useful life NO_X standards from each bin. Manufacturers must use the following formula:

$$\text{Corporate Average NO}_X = \frac{\sum (\text{Tier 2 NO}_X \text{ std for each bin}) \times (\text{sales for each bin})}{\text{total Tier 2 sales}}$$

Manufacturers must exclude vehicles sold in California or states adopting California LEV II standards from the calculation. As indicated above, manufacturers must compute separate NO_X averages for LDV/LLDTs and HLDTs through model year 2008.

The corporate average NO_X standards of the primary Tier 2 program and the interim programs for LDV/LLDTs and HLDTs will ensure that expected fleet-wide emission reductions are achieved. At the same time, the corporate average standards allow us to permit the sale of some vehicles above the levels of the average standards to address the greater technological challenges some vehicles face and to reduce the overall costs of the program. We discuss how manufacturers can generate, use, buy and sell NO_X credits under the interim and Tier 2 programs in the next subsection.

Given the corporate average NO_X standards, we do not believe a corporate average NMOG standard as used by California is essential because meeting the corporate average NO_X standard will automatically bring the NMOG fleet average to approximately 0.09 g/mi or below.

d. Manufacturers Can Generate, Bank, and Trade NO_X Credits

i. General Provisions

As mentioned in the Overview above, we are finalizing our proposal that manufacturers with year-end corporate average NO_X emissions for their Tier 2 vehicles below 0.07 g/mi can generate Tier 2 NO_X credits. Credits can be saved (banked) for use in a future model year

[68] For interim vehicles, this average NO_X standard will be 0.20 for HLDTs and 0.30 for LDV/LLDTs. Compliance with these interim average standards will be calculated in the same manner as compliance with the 0.07 standard.

or for trading (sale) to another manufacturer. Manufacturers can use credits if their corporate average NO_X emissions are above 0.07 g/mi.

As proposed, the Tier 2 standards will apply regardless of the fuel the vehicle is designed for, and there will be no restrictions on averaging, banking or trading of credits across vehicles of different fuel types. Consequently, a gasoline fueled LDV might help a manufacturer generate NOx credits in one year that could be banked for the next year when they could be used to average against NO_X emissions of a diesel fueled LDT within the appropriate averaging structure.

Because of the split phase-in and the different interim programs we are finalizing for the two different groups of vehicles (LDV/LLDTs and HLDTs), we are also finalizing the proposed requirement that manufacturers compute their corporate Tier 2 NO_X averages separately for LDV/LLDTs and HLDTs through 2008. As we proposed, credit exchanges between LDVs/LLDTs and HLDTs will not be allowed nor will credit exchanges across the interim programs or between the interim programs and the final Tier 2 program be allowed. These restrictions will end with the 2009 model year at which time both phase-ins and all interim standards will have ended and the program will permit free averaging across all Tier 2 vehicles. As noted in the NPRM, we are concerned that allowing cross-trading between interim and Tier 2 vehicles will reduce the expected benefits of the program and delay fleet turnover to Tier 2 emission levels. For this reason we did not propose and are not finalizing to permit such exchanges.

ii. Averaging, Banking, and Trading of NO_X Credits Fulfills Several Goals

We explained in the NPRM why we believe the provisions for averaging, banking, and trading of NO_X credits (ABT) will be valuable. In short:

- 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 more stringent emission standard than might otherwise be appropriate under 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.

iii. How Manufacturers Can Generate and Use NO_X Credits

Manufacturers will determine their year-end corporate average NO_X emission level by computing a sales-weighted average of the NO_X standard from each bin to which the manufacturer certifies any LDVs or LDTs. Tier 2 NO_X credits will be generated when a manufacturer's average is below the 0.07 gram per mile corporate average NO_X standard, according to this formula:

NO_X Credits=(0.07 g/mi − Corporate Average NO_X)×Sales

The manufacturer can use these NO_X credits in future years if its corporate NO_X average is above 0.07, or it can trade (sell) the credits to other manufacturers. Tier 2 credits can be generated via this mechanism beginning in the first phase-in year, *i.e.,* 2004 for LDV/LLDTs and 2008 for HLDTs. The use of NO_X credits will not be permitted to address Selective Enforcement Auditing or in-use testing failures.

The enforcement of the NO_X averaging standard will occur through the vehicle's certificate of conformity. A manufacturer's certificate of conformity will be conditioned upon compliance with the averaging provisions. The certificate will be void *ab initio* if a manufacturer fails to meet the corporate average NO_X standard and does not obtain appropriate credits to cover its shortfall in that model year or in the next three model years (see deficit carryforward provision below). Manufacturers will need to track their certification levels and sales unless they produce only vehicles certified to bins containing NO_X levels of 0.07 g/mi or below and do not plan to bank NO_X credits.

iv. Manufacturers Can Earn and Bank Credits for Early NO_X Reductions

In the NPRM, we proposed that to the extent a manufacturer's corporate average NO_X level of its ''early Tier 2'' vehicles was below 0.07 g/mi, the manufacturer could bank NO_X credits for later use. We recognize (and the comments assert) that this provision may be lightly used, because it requires a large reduction from prior standards to produce any credits. However, our goal is to bring vehicles to Tier 2 levels as quickly as possible and we are concerned that any other approach could provide credits for reductions manufacturers would make relatively easily from previous, higher standards. Such credits would then be used to delay the impact of the 0.07 g/mi NO_X standard. Further, we believe that our provision for alternative phase-in schedules provides what is essentially a supplemental, or perhaps even primary, early banking program, in that it permits manufacturers to trade-off earlier phase-in percentages for later phase-in percentages. To provide manufacturers with greater flexibility and with incentives to certify, produce and sell Tier 2 vehicles as early as possible, we are finalizing the alternative phase-in provisions. (See IV.B.4.b.ii above.) Under such schedules, a manufacturer can certify vehicles to an average NO_X level of 0.07 g/mi or below in years prior to the first required phase-in year and then phase its remaining vehicles in over a more gradual phase-in schedule that will still lead to 100% compliance by 2007 (2009 for HLDTs).

Thus, we are finalizing our provision for early NO_X credits essentially as proposed. To the extent that a manufacturer's corporate average NO_X level of its ''early Tier 2'' vehicles is below 0.07 g/mi, the manufacturer can bank NO_X credits for later use. Manufacturers will compute these early credits by calculating a sales-weighted corporate average NO_X emission level of their Tier 2 vehicles, as in the basic Tier 2 program described above. In section IV.B.4.d.vii. below, we describe provisions we are adding to the final rule that will enable manufacturers to generate extra credits from vehicles certified to very low levels. In addition to encouraging production of very clean vehicles, these provisions, which apply beginning in 2001, will enhance the abilities of manufacturers to generate early credits.

Early Tier 2 credits will have all the same properties as credits generated by vehicles subject to the primary phase-in schedule. We proposed that these credits could not be used in the NLEV, Tier 1 or interim program for non-Tier 2 vehicles in any way. We are finalizing this restriction as proposed. We are also finalizing as proposed that the NMOG emissions of these vehicles (LDVs and LLDTs only) can be used in the calculation of the manufacturer's corporate average NMOG emissions under NLEV through 2003.

To provide manufacturers with maximum flexibility in the period prior to 2004, when LDV/LLDT useful lives will still be at 100,000 miles, we proposed and are finalizing that manufacturers may choose between the Tier 2 120,000 mile useful life or the current 100,000 mile useful life requirement for early Tier 2 LDV/LLDTs. (HLDTs already have a 120,000 mile useful life.) Early LDV/LLDT NO_X credits for 100,000 mile useful life vehicles will have to be prorated by 100,000/120,000 (5/6) so that they can be properly applied to 120,000 mile Tier 2 vehicles in 2004 or later.

We proposed to restrict early banking of HLDT Tier 2 NO_X credits to the four year period from 2004–2007. This restriction was due to a concern about excessive credits generation if a longer credit generation period was available. Based on our review of the comments and from reconsideration of the restrictive nature of our approach for early credits, we are much less concerned that allowing generation of early HLDT Tier 2 credits in years prior to 2004 will result in excessive credits. Prior to 2004, manufacturers will only be required to meet the Tier 1 standards which are much higher than the final Tier 2 standards. Manufacturers will have to make large cuts in emissions to bank the small amount of credits offered by our early banking provision. Further, we recognize that vehicles that meet the Tier 2 standards early provide an environmental benefit, and the earlier that benefit occurs, the earlier that areas can use such benefits to reach or come close to attainment. Lastly, we believe it is appropriate to match the period of early credit generation with the years in which we will permit alternative phase-in schedules. Consequently, we are finalizing our provisions for early banking such that manufacturers may bank early Tier 2 NO_X credits in model years 2001–2007.

We recognize that vehicles generating early Tier 2 NO_X credits may be doing so without the emissions benefit of low sulfur fuel, and thus these vehicles may not achieve the full in-use emission reduction for which they received credit. When these credits are used to permit the sale of higher-emitting vehicles, there may be a net increase in emissions. For the most part, this is a problem anyway, since NLEV vehicles are also sensitive to gasoline sulfur. We believe that the benefits of early introduction of Tier 2 technology described above are significant enough that they are worth the risk of some emission losses that might occur if and when the early credits are used. Also, we believe that some fuel sulfur reductions will occur prior to 2004 as refiners upgrade their refineries or bring new refining capacity on stream in anticipation of the 2004 requirements and take advantage of the phase-in proposed in the gasoline sulfur ABT program (described in Section IV.C. below).

v. Tier 2 NO_X Credits Will Have Unlimited Life

We discussed in the preamble to the NPRM why we did not propose to apply the California schedule of discounting unused credits adopted for NMOG credits in the NLEV program. This schedule serves to limit credit life throughout the program by reducing unused credits to 50, 25 and 0 percent of their original number at the end of the second, third and fourth year, respectively, following the year in which they were generated. We agree that such a scheme may be appropriate in the California program with its declining NMOG average standard, but in the federal program, once the phase-in period ends in model year 2009, all LDVs and LDTs will comply on average with a fixed Tier 2 NO_X standard.

Credits allow manufacturers flexibility to meet standards cost effectively and to address unexpected shifts in sales mix. When matched with a NO_X average standard, credits provide flexibility constrained by the requirement that all vehicles, on average, must comply with a fixed standard. Defined bins of standards prevent any one vehicle from having extremely high emissions, while the need to offset higher vehicles with lower vehicles to meet an average NO_X standard prevents large numbers of vehicles from utilizing the higher bins.

We requested comment in the NPRM on the need for discounting of credits or limits on credit life and what those discount rates or limits, if any, should be. The 0.07 NO_X emission standard in the Tier 2 program is quite stringent and does not present easy opportunities to generate credits. The degree to which manufacturers invest the resources to achieve extra NO_X reductions provides environmental benefit for years to come and it is appropriate that the manufacturer get credits. We do not want to take measures to reduce the incentive for manufacturers to bank credits nor do we want to take measures to encourage unnecessary credit use. Consequently we are finalizing our proposal that Tier 2 NO_X credits, including early credits, have unlimited lives.

vi. NO_X Credit Deficits Can Be Carried Forward

When a manufacturer has a NO_X deficit at the end of a model year—that is, its corporate average NO_X level is above the required corporate average NO_X standard—we proposed that the manufacturer could carry that deficit forward into the next model year. Such a carry-forward could only occur after the manufacturer used any banked credits. If the deficit still existed and the manufacturer chose not to or was unable to purchase credits, the deficit could be carried over. At the end of that next model year, according to our proposal, the deficit would need to be covered with an appropriate number of NO_X credits that the manufacturer generated or purchased. Any remaining deficit would be subject to an enforcement action. To prevent deficits from being carried forward indefinitely, the manufacturer would not be permitted to run a deficit for two years in a row.[69]

Manufacturers made the persuasive case that by the time they can tabulate their average NO_X emissions for a particular model year, the next model year is likely well underway and it is too late to make calibration, marketing or sales mix changes to adjust that year's credit generation. Therefore, based upon comments, we are finalizing a modified approach to credit deficits such that a manufacturer having a credit deficit in the interim or Tier 2 program can carry that deficit forward for a total of three years, but the manufacturer must apply all its available credits to that deficit on a one-for-one basis in each of the first two succeeding model years. If the deficit is not covered by the third model year, the manufacturer must apply credits at a rate of 1.2:1. No deficit may be carried into the fourth year. In order to accommodate this modification to our proposal, we must also modify our proposed provision that would have prevented manufacturers from running a deficit in two consecutive model years so that deficits can not be shifted from one year to the next and thus carried forward indefinitely. Because we are permitting, in this final rule, deficits to be carried forward for as long as three years we are finalizing that manufacturers can not run a deficit in any year in which it is paying off a deficit from a previous year. The effect of this provision is the same as that in

[69] Because of the limited duration of the interim programs, we proposed that a manufacturer could carry a credit deficit in the interim program forward until the 2006 model year (2008 for HLDTs). The interim program, in its entirety, lasts only five years and therefore we saw little risk of prolonged deficits.

the NPRM— to keep manufacturers from shifting deficits forward indefinitely.

We note that under our modified final approach, manufacturers will have the flexibility to carry deficits from the interim program forward into the final Tier 2 program. This feature is likely to be used only in an extreme situation since the Tier 2 credits needed to offset the interim credit deficit will be more difficult to generate. Consequently, we do not believe this provision is inconsistent with our approach of segregating interim and Tier 2 credits. In fact, manufacturers electing to cover an interim credit deficit with Tier 2 credits will likely have to accelerate the introduction of Tier 2 vehicles to get the necessary credits to cover the deficit.

We are finalizing that small volume manufacturers may not use the credit deficit carryforward provision until they have been in compliance with the relevant average NO_X standard for one model year. In section V of this preamble we explain that we are not requiring small volume manufacturers to comply with intermediate phase-in requirements under our interim or Tier 2 phase-ins. Rather, they will just have to comply for all of their vehicles in the last phase-in year. Because they do not have to comply with intermediate phase-in requirements, small volume manufacturers effectively get more time to comply (as much as three years). We do not want to create a situation where they could get even more time to comply by using the credit deficit carryforward provision.

vii. Encouraging the Introduction of Ultra-Clean Vehicles

We requested comment in the NPRM as to whether we should provide additional NO_X credits for vehicles that certify to very low levels. We stated in the NPRM that we believe it is appropriate to provide inducements to manufacturers to certify vehicles to very low levels and that these inducements may help pave the way for greater and/or more cost effective emission reductions from future vehicles. We believe it is important in a rule of this nature to provide extra incentive to encourage manufacturers to produce and market very clean vehicles. We believe this is especially important in the earliest years of the program when manufacturers must make resource commitments to technologies and vehicle designs that will have multi-year life spans. We believe this program provides a strong incentive for manufacturers to maximize their development and introduction of the best available vehicle/engine emission control technology, and this in turn provides a stepping stone to the broader introduction of this technology soon thereafter. Early production of cleaner vehicles enhances the early benefits of our program and vehicles certified to these lowest bins produce not just lower NO_X but also lower NMOG, CO and HCHO emissions. If a manufacturer can be induced to certify to a lower bin by the promise of reasonable extra credits, the benefits of that decision to the program may last for many years.

We are finalizing provisions to permit manufacturers, at the beginning of the program, to weight LDV/Ts certified to the lowest two bins more heavily when calculating their fleet average NO_X emissions. Under this provision, which applies through the 2005 model year, manufacturers may apply a multiplier to the number of LDV/Ts sold that are certified to bins 1 and 2 (ZEVs and SULEVs in California terms). This adjusted number will be used in the calculation of fleet average NO_X emissions for a given model year and will allow manufacturers having vehicles certified to these bins to generate additional credits (or use fewer credits) that year.

The multipliers that manufacturers may use are found in Table IV.B.–8 below:

TABLE IV.B.–8.—MULTIPLIERS FOR ADDITIONAL CREDITS FOR BIN 1 AND 2 LDV/T

Bin	Model year	Multiplier
2	2001, 2002, 2003, 2004, 2005	1.5
1	2001, 2002, 2003, 2004, 2005	2.0

e. Interim Standards

i. Interim Exhaust Emission Standards for LDV/LLDTs

The NLEV program referenced throughout this discussion is a voluntary program in which all major manufacturers have opted to produce LDVs and LLDTs to tighter standards than those required by EPA's Tier 1 regulations. Under the NLEV program, manufacturers must meet an NMOG average outside of California that is equivalent to California's current intermediate-life LEV requirement—0.075 g/mi for LDVs and LDT1s (0.10 g/mi for LDT2s). NLEV requirements apply only to LDVs and LLDTs, not to HLDTs.

The NLEV program is effective beginning in the northeastern states in 1999 and in the remaining states in 2001, except that the program does not apply to vehicles sold in California or in states that adopted California's LEV program. The program runs at least through model year 2003 and can run through model year 2005.

Under the Tier 2 phase-in we are finalizing today, not all LDV/LLDTs covered under NLEV will be subject to Tier 2 standards in the 2004 to 2006 period. Without a program for full Tier 2 compliance in 2004 (*i.e.,* because of the phase-in), these vehicles could revert to Tier 1 standards. The NLEV program, moreover, is a voluntary program that contains several provisions that restrict EPA's flexibility and that could lead to a manufacturer or a covered Northeastern state leaving the program in or prior to 2004. To resolve these concerns we are finalizing the proposed interim program for all non-Tier 2 LDV/LLDTs for the 2004–2006 model years. Our interim program will replace the NLEV program, which will terminate at the end of 2003. The transition from NLEV to the interim program should be smooth because the interim program will employ several bins derived from the NLEV standards for LDVs, LDT1s and LDT2s. The interim program will ensure that all LDVs, LDT1s and LDT2s that are not certified to Tier 2 levels during the 2004–2006 phase-in period remain at levels at least as stringent, on average, as NLEV levels. The interim program will also bring the emission standards for LDT2s more into line with those for the LDVs and LDT1s by requiring that they be averaged under the same NO_X standard rather than under separate standards as is the case in the NLEV program.

In the NPRM, we included separate sets of bins for the interim program and Tier 2 program. However, we indicated that manufacturers could use either set for interim vehicles. In today's final rule we have combined all bins into one table for simplicity. We have also added two new bins having NO_X values of 0.03 g/mi and 0.10 g/mi.

In the NPRM, we proposed that, for LDV/LLDTs, all bins with NO_X values over 0.20 g/mi would expire at the end of the 2006 model year when there are no longer any interim LDV/LLDTs. Table IV–B.–4 shows that the two highest bins, bins 9 and 10, which were derived from NLEV and included to smooth the transition from NLEV to the interim program will be unuseable for LDV/LLDTs after 2006—the last year of the LDV/LLDT phase-in. Otherwise all bins will remain viable for the duration of the Tier 2 program unless altered by another rulemaking.

We proposed to align the useful life periods for interim standards with those of the Tier 2 standards (full useful life of 120,000 miles), as discussed in Section V.B. below. The end result of this proposal would have been that all LDV/LLDTs—whether in the Tier 2 program or interim program—would go from 100,000 mile useful lives to 120,000 mile useful lives in 2004. However, manufacturers were extremely concerned about the certification workload burden for 2004. They commented that they would be unable to carry any of their LDV/LLDTs over from 2003 and that they would have to recertify all of their vehicles in 2004 and then likely recertify them again as they were phased into the Tier 2 standards. Therefore, based upon comments, we are finalizing that useful lives of the interim LDV/LLDTs may remain at 100,000 miles. Our reasons for this change are discussed in greater detail in Section V.B.

We are finalizing as proposed a corporate average full useful life NO_X standard of 0.30 g/mi for this interim program. This standard is derived from the NLEV program and represents the full useful life NO_X standard in NLEV that is associated with LEV LDVs and LDT1s. LDVs and LDT1s will already be at this level, on average, under the NLEV program. LDT2s are subject to standards that effectively impose a NO_X average standard of 0.5 g/mi under NLEV, but we believe they should readily be able to meet the 0.30 g/mi average especially since they can be averaged with the LDVs and LDT1s. To aid LDV/LLDTs in meeting the 0.30 g/mi corporate average NO_X standard in the interim program, we are providing an optional NMOG value for LDT2s certifying to bin 9 (where the NO_X standard=0.3 g/mi). This option is only for LDT2s, and only for those produced by manufacturers that elect to comply with the interim requirements for all of their HLDTs for the 2004 model year (see next section). The optional NMOG values for qualifying LDT2s are 0.130 g/mi at full useful life and 0.100 at intermediate useful life.

The 0.30 g/mi corporate average NO_X standard will apply only to non-Tier 2 (interim) LDV/LLDTs and only for the 2004–2006 model years. Manufacturers will compute, bank, average, trade, account for, and report interim NO_X credits via the same processes and equations described in this preamble for Tier 2 vehicles, substituting the 0.30 g/mi corporate average standard for the 0.07 g/mi corporate average standard in the basic program. Also, EPA will condition the certificates of conformity on compliance with the corporate average standard, as described for Tier 2 vehicles. These NO_X credits will be good only for the 2004–2006 model years and will only apply to the interim non-Tier 2 LDV/LLDTs. Credits will not be subject to any discounts, and credit deficits can be carried forward as described under Section IV.B.4.d.vi. above.

NMOG credits from the NLEV program can not be used in this interim program in any way. NO_X credits generated under this interim program will not be applicable to the Tier 2 NO_X average standard of 0.07 g/mi because of our concern that a windfall credit situation could occur. This could happen because credits are relatively easy to generate under a 0.30 g/mi standard compared to generating credits under a 0.07 g/mi standard. As we indicated in the preamble to the NPRM we believe the application of credits earned under the interim standard to the Tier 2 standards could significantly delay the fleet turnover to Tier 2 vehicles. We do not believe there is a need or that it would be appropriate to allow such a delay. The requirements of the interim program will be monitored and enforced in the same fashion as for Tier 2 vehicles.

For the reasons cited above, we believe it is appropriate to extend interim, NLEV-like standards beyond 2003 as a mandatory program and to bring all LDVs and LLDTs within its scope. Manufacturers have already demonstrated their ability to make LDVs and LLDTs that comply at levels well below these standards. As the interim standards for LDV/LLDTs are essentially 'phase-out'' standards, we did not propose and are not finalizing early banking provisions for the interim LDV/LLDTs.

ii. Interim Exhaust Emission Standards for HLDTs

We believe these interim standards are necessary and reasonable for HLDTs. While these trucks make up a fairly small portion of the light-duty fleet (about 14%), their current standards under Tier 1 are far less stringent than the NLEV standards that apply to current model year LDVs and LLDTs. Given the delayed phase-in we are finalizing for HLDTs, we believe it is appropriate to require some interim reductions from these vehicles. Further, manufacturers have already demonstrated their ability to meet these interim standards with HLDTs. These standards are a reasonable first step toward the Tier 2 program and will provide meaningful reductions in the near term relative to current certification levels under the Tier 1 emission standards.

We also proposed interim standards to begin in 2004 for HLDTs. These vehicles are not included in the NLEV program and will be subject only to the Tier 1 standards prior to today's rule taking effect. Tier 1 standards permit NO_X emissions of 0.98 g/mi for LDT3s and 1.53 g/mi for LDT4s. We are finalizing these standards generally as proposed; to address statutory lead time requirements, we are offering two options for the phase-in of HLDTs to the interim standards. Manufacturers can choose between either of these two options:

(Option 1) Like we proposed in the NPRM, manufacturers must bring their entire production of 2004 model year HLDTs under the interim requirements and phase 25% of them into the 0.20 g/mi fleet average NO_X requirement, followed by 50% in 2005, 75% in 2006, and then 100% in 2007; or

(Option 2) We are including this option to address statutory lead time requirements for HLDTs. In the case of 2004 model year test groups whose model years commence *before the fourth anniversary* of the signature date of today's rule, the manufacturer may exclude those test groups from the interim HLDT provisions of the rule. In the case of 2004 model year test groups whose model years commence *on or after the fourth anniversary* of this rule's signature, the manufacturer must bring all such HLDTs under the requirements of our interim program, and all such vehicles or 25% of the manufacturer's sales of 2004 model year HLDTs, whichever is less, must comply with the corporate average NO_X standard of 0.20 g/mi. The manufacturer must then bring all of its HLDTs into the interim requirements beginning with the 2005 model year including a 50%, 75%, 100% phase-in to the 0.20 g/mi fleet average NO_X standard beginning that year. The beginning of a test group's model year is determined under section 202(b)(3) of the Act and 40 CFR Part 85 Subpart X.

Our final rule is consistent with the requirements of the Act because manufacturers won't have to phase-in HLDTs until the model year that commences four years from the signature of this rule if they don't want to. However, to provide incentive for manufacturers to comply with the interim requirements for all of their HLDTs beginning with the 2004 model year, *i.e.* to elect Option 1, we are finalizing a provision to permit those manufacturers to use higher NMOG values in two situations. Manufacturers electing to meet the interim requirements for all of their 2004 model year HLDTs including the 25% phase-in number must so declare in their 2004 model year HLDT certification applications. They may then:

- Use a full useful life NMOG value, through the 2008 model year, of 0.280 g/mi for LDT4s certified to bin 10 (0.195 g/mi at intermediate life); and
- Use a full useful life NMOG value, through the 2006 model year, of 0.130 g/mi for LDT2s certified to bin 9 (0.100 g/mi at intermediate life).[70]

In the case of the LDT4s, the optional NMOG standard will enable manufacturers to more easily meet our interim HLDT NO_X standards, the highest of which (0.6 g/mi) is one-third tighter than what will be required in California under Cal LEV I through 2006. For the LDT2s, the optional NMOG standard will help manufacturers certify more LDT2s to bin 9 (0.3 g/mi) than they likely would otherwise (they would probably certify some LDT2s to bin 10 where NO_X=0.6 g/mi). Therefore, both of these optional standards are consistent with our goal to achieve important early NO_X benefits from our program.

Except for the application of the new option described above, the interim standards for HLDTs will apply as proposed, and will phase-in through the 2007 model year, as shown in Table IV.B.–2. We are finalizing the proposed corporate average full-life NO_X standard of 0.20 g/mi for interim HLDTs.

[70] Manufacturers must cite this declaration in their LDT2 certification applications for the 2004–2006 model years and in their LDT4 applications for the 2004–2008 model years. If manufacturers employ alternate phase-in schedules that begin prior to 2004, they must also make the declaration in each applicable year before 2004.

Manufacturers will comply with the corporate average HLDT NO_X standard by certifying their interim HLDTs to any of the full useful life bins shown in Table IV–B.–4. Where applicable, manufacturers will also comply with the intermediate useful life standards shown in Table IV.B.–5. Interim HLDTs not needed to meet the phase-in percentages during model years 2004–2006 will have to be certified to the standards of one of the bins in Table IV.B.–4 (and –5), and NO_X will thus be capped at 0.60 g/mi. These trucks will not be included in the calculation to demonstrate compliance with the 0.20 g/mi average.

At the end of each model year, manufacturers will determine their compliance with the 0.20 NO_X standard by calculating a sales weighted average of all the bins to which they certified any interim HLDTs, excluding those not needed to meet the applicable phase-in requirements during 2004–2006. The excluded trucks must comply with the standards from one of the bins in Table IV-B–4 (and –5) which effectively caps their emissions at 0.60 g/mi.

For HLDT test groups that are not subject to the phase-in in model year 2004 under Option 2 above, the same requirements as described above apply except that there are no new standards for these vehicles in the 2004 model year. Also, the optional higher NMOG values for LDT2s and LDT4s do not apply for any manufacturer that uses Option 2.

Given that the interim HLDT standards are ''phase-in'' standards through 2007 (as opposed to the interim LDV/LLDT standards, which are ''phase-out'' standards), we are including provisions that manufacturers may employ alternative phase-in schedules as proposed for the Tier 2 standards and described in detail in section IV.B.4.b.ii. of this preamble. These schedules provide manufacturers with greater flexibility and we believe they also provide incentive for manufacturers to introduce advanced emission control technology at an earlier date. Alternative phase-in schedules will have to provide 100% phase-in by the same year as the primary phase-in schedule (2007). Manufacturers will be eligible for alternate phase-in schedules to the extent that they produce HLDTs that meet or surpass the NO_X average standard for interim HLDTs of 0.20 g/mi in 2001–2003 or to the extent that they produce more HLDTs than required that meet the 0.20 average standard in 2004 or later.

Where manufacturers elect not to meet the phase-in requirements for all of their 2004 model year HLDTs, as discussed above under Option 2, they may still employ alternate phase-in schedules, but the sum of 225 percent is required rather than the 250 percent required for alternate phase-ins described in section IV.B.4.b.ii. In this case, the sum of phase-in percentages up through the 2005 model year must total to at least 50%. Also, manufacturers must raise the 225% value to the extent that any of their 2004 HLDTs' model years commence on or after the fourth anniversary of the signature date of this rule and are brought into compliance with the 0.20 g/mi average NO_X standard.

Lastly, note that for bin 10, which is only usable during the interim program, we have established a PM standard of 0.08 g/mi, which is more stringent than the Tier 1 standard previously in effect for these vehicles. We do not expect low sulfur diesel fuel to be widely available during the time frame of the interim program but we expect that bin 10 levels can be reached by diesel technology on current diesel fuel. As a part of this overall approach, we are making the intermediate life standards optional for diesels for this bin.

f. Light-Duty Evaporative Emission Standards

We are finalizing as proposed a set of more stringent evaporative emission standards for all Tier 2 light-duty vehicles and light-duty trucks. The standards we are finalizing are shown in Table IV.B.–9 and represent, for most vehicles, more than a 50% reduction in diurnal plus hot soak standards from those that will be in effect in the years immediately preceding Tier 2 implementation. The higher standards for HLDTs provide allowance for greater non-fuel emissions related to larger vehicle size.

TABLE IV.B.–9.—FINAL EVAPORATIVE EMISSION STANDARDS

[Grams per test]

Vehicle class	3 day diurnal +hot soak	Supplemental 2 day diurnal +hot soak
LDVs and LLDTs	0.95	1.2
HLDTs	1.2	1.5

Evaporative emissions from LDVs and LDTs represent nearly half of the light duty VOC inventory projected for the 2007–2010 time frame, according to MOBILE5 projections. Manufacturers are currently certifying to levels that are, on average, about half of the current standards, and in many cases, much less than half the standards. Thus, meeting these standards appears readily feasible. Even though manufacturers are already certifying at levels much below the current standard, we believe that reducing the standards will result in emission reductions as all manufacturers seek to certify with adequate margins to allow for in-use deterioration. Further, we believe that tighter standards will prevent ''backsliding'' toward the current standards as manufacturers pursue cost reductions.

As mentioned in section IV.B.–4.b above, we will phase in the Tier 2 evaporative standards by the same mechanism as the Tier 2 exhaust standards; *e.g.,* 25/50/75/100 percent beginning in 2004 for LDV/LLDTs and 50/100 percent beginning in 2008 for HLDTs (as shown in Table IV.B.–2). As for the exhaust standards, alternative phase-in plans will also be available.

The evaporative emission standards we proposed and are finalizing today are the same as those that manufacturers' associations proposed during the development of California's LEV II proposal. California ultimately opted for more stringent standards; we believe that our standards are appropriate for federal vehicles certified on higher-volatility federal test fuel.

g. Passenger Vehicles Above 8,500 Pounds GVWR

Historically, we have categorized all vehicles above 8,500 pounds GVWR as heavy-duty vehicles regardless of their application and they have been subject to standards and test procedures designed for vehicles used in heavier work applications.[71] In the Tier 2 NPRM, we requested comment on whether some portion of vehicles above 8,500 pounds GVWR should be included in the Tier 2 program, based on vehicle use or design characteristics. The Tier 2 proposals, however, applied to light-duty vehicles and light-duty trucks and did not cover any vehicles above 8,500 pounds GVWR.

On October 29, 1999, after carefully considering all of the comments on this issue, we proposed to include all personal use passenger vehicles (both 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 Tier 2 program change in our NPRM concerning emissions standards for 2004 and later heavy-duty vehicles and engines, (64 FR 58472).

Specifically, we proposed to revise the definition of light-duty truck to include any complete vehicle between 8,500 and 10,000 pounds GVWR that is designed primarily for the transportation of persons and has a capacity of not more than 12 persons. We expected that this definition would exclude vehicles that have been designed for a legitimate work function as their primary use, such as the largest pick-up trucks, the largest passenger vans, and cargo vans; these vehicles would continue to be categorized as heavy-duty and would be subject to applicable heavy-duty standards. We requested comment on whether the proposed definition would adequately exclude these vehicles, or whether additional criteria may be needed and how that criteria might be used.

Today, we are finalizing Tier 2 standards for passenger vehicles above 8,500 pounds GVWR. 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. As we intended in the proposal, these vehicles will generally be subject to the same requirements as HLDTs. We have made modifications to the program, primarily in response to comments we received in two areas: (1) Changing the definition of light-duty truck and (2) the interim program requirements.

New Vehicle Category: Medium-Duty Passenger Vehicles (MDPVs)

The mechanism we proposed to bring the passenger vehicles over 8,500 pounds into the Tier 2 program, was to modify the definition of light-duty truck to include those vehicles. The objective of this proposal was to have these vehicles treated as HLDTs within Tier 2. We are finalizing requirements which remain consistent with our objective of including these vehicles in Tier 2 beginning in 2004. However, the approach we are finalizing is somewhat different than that proposed.

Rather than finalizing the revised definitions for light-duty truck as we proposed, we are creating a new category of heavy-duty vehicles termed ''medium-duty passenger vehicles'' (MDPVs). These vehicles will generally be grouped with and treated as HLDTs in the Tier 2 program. The MDPV category is defined along the lines of the proposed definition change for the LDT category, with some modification, as described below. Our decision to create a new sub-category of heavy-duty vehicles rather than modify the existing LDT definition does not, in and of itself, change the way in which Tier 2 standards are applied to the vehicles.

We decided upon the above approach because section 216 of the CAA establishes the definition for LDT as having the meaning contained in the CFR as of 1990. We received several comments that EPA may not change the definition and must instead devise a way to categorize the vehicles for purposes of Tier 2 which does not change the definition of light-duty truck. Rather than adopt a change to the LDT definition that would be questionable from a legal perspective, we are adopting an approach that we believe is clearly legally acceptable. Under this approach (as with the proposed approach), the standards for these vehicles are promulgated under

[71] The heavy-duty definition also includes vehicles that weigh over 6000 lbs curb weight regardless of their GVWR. We are not aware that any vehicles currently produced have curb weights above 6,000 lbs, but GVWRs of 8,500 lbs or less. Nevertheless, this discussion and our requirements includes such vehicles.

section 202(a)(3), which applies to heavy-duty vehicles/engines.

We are defining medium-duty passenger vehicles as any complete heavy duty vehicle less than10,000 pounds GVWR designed primarily for the transportation of persons including conversion vans (*i.e.,* vans which are intended to be converted to vans primarily intended for the transportation of persons. The conversion from cargo to passenger use usually includes the installation of rear seating, windows, carpet, and other amenities). We are not including 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. We would consider vehicles designed primarily for passenger use to be those that have seating available behind the driver's seat. We have added the rear passenger seating capacity criterion to exclude large passenger vehicles which are primarily used in heavy-load passenger applications. We do not believe vehicles designed primarily for personal use passenger transportation would be equipped with rear seating for more than 9 passengers. [72]

We have added the pick-up bed length criterion to the definition to clearly distinguish standard pick-ups from other vehicles meeting the GVWR and seating capacity criteria. We received several comments that although the proposal clearly states our intention not to include heavy-duty pick-up trucks in the Tier 2 program, the proposed regulatory definition was unclear. Currently, heavy-duty pick-ups have beds in excess of six feet. Any future offerings of vehicles that are equipped with significantly shorter beds would be included in the MDPV category, if the vehicle also met the weight and seating capacity criteria. EPA is making a distinction based on bed length because a vehicle introduced with a shorter bed would have reduced cargo capacity and would likely have increased seating capacity relative to current pick-ups, making it more likely to be used primarily as a passenger vehicle.

Interim Standards

As noted above, the MDPVs and HLDTs must meet the final Tier 2 standards by 2009 at the latest. Prior to 2009, HLDTs and MDPVs are required to meet interim standards. The interim standards, as described earlier in section IV.B.4, are based on a corporate average full life NO_X standard of 0.20 g/mile which is phased in 25/50/75/100 percent in 2004–2007. MDPVs must be grouped with HLDTs for the interim standards phase-in.

We received several comments from manufacturers that requiring these larger vehicles to meet a new, unique standard prior to phase-in to the interim program would worsen the workload burden created by the Tier 2 program. Manufacturers do not currently have facilities available for chassis-testing diesel vehicles and there is not enough time to fold diesel vehicles into a chassis-based program by 2004.[73]

To address this situation, we are providing the following temporary additional flexibilities for MDPVs. We are finalizing an additional upper bin for MDPVs for the interim program (effective in model years 2004 through 2008). This bin would only be available for MDPVs. The bin, shown in Table IV.B–10, is equivalent to the California LEV I standards that are applicable to these vehicles prior to 2004. Vehicles certified to this bin must be tested at adjusted loaded vehicle weight (ALVW), consistent with California program testing requirements.[74] Including this upper bin provides manufacturers with the ability to carry over their California vehicles to the federal program prior to their phase-in to the interim and final Tier 2 standards. Once phased in to the interim standards manufacturers may continue to use the upper bin but the vehicles must be included in the 0.20 g/mi NO_X average. The upper bin is not available to manufacturers for the final Tier 2 program.

TABLE IV.B.–10.—TEMPORARY INTERIM EXHAUST EMISSION STANDARDS BIN FOR MDPVS [a]

	NO_X	NMOG	CO	HCHO	PM
Full Useful Life (120,000 mile)	0.9	0.280	7.3	0.032	0.12

Notes:
[a] Bin expires after model year 2008.

We proposed that HLDTs not needed to meet the phase-in percentages for the interim program during model years 2004—2006 would be required to meet one of the interim bins. Such vehicles, however, would not be included in the calculation to demonstrate compliance with the 0.20 g/mile average. Thus, we proposed that the emissions of all interim HLDTs would be capped at a NO_X value of 0.6 g/mile. We are retaining the bin structure and requirements which effectively cap NO_X emissions at 0.6 g/mile for all HLDTs below 8,500 pounds GVWR, as described in section IV.B. Similarly, for MDPVs, the 0.9 g bin described above is the highest bin available and acts as the cap for vehicles not yet phased-in to the interim standards.

In addition, for diesel MDPVs prior to 2008, we are allowing manufacturers the option of meeting the heavy-duty engine standards in place for the coinciding model year. Diesels meeting the engine-based standards would be excluded from the interim program averaging pool. In 2008, the manufacturers must chassis certify diesel vehicles and include them either in the interim program or in the final Tier 2 program. In 2009 and later, all MDPVs, including diesels, must be brought into the final Tier 2 program. As with the higher bin of chassis-based standards, the purpose of this diesel provision is to provide the option of carry-over of vehicles until they are brought into the Tier 2 program. We believe these modifications to the program will substantially ease the workload concerns of manufacturers in the interim years by allowing them to carry-over vehicle models and engine families. The provisions also remain consistent with EPA's goal of including the vehicles in the overall Tier 2 program structure.

[72] Vehicles that are "designed" to accommodate more than nine passengers in the rearward seating area in their standard configuration but that have some of the standard rear seating removed to accommodate two or more wheel chair tie downs would usually not be considered MDPVs.

[73] Currently, diesel heavy-duty engines are certified to heavy-duty engine standards rather than vehicle standards.

[74] ALVW is the average of curb weight and GVWR. The test weight is sometimes refered to as "half payload".

For diesel engines that are engine certified and used in MDPVs, as allowed through model year 2007, we are requiring those engines to comprise a separate averaging set under the averaging, banking and trading requirements applicable to heavy-duty diesel engines. We are permitting engine-based certification for these diesel vehicles to provide time and flexibility for manufacturers who may have limited experience with chassis certifying vehicles containing such engines. However, we do not want to create a situation where engines above applicable engine standards could be used in these vehicles, when other MDPVs are being brought under stringent standards. Therefore we believe it is appropriate to constrain the application of credits to these engines. We note that we are not permitting credits from other programs (like NLEV) to be applied in any way to Tier 2 or interim vehicles.

For LDT4s, we have finalized an optional higher NMOG level of 0.280 g/mile for bin 10 (0.6 g/mile NO_X), as described in section IV.B.4.a of the preamble. MDPVs placed in bin 10 may also certify to the higher NMOG level of 0.280 g/mile. This provision provides manufacturers with the incentive of selecting the lower NO_X bin for MDPVs, since the NMOG level is not an obstacle to compliance.

As described in section IV. B.4.e.ii., manufacturers have two options for the start of the program requirements. In Option 1, the program begins with the 2004 model year for 25 percent all vehicles. In Option 2, manufacturers can exempt 2004 model year vehicle test groups whose model years begin on or after the fourth anniversary of this rule's signature. These options are also available for MDPVs for the same reasons we are providing them for HLDTs. However, the additional 0.9 g bin contained in Table IV.B.–10, the optional higher NMOG standard of 0.280 g/mile for bin 10, and the option of certifying to the engine-based standards for diesels are available only with Option 1.

Other Emission Control Requirements

We are requiring all non-diesel MDPVs to be OBDII compliant beginning in 2004. California requires OBDII for their LEV I program and therefore, the new OBDII requirements are consistent with the approach of allowing vehicles to be carried over from California. [75] Diesel vehicles which are carried over from the California program are required to be equipped with the OBD system as the system is certified in California. Diesel vehicles not carried over from California are not required as part of this rulemaking to be equipped with OBDII. However, we have proposed OBDII requirements for heavy-duty diesel engines in our heavy-duty engines NPRM (64 FR 58472). If OBDII requirements are finalized for heavy-duty engines and vehicles as part of that rulemaking the OBDII requirements would likewise apply to diesels in the MDPV category.

As proposed, we are applying Tier 2 evaporative emissions standards and existing HLDT ORVR requirements to MDPVs. MDPVs must be grouped with HLDTs for purposes of phasing in to the Tier 2 evaporative emission standards contained in this rule. We have added somewhat higher standards for the MDPVs to account for their larger fuel tanks and vehicle sizes.[76] However, the stringency of the standards remains similar to that for HLDTs. These standards are described in section IV.B.4.f of the preamble. ORVR requirements currently exist for HLDTs and are to be phased-in through model years 2004–2006.[77] We proposed to apply the same standards and phase-in requirements to vehicles over 8,500 pounds GVWR. We are finalizing these ORVR requirements for MDPVs, which must be grouped with HLDTs for purposes of phased-in to the ORVR requirements.

For those manufacturers electing option 2, OBD is required when the vehicle family is covered under these new requirements (*i.e.,* 2004 or 2005 depending on when certification occurs). For ORVR, the situation is similar. The phase-in is 40 percent of any 2004 certifications which occur four years after this rule is promulgated, 80 percent in 2005, and 100 percent in 2006. As before, the vehicles covered by these phase-ins must be combined with those in the LDT3/4 phase-in for purposes of calculating compliance.

We are finalizing Cold CO and Certification Short Test requirements for Tier 2 MDPVs. However, we are not finalizing SFTP standards for MDPVs in today's rulemaking. Currently, SFTP standards do not apply to any vehicles above 8,500 pounds GVWR, including those in the California LEV I and LEV II programs. We are concerned, therefore, that finalizing SFTP requirements in today's rulemaking would prevent manufacturers from carrying over vehicle models during the phase-in years of the program. We are currently contemplating a new SFTP rulemaking which would consider ''Tier 2'' SFTP standards for all vehicles, including MDPVs. California is also interested in developing more stringent SFTP standards within the context of their LEV II program and we are coordinating with California on these new SFTP standards.

Sustained Severe Use; In-Use Testing of MDPVs

While we are confident that MDPVs can comply in-use with the standards we are finalizing, manufacturers are concerned about in-use liability for MDPVs that are in sustained severe-use. In our in-use emission testing program, we generally screen vehicles for proper maintenance and use and delete vehicles that we believe may have been misused or malmaintained. Also, in the regulations for manufacturer in-use testing, we permit manufacturers to delete vehicles from samples if they have been used for ''severe duty (trailer towing for passenger cars, snow plowing, racing)'', and we provide that vehicles may be deleted for other reasons upon EPA approval.

We recognize that MDPVs will be marketed and used for carrying many passengers, carrying heavy loads and trailer towing. While it is not our intention to exempt vehicles from in-use liability that have been used for their intended purposes, we understand that some MDPVs may be subject to sustained severe service applications, such as frequent overloading or frequent towing beyond manufacturer's advertised capacity and could not be considered to be representative of properly maintained and used vehicles. Furthermore, we would not necessarily consider to be representative MDPVs which are routinely or regularly used in heavy-load hauling application or towing even within the manufacturers limits. Thus, for example, an SUV MDPV used on a daily basis to haul a work crew and tow equipment to a distant work site may not be representative while the same SUV used to haul the family and tow a boat to the lake on weekend excursions would be representative. MDPVs in sustained severe operations should not be included in manufacturer or EPA in-use test programs, while those that see less frequent severe operation should be included.

[75] As with HLDTs, the California OBDII compliance option is available for MDPVs.

[76] For Tier 2 MDPVs, evaporative standards will be 1.4 g/test for the 3 day diurnal+hot soak test and 1.75 g/test for the supplemental 2 day diurnal+hot soak test.

[77] ORVR requirements are phased in for HLDTs, at 40/80/100 percent in 2004–2006 (see 40 CFR 86.1810–01 (k)).

C. Our Program for Controlling Gasoline Sulfur

As with our program for vehicles, the program we are establishing today for reducing sulfur levels in commercial gasoline will achieve the same large NO_X reductions that we projected for the proposed program. Here, too, the final program is very similar to our proposed program. Adjustments we have made to the proposed program will smooth the refining industry's transition to the low-sulfur requirements and encourage earlier introduction of cleaner fuel.

With today's action, we are requiring substantial reductions in gasoline sulfur levels nationwide. As we explained in Section IV.A, because sulfur significantly inhibits the ability of automotive catalysts to control emissions, we had to consider sulfur's impact in setting the Tier 2 standards. We knew at the time of proposal that newer catalysts were more sensitive to sulfur than older technologies, and projected that Tier 2 catalysts would be as or even more sensitive than those used in today's NLEV vehicles. Furthermore, we believed that the sulfur build-up on Tier 2 catalysts may be irreversible. Since the proposal, additional data we've collected have confirmed and strengthened our concerns. It now appears that the catalysts expected to be used in Tier 2 vehicles will be even more sensitive to sulfur than we originally estimated, and that this sulfur impact will be approximately 45 percent irreversible under typical driving conditions. Thus, the gasoline sulfur standards we finalize today will enable the stringent tailpipe emission standards we're implementing for Tier 2 vehicles and will help to ensure that these low emission levels will be realized throughout the life of the vehicle. Furthermore, since vehicles already on the road, including NLEV vehicles, are in many cases quite sensitive to sulfur, gasoline sulfur control will also help to reduce emissions of pollutants that endanger public health and welfare from these vehicles.

In developing this gasoline sulfur control program, we gave substantial consideration to the ability of the refining industry to meet these requirements. We proposed a set of standards applying to refiners and to individual refineries combined with a sulfur averaging, banking, and trading (ABT) program intended to provide flexibility in meeting the standards. We concluded that our proposal was reasonable and cost-effective based on our projections regarding the number of refineries that would (1) need to reduce sulfur levels each year as the standards tightened, (2) need sulfur ABT credits to meet the 30 ppm refinery average standard in 2004 and/or 2005 to defer installation of desulfurization equipment, and (3) install desulfurization equipment prior to 2004, generating the needed sulfur credits. This analysis formed our picture of the industry's investment stream—a year-by-year estimate of how many refineries would be constructing new equipment and what technologies these refineries would choose. We assumed that any investments would be in the new, lower cost technologies, and that these technologies would be available and adequately demonstrated to allow refiners to select them as early as the year 2000 to begin operation (and thus, credit generation) as early as 2002. Based on these assumptions, our analysis showed that sufficient credits would be generated before 2004 to enable a number of refineries to delay construction and use credits to meet the 30 ppm standard in 2004, and in some cases, even in 2005. Overall, we believed our analysis represented a reasonable and balanced rate of investment by the industry over a several year time period.

In response to our proposal, we received many comments which raised concerns about the feasibility of our program. Some comments suggested that our proposed declining cap (300 ppm cap for 2004 and a reduced cap of 180 ppm for 2005) could be an additional and burdensome expense for most refiners to meet. Specifically, these commenters believed that the declining cap would be more constraining than compliance with the corporate average or even the refinery average standards (as long as the ABT program produced sufficient credits). Because refiners probably would not make multiple investments in such a short time, the 180 ppm cap could force some refiners to install the equipment needed to get to the 80 ppm cap earlier than otherwise needed. The commenters argued that this would force all of the industry's investments into the first years of the program rather than allowing for a smoother transition over several years as we had originally envisioned. Many comments also suggested that since there have not been long-term commercial demonstrations of the newer gasoline desulfurization technologies, refiners would not consider these technologies to be viable and, if faced with our proposed 30 ppm standard in 2004, may select the more traditional, higher cost sulfur reduction processes. Some of these commenters suggested that we should delay the 30 ppm standard, and recommended a range of suggested deadlines (2005–2007).

We also received many comments which suggested that the ABT program restricted the generation of credits, and provided no certainty that credits would be generated prior to 2004. Commenters stated that two features in particular—the delay in establishing each refinery's sulfur baseline due to 1997–98 data review and the strict 150 ppm ''trigger'' for generating credits—caused them to question whether adequate sulfur credits would be available. If credits could not be guaranteed early enough to forestall investment decisions, refiners would be forced to begin construction earlier than we had projected. Under such a scenario, the costs of the program would be substantially greater, and many commenters suggested that, regardless of cost, it would be impossible for the entire industry to meet the deadline (due to limitations on engineering design and construction resources as well as the time required to obtain permits).

Finally, we received many comments which argued that not all refineries would be able to concurrently comply with the proposed standards in the time period provided, given the competition for engineering resources and the time needed for construction of desulfurization equipment. These comments focused specifically on small refineries (owned by both small and large corporations) and refineries that were relatively isolated geographically (such as many refineries in the Rocky Mountain region) which had little access to other sources of gasoline should they have difficulty in complying with our requirements. The commenters generally argued that these refiners needed more time than the rest of the industry to meet our proposed standards. Some of the commenters also argued that the standards applicable to many of these refiners should be less stringent because of their belief that the environmental needs of the states where these refineries were located and/or marketed gasoline were small relative to the needs of other states. Suggestions for temporary and permanent regional programs which provided less stringent control in the Western half of the country were included with many of these comments.

Based on what we've learned from the comments received and additional information we've gathered, we have revised our analysis of when refiners will invest in desulfurization equipment and how the sulfur ABT program can best help to distribute these investments over several years while maintaining the original goals of the program. The following is a brief summary of our new analysis; a more complete explanation of our assumptions can be found in the RIA.

About 15 percent of current domestic gasoline production already meets the gasoline sulfur standard, or can do so with very little additional capital investment, and at most a small increase in operating cost. The remainder of the industry—the majority of U.S. refineries—will have to install at least one desulfurization processing unit to lower gasoline sulfur to the required levels. Furthermore, many of these refineries will need to make changes to their operations in advance of 2004 simply to comply with the 300 ppm cap standard, even if they can obtain sufficient ABT credits to delay compliance with the 30 ppm refinery average standard. Refiners facing this situation will need to make their decisions within a year or at most two from today's action. From the comments we received and discussions we've had with refiners and technology vendors, we acknowledge that some of the newer, more promising processes may not be in operation for sufficient time to gain valuable operating experience (one to two years of operation) until 2002 or later. Hence, we now believe that some refiners may choose from one of the traditional, commercially-demonstrated desulfurization processes, even though these technologies may be more costly, to meet our standards.

However, we continue to believe that the majority of refiners will delay construction (taking advantage of the sulfur ABT program and perhaps making modest operational changes in the interim) and will have a wide range of technological options to choose from, at reduced capital investment and operating costs compared to the more traditional approaches. Examples of these technologies are CDHydro and CDHDS (licensed by the company CDTECH), Octgain 125 and Octgain 220 (licensed by Mobil Oil), S Zorb (licensed by Phillips), IRVAD (licensed by Black & Veatch), and others. These technologies generally use conventional refining processes combined in new ways, with improved catalysts and other design changes that minimize the undesirable impacts (such as a substantial loss in octane) and maximize the effectiveness of the desulfurization approach. Since these processes provide less costly ways to reduce gasoline sulfur, we have based our economic assessment (summarized in Section IV.D. below) on the presumption that the majority of refiners will elect to use one of these processes to meet the 30 ppm standard, even if it requires delaying compliance (through the purchase of ABT program credits) until 2006.

However, after considering the data available to us about current refinery sulfur levels and the ability of refiners to reduce sulfur levels to meet the standards, we have made several modest changes to the program. These changes will not affect the environmental performance of the proposed program. We agree that the declining cap had the unintended consequence of forcing investments earlier than desired for an orderly transition to the 80 ppm cap. Thus, we have changed the program from the proposal, establishing a 300 ppm per-gallon cap in 2004 and 2005. We do not expect this change to have an impact on the environment (or on the Tier 2 vehicles that will be introduced in this interim period) since average sulfur levels will be required to decrease due to the declining corporate average, which begins in 2004. We kept the corporate average standards proposed for 2004 and 2005, but are permitting inter-company trading around these standards. We believe this change will provide further flexibility to the industry in allowing some refineries to delay construction and encourage others to move forward sooner. Having now concluded that many refiners would benefit from an additional year to evaluate and consider the technological options before having to install equipment to meet the 30 ppm standard, we have delayed this standard for one year. In acknowledgment that some areas of the country have less urgent environmental needs for the emissions reductions that this program will bring, and that many of the refiners that supply gasoline to these areas are ones which will have the most difficulty in meeting the standards, we have finalized a geographic phase-in of the standards to complement the temporal phase-in applicable to the rest of the industry. Thus, in certain states in the West, refiners have the option of meeting interim standards while delaying compliance with the 30 ppm average until 2007. Finally, we have made changes to the sulfur baseline requirements and the credit trigger to help ensure that the sulfur ABT program functions as we originally envisioned it would.

These changes will encourage reductions in gasoline sulfur levels beginning as early as 2000, while providing enough flexibility to require the majority of refineries to meet a 30 ppm average sulfur standard by 2006. Overall, the industry will be able to spread the needed investments over several years rather than having to comply as a whole by 2004, and will be able to maximize the use of the most efficient and lowest cost technologies. While we have provided additional flexibility for the industry, we have done so without compromising the environmental benefits of the program in 2004 and beyond when compared to our proposal.

The following sections summarize the requirements for gasoline refiners and importers, including our geographic phase-in requirements; special provisions for small refiners, and our plans to facilitate the construction permitting process to enable refiners to install gasoline desulfurization technology in a timely manner. Section VI provides additional information about the compliance and enforcement provisions that will accompany these requirements. More detailed information in support of the conclusions presented here is found in the RIA and in our RTC document.

1. Gasoline Sulfur Standards for Refiners and Importers

This section explains who must comply with the gasoline sulfur control requirements, the standards and deadlines for compliance, and how refiners can use the ABT program to meet the standards. The last section discusses how individual state gasoline sulfur programs are affected by today's action. Standards specific to eligible small refiners are presented in Section IV.C.2.

a. Standards and Deadlines that Refiners/Importers Must Meet

Anyone who produces gasoline for sale in the U.S. must comply with these regulations. This includes anyone meeting our definition of a refiner (including blenders, in most instances) and importers. Certain refiners may qualify for temporarily less stringent standards and deadlines because these companies either (1) market gasoline in the temporary geographic phase-in area (explained in section b below), or (2) they qualify under our definition of small refiner (explained in section IV.C.2 below). Foreign refiners may also have separate requirements, if they qualify as small refiners.

These requirements will apply to all gasoline sold in the U.S., including Alaska, Hawaii, Puerto Rico, American Samoa, the Virgin Islands, Guam, and the Northern Mariana Islands.[78] This national approach is appropriate, based on our conclusions that vehicle emissions must be reduced nationwide to adequately protect public health and the environment and Tier 2 vehicles require protection from the harmful impacts of gasoline sulfur regardless of where they are operated.

Table IV.C.–1. summarizes the standards for gasoline refiners and importers. There are three standards which refiners and importers must meet. In 2004 and beyond, every gallon of gasoline produced is limited by a per-gallon maximum or ''cap.'' The cap standard becomes effective January 1, 2004 (and January 1 of subsequent years as the cap standard changes). Also, in 2004 and 2005, each refiner must meet an annual-average standard for its entire corporate gasoline pool. Finally, each individual refinery is subject to a refinery average standard, beginning in 2005. Refineries that do not take advantage of the sulfur ABT program will have actual sulfur levels averaging 30 ppm beginning in 2005. Additional details about the requirements for meeting these standards is found in the following sections.

TABLE IV.C.–1.—GASOLINE SULFUR STANDARDS FOR REFINERS, IMPORTERS, AND INDIVIDUAL REFINERIES

[Excluding Small Refiners and GPA Gasoline]

Compliance as of—	2004 [a]	2005	2006+
Refinery Average, ppm [b]	....	30	30
Corporate Pool Average, ppm [c]	120	90	....
Per-Gallon Cap,[d] ppm	300	300	80

NOTES:

[a] We project that the pool averages will actually be below 120 ppm in 2004. For a discussion of how the program gets early sulfur reductions before 2004, see section IV.C.1.c.

[b] The refinery average standard can be met through the use of sulfur credits or allotments from the sulfur ABT program, as long as the applicable corporate pool average and per-gallon caps are not exceeded, as explained in Section IV.C.1.c.viii.

[c] The corporate pool average standard can be met through the use of corporate allotments obtained from other refiners, if necessary, as explained in Section IV.C.1.c.iii.

[d] In 2004, exceedances up to 50 ppm beyond the 300 ppm cap are allowed. However, in 2005, the cap for all batches will be reduced by the magnitude of the exceedance.

i. What Are the Per-Gallon Caps on Gasoline Sulfur Levels in 2004 and Beyond?

To reduce the potential for permanent damage to the emission controls of Tier 2 vehicles and later NLEV vehicles, we are implementing caps on the sulfur content of every batch of gasoline produced or imported into the country beginning in 2004. As shown in Table IV.C.–1, a cap of 300 ppm is first implemented in 2004. This cap remains in 2005. In 2006 and beyond, the cap is lowered to 80 ppm. These caps apply at the refinery gate. Sulfur caps are also applied to gasoline downstream of the refinery; see Section VI for additional discussion of downstream cap standards. These downstream caps will facilitate compliance and enforcement without changing the way the distribution system currently functions.

Several commenters suggested the rule should also include a provision to address the occasions when refiners must temporarily take processing units out of operation so that planned, recurring maintenance can be performed, commonly termed ''turnarounds,'' or if processing units are unexpectedly taken out of operation due to accident or malfunction, commonly termed ''upsets.'' These commenters expressed particular concern that the gasoline produced at a refinery may not meet the sulfur cap standards when a refinery's desulfurization unit is not operating. These commenters contended that the regulations should allow refiners to produce gasoline that exceeds the cap standard for a limited time where the excess sulfur is due to a turnaround or upset. However, they also suggested that the refiner should be required to meet the refinery average standard with the high sulfur gasoline included in its average calculation in order to create an incentive for refiners to limit the volume and sulfur content of high sulfur gasoline.

Today's rule does not grant relief to refiners because of turnarounds or upsets. While the concern raised by the commenters is reasonable, the solution they suggested would nevertheless result in distribution of gasoline exceeding the cap standards. The cap standards are necessary because gasoline with higher sulfur levels will significantly harm or destroy the emission controls used in Tier 2 vehicles.

We believe there are strategies refiners can use to mitigate or eliminate the difficulties associated with turnarounds and upsets. For example, some refiners schedule turnarounds for a number of refinery processing units at the same time when the refinery largely stops producing gasoline, thereby avoiding the need to produce any high sulfur gasoline. In other situations it may be possible for a refiner to store high sulfur products until the desulfurization unit is operating or to transfer high sulfur products to a neighboring refinery for desulfurization.

We commit to continue evaluating the turnaround issue especially as new technologies are introduced. Based on our evaluation, if a problem is evident and if an appropriate solution can be devised, we will act at that time.

In 2004, if any batch of gasoline[79] exceeds the 300 ppm cap (up to 350 ppm), then the cap for all batches produced by the refinery in 2005 will be reduced by the magnitude of the exceedance. For example, if any given batch of gasoline has a cap of 325 ppm (a 25 ppm exceedance) in 2004, then the cap becomes 275 ppm for all batches of gasoline produced by that refinery in 2005. However, at no time in 2004 can a batch be higher than 350 ppm sulfur. We have made this adjustment to accommodate those refiners who would have to invest in control technologies to meet the 300 ppm cap in 2004 (perhaps at a higher cost than they would incur if they could delay the investment a year) but could otherwise meet a slightly higher cap through operational changes which would not require new equipment.

[78] Gasoline sold in California is exempt from meeting these Federal standards, due to our belief that California gasoline already meets or exceeds these requirements. See Section VI for more discussion on this issue.

[79] Including gasoline produced for use in the geographic phase-in area and small refiner gasoline.

ii. What Standards Must Refiners/Importers Meet on a Corporate Average Basis?

Refiners and importers must meet annual-average, volume-weighted sulfur standards for their entire corporate gasoline pool in 2004 and 2005. In 2004, this standard is 120 ppm; in 2005, it is reduced to 90 ppm. In 2006 and beyond, there will no longer be a corporate pool average standard, since each refinery and importer will be held to its own single refinery average standard, as discussed in the next section.

These standards represent the maximum allowable sulfur levels, on an annual average basis, for each refiner/importer, volume-weighted across all refineries owned and operated by that refiner (or all gasoline imported by the importer in the calendar year), rather than at each individual refinery or by each batch of gasoline. Thus, a refiner's gasoline may exceed the average standard of 120 ppm at one refinery, if sufficient gasoline below that standard is produced at its other refinery(ies), such that its corporate, volume-weighted average sulfur level does not exceed 120 ppm. Alternatively, allotments may be used to meet this requirement. This requirement does not apply to small entities or to corporations that do not have to meet the pool average standard in the GPA program. For compliance with this corporate averaging requirement, as well as with the other requirements of this subpart, we consider a parent corporation owning wholly-owned subsidiaries that also own refineries to be the refiner of these facilities. Thus, the parent corporation must comply with refiner corporate average requirements. In its compliance calculations, the refiner must include the gasoline produced at the refineries it owns, plus the gasoline produced at the refineries owned by its wholly-owned subsidiaries.

For purposes of compliance, we proposed that a joint venture, in which two or more refiners collectively own and operate one or more refineries, be treated as a separate refining corporation under the gasoline sulfur requirements. Hence, a refinery owned by a joint venture would have been included in the corporate pool calculations of the joint venture, and could not have been included in calculations with other refineries solely owned by one of the parties to the joint venture. Based on comments we received on this issue which argued that a company with majority ownership in the joint venture should be allowed to count the jointly held refinery in its corporate average, we have revised our treatment of refineries owned by joint ventures. Each joint venture must separately meet the corporate pool average standard, whether the joint venture owns one or multiple refineries. If a joint venture fails to meet the corporate pool average standard, then each partner in the joint venture is jointly and severally liable for the violation. However, if one partner to a joint venture refinery includes the joint venture refinery in its corporate pool, and that corporate pool meets the corporate pool average standard, then the joint venture will be considered by EPA to be in compliance (if the joint venture owns only the one refinery). If the joint venture owns multiple refineries and only one or some of the refineries is included in the corporate pool calculations of one partner, compliance by the joint venture with the corporate pool average standard will be judged based on the average sulfur levels of the remaining refinery(ies) owned by the joint venture.

In meeting the corporate average stds in 2004 and 2005, refiners and importers may use allotments as discussed in IV.C.1.c below.

iii. What Standards Must be Met by Individual Refineries/Importers?

Beginning in 2005, every refinery must meet an average standard of 30 ppm sulfur at the refinery gate on an annual, volume-weighted basis. Similarly, every importer must meet the 30 ppm average standard beginning in 2005. (These requirements do not apply to small entities or to GPA gasoline). In meeting this standard, individual refineries and importers may use credits generated or purchased under the provisions of the sulfur ABT program discussed below in Section IV.C.1.c, and/or, in 2005 (only), sulfur allotments (as described in the previous section) obtained from a refiner who has excess allotments to sell, if they are unable to comply based on their actual gasoline sulfur levels. Hence, the actual average sulfur levels for gasoline produced at some refineries can be higher than 30 ppm in 2005, but only if refiners use (1) credits generated from cleaner gasoline produced early and/or (2) allotments generated by a refiner which produces gasoline averaging, on a corporate basis, lower than 90 ppm in 2005. However, the corporate pool average standards and per-gallon caps will limit the degree to which gasoline can exceed 30 ppm on average.

We allow refiners to use either sulfur allotments or ABT credits to meet the 30 ppm standard in 2005 for several reasons. First, this is an environmentally neutral approach because the national pool in 2005 will still average no greater than 90 ppm, since every refiner must meet the corporate average standard before applying allotments to the compliance of any refineries with the 30 ppm standard. Second, it provides refiners who have excess allotments in 2005 an additional market for those allotments, thus giving refiners an incentive to exceed the 90 ppm corporate average standard in 2005. In either case, the reductions will have occurred and thus the allotments and credits have very similar purposes and thus should be interchangeable.

In 2006 and beyond, the 30 ppm refinery average standard continues to be a requirement for every refinery or importer. The sulfur credits generated in the ABT program may be used by refineries or importers to comply with this requirement. However, because of the 80 ppm cap in these years, we expect that the majority of refiners/importers will average 30 ppm, although some individual refineries/importers could average slightly more or less (if the refineries/importers bank, sell, or purchase credits to meet this standard, as explained in the ABT discussion below). Furthermore, the majority of credits will expire at the end of 2006.

b. Standards and Deadlines for Refiners/Importers Which Provide Gasoline to the Geographic Phase-In Area (GPA)

As indicated above, certain refiners may qualify for temporarily less stringent standards and deadlines for some or all of their gasoline because these companies either (1) produce gasoline to be sold in the temporary geographic phase-in area (GPA) or (2) qualify under our definition of small refiner. In this section, we explain the geographic phase-in area of our program and the interim standards and deadlines for compliance in that area. The provisions that apply to qualifying small refiners are described in section IV.C.2., below.

i. Justification for Our Geographic Phase-In Approach

In addition to phasing in our national gasoline sulfur program temporally from 2004–2006, we are phasing in our program geographically. In response to our proposal, we received many comments from the refining industry regarding timely implementation of our proposed gasoline sulfur program. Commenters argued that not all refineries would be able to concurrently comply with the proposed standards in the time period provided, given the competition for engineering resources and the time needed for construction of desulfurization equipment. In consideration of these comments, we have made some modifications to enhance the timing of our program without compromising the environmental benefits we expected from our proposal.

As part of our assessment we also examined other phase-in approaches which might enhance the orderly introduction of refining technology without jeopardizing the environmental benefits of our program. As a result of this assessment, we have concluded that many states in the Great Plains and Rocky Mountain areas of the United States have a somewhat less urgent environmental need for ozone precursor reductions in the near term. Moreover, their gasoline supply is dominated by that produced by small capacity, geographically-isolated refineries located therein. As a general rule, refineries in this area will have the most difficult time of all refineries nationwide in competing for the vendor, supply, engineering, and construction resources needed to modify their refineries to comply with the standards. Based on 1998 Department of Energy data, over 80 percent of the gasoline sold in this area is produced by the relatively small refineries located within the region.[80] Similarly, Alaska faces a less urgent environmental need for reductions in ozone precursors and has refineries which are challenged and geographically isolated.

A more orderly and cost-efficient phase-in of the 30 ppm standard could be achieved if all gasoline sold in this area was subject to somewhat less stringent standards than those in the rest of the country for a short time. This approach will allow the refineries producing gasoline for use in this area more compliance flexibility, more time to install and prove out the equipment needed for compliance, and thus a greater opportunity to reduce their overall costs. As described below, this approach results in only a minimal loss in emission reduction benefits. By stretching out demand for design, engineering, construction and other related services during the 2000–06 period, these provisions should also help to reduce the overall costs of the gasoline sulfur program.

The remainder of this section is divided into two parts. The first describes the rationale for development of this approach and how we identified the appropriate area, and the second provides a description of the requirements for refiners and importers that produce fuel for sale in the area.

ii. What Is the Geographic Phase-in Area (GPA) and How Was it Established?

As we considered the geographic phase-in approach, we aimed to minimize the environmental losses which could occur from exposing Tier 2, NLEV, (and other) vehicles to higher gasoline sulfur levels when the gasoline sulfur standards are being phased in nationwide. We used two criteria to develop and evaluate this approach: (1) relative environmental need and (2) the ability of U.S. refiners and the distribution system to provide compliant gasoline.

The states we have identified for the GPA are shown in Figure IV.C–1.[81]

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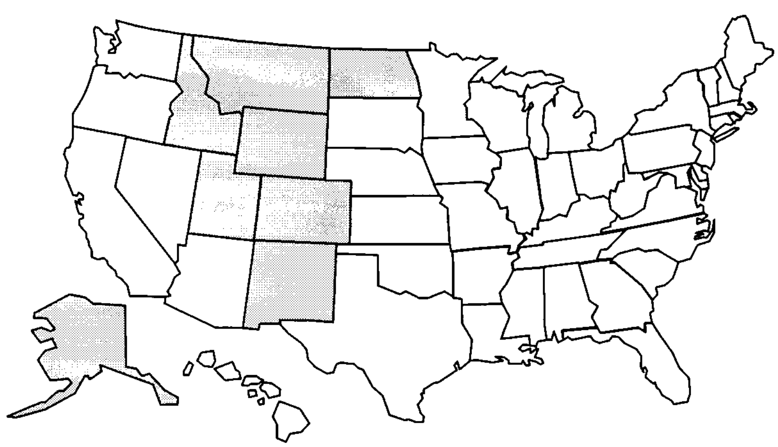
Figure IV.C.-1:

Geographic Phase-In Area (GPA)



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The first and primary criterion we considered in defining this area was environmental need. In defining the GPA, we identified those states that have somewhat less urgent environmental need in the near term for reductions in ozone precursors and whose emissions are less important in terms of ozone transport concerns. This area includes some states that are located in the Great Plains and the Rocky Mountains, as well as Alaska. Most states within the Rocky Mountains and Great Plains do not have a compliance problem with the 1-hour ozone standard in the near term, although they do have concerns in terms of maintaining compliance with the particulate matter standard. However, there are two states (Arizona and Nevada) in the Rocky Mountain vicinity that do have ozone air quality concerns. These states have instituted local fuel quality programs (in Phoenix, AZ and Las Vegas, NV) to reduce ozone precursor emissions. In addition, as shown in Table III.C–2, Arizona and Nevada are projected to have concerns with PM10 compliance in the future. Given these factors, we excluded them

[80] Much of this gasoline is produced by small volume refineries that are not owned by small businesses, and are therefore not afforded the flexibility of the small refiner provisions described in Section IV.C.2.

[81] Alaska, Colorado, Idaho, Montana, New Mexico, North Dakota, Utah, and Wyoming

from the phase-in area and its temporarily less stringent standards except as described below in Section IV.C.1.b.vii for counties and tribal lands in adjacent states.

We also defined the phase-in area based on the relative difficulty of producing or obtaining complying gasoline. The refining industry in the GPA is dominated by relatively low capacity, geographically-isolated refineries many of which are owned by independent companies. Such refineries face special challenges in complying with the requirements of the national program by 2004 because their crude capacity, corporate size, and location make it difficult for them to compete for the design, engineering, and construction resources needed to comply by 2004.

Furthermore, an assessment of 1998 gasoline production and use data and information on the products pipeline system shows that states in the GPA and portions of several adjoining states are solely or predominantly dependent on gasoline produced by these refineries and have limited or no access to gasoline from other parts of the country. Based on this analysis, we concluded that several states and portions of other states meeting our first criterion (less urgent environmental need for ozone precursor emission reductions) also face the likelihood of a supply shortage of low sulfur gasoline. Providing low sulfur gasoline to these states and adjoining areas is expected to be more difficult and costly in the near term. Section IV.C.1.b.vii below, discusses how the adjoining areas (counties/tribal lands) will be identified.

Thus, we believe it is appropriate to phase in the 30 ppm average, 80 ppm cap standards in these areas by allowing an additional year compared to the rest of the country, rather than delaying implementation of the standards nationwide to accommodate these states. Under this approach, the areas with the most urgent need for the ozone reduction benefits associated with low sulfur gasoline will realize them as soon as is feasible, and other areas will experience them shortly thereafter.

On the other hand, much of the area in the adjoining states has significant pipeline, rail, barge, and truck access to gasoline which will be capable of meeting the standards in Table IV.C–1 beginning in 2004. Even if these states have less environmental need in the near term, there are health benefits (particulate and air toxic emission reductions) as well as performance benefits for vehicle emission control systems (including avoidable irreversible sulfur effects) which need not be foregone. Therefore, we concluded that since it will not be more difficult to send gasoline to these adjoining areas through the distribution system, the significant environmental benefits of requiring low sulfur gasoline as early as is feasible justifies excluding these states from the GPA.

Some might argue that there are other states which should be considered under this program. However, based on our criteria of environmental need (including ozone transport and irreversibility concerns) challenged refineries, and limited access to complying gasoline we could identify no other states or territories which to include.

iii. Standards/Deadlines for Gasoline Sold in the Geographic Phase-in Area

While the states in the GPA may have less of an environmental need for ozone precursor reductions in the near term, there are significant environmental reasons to make the program as stringent as possible, still enabling a smooth transition to low sulfur gasoline nationwide. Toward that end, we are establishing the following requirements for gasoline sold in the GPA, which we view as the appropriate balance between these two factors.

The GPA provision covers all gasoline produced or imported for use in the GPA, whether refined there or brought in by pipeline, truck, rail, etc.[82] Foreign refiners are involved in this program through the importers, who are, in fact, the regulated entities. Refineries and importers must meet a 150 ppm average and a 300 ppm cap for all gasoline produced or imported for the GPA under this program beginning January 1, 2004. However, if a refinery's/importer's 1997–98 average sulfur level is less than 150 ppm, then that refinery's/importers gasoline has a standard of its baseline plus 30 ppm but in no case greater than 150 ppm. For example, a refinery with a baseline of 100 ppm would have a sulfur standard of 130 ppm for its GPA gasoline, a refinery with a baseline sulfur level of 140 ppm would have a standard of 150 ppm for its GPA gasoline, and a refinery with a baseline of 200 ppm would have a standard of 150 ppm for its GPA gasoline. Furthermore, if under the ABT provisions discussed below and in section IV.C.1.c, a refinery/importer generates credits (in 2000–2003) and/or allotments (in 2003) by dropping its refinery/imported gasoline average below 150 ppm then the baseline for that refinery is set at the new level and the standard becomes baseline plus 30 ppm but not greater than 150 ppm. This is to ensure that refineries and importers who already are lower than the 150 ppm standard on average maintain current sulfur levels. The 30 ppm factor is intended to allow some flexibility for refineries and importers whose 1997 and 1998 levels are an aberration from normal operations or who face changes in crude slates in future years.

Corporate pool average standards apply in the national gasoline sulfur program for calendar years 2004 and 2005. Most refiners/importers producing gasoline for use in the GPA market the majority of their gasoline outside of the GPA where they compete with many other refineries. Since the phase-in of the national program expects compliance with the 120/90 ppm corporate pool average standards in 2004 and 2005, we are requiring that refiners/importers who market the majority (greater than 50 percent of production volume) of their gasoline outside of the GPA to account for the sulfur levels of their GPA gasoline in their calculation for compliance with the corporate pool average standards.

To provide additional flexibility during this phase-in, refiners may use sulfur ABT credits and allotments (as explained in IV.C.1.c) to meet these standards. Refineries producing GPA gasoline can generate credits beginning in 2000 under the provisions of the national program (described in section IV.C.1.c). Also, refineries/importers marketing gasoline in the GPA may through extraordinary measures be able to generate credits in 2004–2006. To qualify they must achieve levels below 150 ppm or their more stringent baseline levels as discussed above whichever is less. Under these circumstances, these refineries/ importers can earn credits for the GPA gasoline they produce during 2004–06. Credits generated under the GPA program are fully fungible with national credits and are subject to the same regulatory requirements.

The national program includes provisions which permit refiners/ importers to generate allotments for use in 2004 and 2005. Refiners and importers marketing gasoline in the GPA may only generate sulfur allotments in 2004 or 2005 if their corporate average sulfur level meets the corporate pool average standards for each year (as indicated in Table IV.C.1), including gasoline produced for the GPA, if applicable. Refiners not compelled to meet the corporate pool

[82] As discussed below, refiners can supply gasoline not designated as GPA gasoline to the GPA, provided it meets the standards in Table IV.C.–2. Also, the GPA standards do not apply to gasoline produced by small refiners that is used in the GPA.

average standards under the GPA may not generate allotments.

The temporary provisions for the GPA apply for three years, 2004 through 2006. Since the low sulfur standards for the rest of the country require compliance with a 30 ppm refinery average standard and an 80 ppm gallon cap in 2006, the geographic phase-in provides an additional year to reach those standards. This extra year and the somewhat less stringent standards during the phase-in will provide the refining industry the opportunity for more orderly transition to the 30/80 ppm standards by 2007.

Requirements for gasoline sold in the GPA are summarized in Table IV.C.–2, below. Gasoline produced by refiners subject to the small refiner standards described in Section IV.C.2. of this notice is not subject to the provision of the geographic phase-in, since the small refiner provisions apply to eligible refiners regardless of geographic location. Gasoline produced by such refiners can be sold nationwide, including in the GPA.

TABLE IV.C.–2.—GASOLINE SULFUR STANDARDS FOR THE GEOGRAPHIC PHASE-IN AREA

[Excludes Small Refiners]

Compliance as of—	2004	2005	2006
Refinery GPA Gasoline Average [a], ppm	150	150	150.
Corporate Pool Average [b], ppm	120	90	Not Applicable.
Per-Gallon Cap [c], ppm	300	300	300.

Notes:

[a] The refinery average standard for GPA gasoline is the more stringent of: 150 ppm; the refinery 1997–1998 baseline plus 30 ppm; or the sulfur level from which early credits were generated plus 30 ppm. Refiners can use credits or allotments to meet the average.

[b] Applies only to refiners/importers which sell >50% of their gasoline outside the GPA.

[c] As discussed above, in 2004 both GPA and Non-GPA gasoline may have a sulfur content as high as 350 in which case the refinery or importer becomes subject to a correspondingly more stringent cap standard in 2005.

iv. What Are the Per-Gallon Caps on Gasoline Sulfur Levels in the Phase-in Area?

The sulfur level caps for gasoline sold in the phase-in area and the rest of the nation are the same in 2004 and 2005, but in 2006 the cap remains at 300 ppm in this area while it declines to 80 ppm for the rest of the country. To assure that compliance at the refinery gate is correct regardless of where the gasoline is ultimately sold, as gasoline intended for the GPA moves in the distribution system to or through the geographic area it must be identified as phase-in area gasoline in product transfer documents and must remain segregated from gasoline intended for use outside this area. In addition, use of phase-in area gasoline is prohibited outside the GPA, but the converse is allowed, i.e., gasoline designated for use outside the GPA can be used in this area. For all three years, refiners and importers must meet the requirements described in Tables IV–C.1 and IV–C.2, as applicable, and therefore must maintain refinery or import records as applicable as to where a gasoline batch is sold.[83]

We recognize that this higher standard/cap for one year could create the incentive for those not marketing gasoline in the GPA today to seek a market to sell higher sulfur gasoline and for others to seek to increase market share. While this is indeed allowable under our program and is perhaps to be anticipated in a free market system, in all likelihood the incentives are small. Such refiners/importers would still have to meet the 150 ppm average and would perhaps face increased shipping and marketing costs. Nonetheless, we plan to monitor market developments to assess whether such a provision creates significant market shifts or the potential for increases in average sulfur levels in the GPA gasoline.

[83] These segregation and designation requirements do not apply to gasoline produced by refiners subject to the small refiner standards described in Section IV.C.2. This is because small refiner gasoline can be sold anywhere in the country, and is not subject to different standards depending on where it is sold.

v. How Do Refiners/Importers Account for GPA Fuel in Their Corporate Average Calculations?

Those refiners or importers that sell all of their gasoline to the GPA (*i.e.,* they produce no fuel for use outside the GPA), regardless of whether they are located within or outside of the area, have refinery/importer standards that are equal to the least of 1) 150 ppm, 2) the refinery's or importer's 1997–98 average sulfur level plus 30 ppm or 3) the refinery's or importer's lowest actual annual sulfur level plus 30 ppm in any year 2000–2003 if credits are generated. Because the refiners produce *all* of their fuel for use in the GPA, they are exempt from the corporate average standards in Table IV.C–1.

Furthermore, any refiner/importer which certifies 50 percent or more of its gasoline production volume for sale as GPA gasoline in 2004 and 2005 is not required to meet the corporate pool average for that year for its entire gasoline pool. Not only would it be difficult to comply on average (if it were assumed that the GPA gasoline was 150 ppm and non-GPA gasoline was 30 ppm), but also it would undermine the achievement of the basic goal of a more orderly and efficient phase-in of low sulfur gasoline since the flexibility afforded by the GPA could be diminished.

Otherwise, those who produce less than 50 percent of their gasoline for the GPA (which is the majority of those refiners which market in both locations), must meet the corporate pool average standards in 2004 and 2005 for their entire gasoline pool. Thus, such refiners must compensate for the higher sulfur levels of their GPA gasoline by producing non-GPA gasoline that averages sufficiently less than 120 ppm in 2004 and 90 ppm in 2005 to ensure that their corporate average meets the corporate pool average standard for each year. Importers who provide less than 50 percent of their gasoline to the GPA must also include their GPA gasoline in their overall corporate pool average calculation. Alternatively, the refiner can use sulfur allotments to meet the corporate pool average standard for its total gasoline production, including gasoline sold inside and outside the phase-in area. Since most refiners which sell gasoline both in and outside the GPA sell the vast majority outside the GPA the additional flexibility provided for gasoline sold in the phase-in area should not significantly affect compliance with the corporate pool average standard for a refiner's nationwide production.

vi. How Do Refiners/Importers Apply for the Geographic Phase-in Area Standards?

As part of program administration, we are requiring that any refiner/importer expecting to sell gasoline in this area during the phase-in period (2004–2006) make application to EPA in writing by December 31, 2000. This application would provide the minimum information needed by EPA to characterize a refiner's/importer's participation, establish the applicable standards if the 1997–98 average is less than 150 ppm, and establish our enforcement program for refiners/ importers in this area for gasoline entering or leaving the area. Participation on the part of any refinery or importer is voluntary. At any time, a refiner/importer who previously opted into the GPA program may produce gasoline meeting the standards in Table IV.C–1 in the GPA, or may cease producing gasoline for the GPA (and produce gasoline meeting the standards in Table IV.C–1 solely outside of the GPA). Such a decision would affect the averages/caps which apply to the gasoline sold in the GPA. Gasoline sold in the GPA that is not designated as GPA gasoline is considered Non-GPA gasoline for purposes of compliance with the corporate pool average requirement and refinery average requirements.

vii. How Will EPA Establish the GPA in Adjacent States?

EPA is establishing a geographic phase-in area that encompasses eight states (MT, ND, ID WY, CO, UT, NM, AK). In addition, counties and tribal lands in states immediately adjacent to these which received a majority of their gasoline in calendar year 1999 from a refinery(ies) located within the GPA will be covered by the phase-in area provisions. The criteria to identify these additional counties and tribal areas are designed to identify areas whose gasoline distribution system is closely tied to the eight states such that they share the same characteristics of gasoline supply. Therefore, dispensing outlets (retail and private) in such areas will continue to have access to that gasoline in most cases. Distribution and production of gasoline in these additional areas will be subject to the same standards and requirements as gasoline in the eight states identified above.

At this time, EPA is not able to identify all the counties and tribal lands that would be included in the phase in area. In light of the air quality benefits of introducing low sulfur gasoline as quickly as possible, we want to ensure that the phase-in area is accurately identified and that including any areas outside these eight states will not have a significant adverse air quality impact on any counties or tribal lands that are included in the phase-in area. EPA will be working with interested stakeholders will to conduct an assessment to determine which counties/tribal lands within the immediately adjacent states meet the criteria as described in the regulatory text. EPA expects to complete action on this assessment by December 31, 2000. c. How Does the Sulfur Averaging, Banking, and Trading Program Work?

The sulfur ABT program provides flexibility to refiners by giving them more time to bring all of their refineries into compliance with the corporate averages in 2004 and 2005 as well as the 30 ppm individual refinery standard in 2005 and beyond. ABT will provide the opportunity for reduced costs by allowing the industry the flexibility to average sulfur levels among different refineries, between companies, and across time. With ABT, some refineries will be able to delay installation of desulfurization equipment, because other refineries will generate sulfur allotments and credits through early sulfur reductions. In this way, installation of desulfurization technology will be spread out over a longer period of time than would be the case without ABT. Since, with the banking provisions, reductions in annual average sulfur levels which occur as early as 2000 have a value during program implementation, the ABT program provides an incentive for technological innovation and the early implementation of refining technology.

The ABT program also provides the opportunity for meaningful emissions reductions in 2004 because it allows the Tier 2 standards to be implemented earlier than might otherwise have been possible (if the Tier 2 standards were delayed to provide the refining industry more time to comply), and because it provides direct environmental benefits even in the years before Tier 2 vehicles are introduced. One benefit is related to the effect of gasoline sulfur on exhaust emissions, as discussed in the Regulatory Impact Analysis. This benefit will result both from older vehicles on the road (Tier 0 and Tier 1 emission control technologies, which have some degree of sulfur sensitivity and will benefit from sulfur reductions which occur prior to implementation of the refiner and refinery standards summarized in Table IV.C–1) and from NLEV vehicles (which are more sensitive to sulfur than earlier technologies) which will continue to be sold while Tier 2 vehicles are phased-in. Another environmental benefit is the reduction in atmospheric sulfur loads as a direct result of reduced gasoline sulfur levels, leading to reduced emissions of sulfur-containing compounds from motor vehicles.

The following sections explain the requirements for participation in the sulfur ABT program for allotments and credits.

Sulfur Allotment Program

i. Generating Allotments Prior to 2004

To provide additional incentive for early sulfur reductions and to enhance the overall feasibility and cost effectiveness of the gasoline sulfur control program, we are implementing a sulfur allotment program. While few commenters supported the sulfur allotment concept in the NPRM, a number suggested that greater flexibility for compliance in the early years would be helpful. The program described below is in addition to the early sulfur credit program described elsewhere.

For 2003, refineries can generate sulfur allotments (in ppm-gallons) by producing gasoline containing less than 60 ppm sulfur on an annual-average basis. This 60 ppm "trigger" was chosen to reward refineries who demonstrate compliance using technology designed to meet the 30 ppm standard before 2005. Once this 60 ppm trigger is reached, allotments will be calculated based on the amount of reduction from 120 ppm.[84] However, these allotments may be discounted depending on the actual sulfur level. If a refinery fully demonstrates compliance by producing gasoline with an annual average sulfur level of 0 to 30 ppm, the allotments retain their full value—they are not discounted at all. For actual sulfur levels of 31–60 ppm, which are indicative of a partial demonstration of compliance with the ultimate low sulfur standard, the allotments are discounted 20 percent. For example, consider a refinery that has an average sulfur level of 50 ppm at the end of 2003. That refinery would have generated 56 sulfur allotments [(120 ppm − 50 ppm) × 0.8 × Volume (in gallons)] to be used or sold in 2004. If that same refinery instead produced fuel with an average sulfur level of 20 ppm at the end of 2003, then it would have generated 100 sulfur allotments [(120 ppm − 20 ppm) × volume (in gallons)] to be used or sold in 2004.

ii. Generating Allotments in 2004 and 2005

For 2004 and 2005, refiners or importers (but not individual refineries)

[84] If a refinery has a baseline sulfur level higher than 120 ppm (as described below in IV.C.1.c.v.), then credits are generated from the baseline to 120 ppm and allotments from 120 ppm to the new sulfur level (and discounted 20 percent if applicable).

can generate allotments by producing gasoline that has a sulfur level below the annual corporate average standard (120 ppm and 90 ppm). The number of allotments generated is equal to the difference between 120 ppm (or 90 ppm) and the corporate average sulfur level. Allotments generated by refiners or importers in 2004 and 2005 are not discounted, unlike some of those that are generated by refineries in 2003. Refiners that sell fuel to the GPA may also generate allotments by producing fuel that is cleaner than the corporate average standards, regardless of the volume of fuel that is produced for use in the GPA. On the other hand, as explained in Section IV.C.2., gasoline produced by small refiners who are complying with the standards in Table IV.C.–3 cannot be used to generate sulfur allotments since these producers are not required to meet a corporate average standard.

iii. Using Allotments in 2004 and 2005

Refiners and importers can use sulfur allotments that they generate or purchase from other refiners/importers to demonstrate compliance with the 120 ppm corporate standard in 2004 and the 90 ppm corporate standard in 2005. Each refiner's sulfur allotment for 2004 and 2005 will be calculated based on the total volume of gasoline imported and produced at their refineries (or only imported gasoline in the case of companies that only import gasoline) and the corporate pool average standard for that year. In anticipation of exceeding or falling short of the standard for any one year, companies may trade sulfur allotments, either in the compliance year or earlier (as early as the year 2000). For example, a refiner that expects to produce a total of 2.5 billion gallons of gasoline in 2004 has a sulfur allotment of 300 billion ppm-gallons (120 ppm × 2.5 billion gallons). If its corporate pool average is actually 200 ppm in 2004, it will exceed its 2004 allotment by 200 billion ppm-gallons (since 200 ppm × 2.5 billion gallons = 500 ppm-gallons), and must obtain sulfur allotments from another refiner to offset this increase. Similarly, if this refiner expects to average 80 ppm in 2004, it has an excess of 100 billion ppm-gallons to trade to other refiners. However, if a refiner trades away part of its allotment, the refiner must still comply with the corporate standard, just as another refiner has to do if it does not trade allotments.

In 2005, refiners must comply both with the corporate average standard and the refinery average standard for each of their refineries. Once a refiner has established compliance with the 90 ppm corporate average standard (with or without the use of allotments), each of its refineries can then establish compliance with the 30 ppm refinery standard through actual production of 30 ppm gasoline or through the use of *excess* allotments and/or sulfur credits. Once compliance with the 90 ppm corporate pool average standard is established, the refiner would use 90 ppm as each of its refineries actual sulfur level, then apply an appropriate number of credits or allotments to meet the 30 ppm refinery average standard for each refinery. (See discussion below for an explanation of how a refiner can use both sulfur ABT credits and allotments to comply with the refinery average standard in 2005.)

iv. How Long Do Allotments Last?

We expect most refiners will trade sulfur allotments well before the end of each compliance year so they will have the needed certainty of compliance with the corporate average standard. Our program allows such trades to occur at any time during the year, although the refiner is liable for any shortfall in compliance resulting from having traded away too many allotments. A refiner may also carry over excess 2004 allotments (those generated in 2003 or 2004) for compliance with the 90 ppm corporate standard for 2005. However, those allotments must be discounted by 50 percent. This 50 percent discount factor is needed to equalize the emission impact of sulfur control between 2004 and 2005. In 2005, there is an extra model year of NLEV/Tier 2 vehicles relative to 2004. In addition, the NLEV/Tier 2 fleet is one year older in 2005 than 2004. This increased age translates into higher vehicle emissions due to general deterioration. Since sulfur acts on a percentage basis, the absolute emission increase due to sulfur impacts on vehicle emission control systems in 2005 is higher than in 2004.

As discussed below in section IV.C.1.c.x, a refiner or importer may convert allotments into credits in 2004 and 2005 for compliance with the refinery average standards in 2005 and beyond. All transactions between refiners involving sulfur allotments must conclude by the last day of February in the calendar year following the compliance year in which the allotments are to be used.[85]

[85] Allotments used for GPA gasoline compliance may be retained until February 2007. Allotments used for small refiner gasoline compliance may be retained until February 2008.

Sulfur Credit Program

v. Establishing Individual Refinery Sulfur Baselines for Credit Generation Purposes

The purpose of establishing a sulfur baseline for each refinery is to provide a starting point for determining sulfur credits for reductions in gasoline sulfur levels. We proposed that refiners would have to establish a sulfur baseline for each individual refinery, by submitting to us data establishing their annual average gasoline sulfur level based on the average of their 1997 and 1998 operations. We would review the data and, barring any discrepancies, approve a sulfur baseline for each refinery. We received comments supporting this option as well as comments stating that the time involved for this application and approval process would delay the refiner's ability to plan for and begin construction of gasoline desulfurization technology. Refiners would want the certainty of an approved sulfur baseline before making investment decisions, and thus would wait to obtain EPA's approval before proceeding. We also received comments about what year(s) would be most appropriate to use to establish a sulfur baseline. Some of these comments argued for the use of existing, approved 1990 baselines, or some adjusted version of 1990 baselines, rather than new data, to expedite the process of establishing sulfur baselines.

We also proposed a different sulfur baseline for reformulated gasoline (RFG) produced in the summer for those refineries which produce reformulated gasoline. While the conventional gasoline sulfur baseline (and the baseline for winter RFG) was proposed to be tied to current sulfur levels, the baseline for summer reformulated gasoline was proposed to be 150 ppm, the approximate level we expect summer reformulated gasoline to contain in 2000 and beyond because of the Phase II reformulated gasoline requirements, which take effect in 2000. We argued that winter RFG did not have any de facto sulfur restrictions, and thus winter RFG should be counted with conventional gasoline for the purpose of credit generation relative to the refinery's conventional gasoline sulfur baseline.

Since the proposal, we have learned that overall gasoline sulfur levels (conventional plus reformulated) are significantly lower than they were in 1990. As explained in the Regulatory Impact Analysis, national average sulfur levels when both conventional and reformulated gasolines are considered dropped to 306 ppm in 1997 and 268 ppm in 1998, compared to the 1990 national gasoline sulfur average of 339 ppm, decreases of 10 and 21 percent, respectively. The substantial drop between 1997 and 1998 seems to be related to the mandatory use of the Complex Model, which began in 1998 and had implications for both reformulated and conventional gasoline compliance. Thus, we have become convinced that the most appropriate sulfur baseline would be based on data which establish current sulfur levels, not on data which are nearly ten years old. We considered reducing all 1990 baselines by 21 percent to reflect the national average decrease since 1990, but determined that this approach would be inappropriate because some refiners have reduced levels substantially more than 10–21 percent since 1990, and would thus be eligible to generate a very large number of credits for reductions that have already been made.

Furthermore, as we proposed, and some commenters argued, we have concluded that averaging data from two years is the most appropriate approach, because averaging over two years will help to account for any unusual variations in operations that may have occurred at individual refineries in either of these years. We concluded that averaging data from 1998 and 1999 is not feasible, because the 1999 data will not be fully available to EPA until after the reporting deadline of May 2000. Hence, we believe it is preferable to use 1997 and 1998 data, rather than delaying the time baselines are established. We do not expect significant changes in 1999 sulfur levels relative to 1998 levels, so we believe the use of the 1997–1998 data provides a reasonable representation of current sulfur levels.

We have also learned that summer reformulated gasoline is already averaging close to our expected sulfur level for the year 2000. Winter RFG does not show this same decrease, presumably because refiners are shifting high sulfur blendstocks out of RFG in the summer but back into RFG in the winter to maintain compliance with the conventional gasoline antidumping requirements. Thus, it appears that if we held summer RFG to a lower baseline, as proposed, we would have to raise the winter RFG baseline commensurately to reflect actual refinery operations. The net environmental impact would be no different than if we had a single sulfur baseline applying to all RFG, or to all gasoline produced at the refinery, since the annual pool sulfur levels are constant even while there may be seasonal variations. Therefore, we are not finalizing a separate sulfur baseline for summer RFG, but rather combined conventional and reformulated gasoline sulfur levels.

Having considered the comments we received and the new data available to us, we have concluded that refiner sulfur baselines should be established from 1997 and 1998 operating data. Hence, we are requiring refiners which wish to generate sulfur credits prior to 2004 to establish a 1997–98 sulfur baseline for each refinery at which they intend to generate credits. We believe the process we have defined will minimize the burden to the industry and the time it will take for us to review and approve the sulfur baselines. Specifically, refiners which plan to generate sulfur credits must submit to us information which establishes the batch report numbers, sulfur levels, and volumes of each batch of gasoline produced in 1997 and 1998, as well as the annual average sulfur level calculated from these data. Within 60 days, we will review the application and notify the refiner of approval or of any discrepancies we find in the data submitted. If we do not respond within 60 days, the baseline should be considered to be approved.

While we expect most refiners will apply for a sulfur baseline in the near future (to maximize the time that they can generate credits before 2004), there is no cut-off date for applying for a sulfur baseline. However, if the refiner wishes to generate credits for a given calendar year, we must receive his baseline application no later than September 30 of that year to provide us adequate time to review the baseline prior to the end of the year (at which time any credits generated in that year would be assessed and reported by the refiner). We believe that this approach for establishing sulfur baselines meets our goal of providing a workable ABT program that refiners can take advantage beginning in the year 2000, without sacrificing the environmental benefits of the sulfur standards.

Foreign refiners which have already established an individual refinery baseline with us, and thus have submitted reports on all batches of gasoline sent to the U.S. in 1997 and 1998, may follow this same procedure if they wish to generate sulfur credits prior to 2004. Foreign refiners which have not reported 1997–98 gasoline qualities to us must follow an alternate approach. Specifically, they must follow the general requirements of our protocol for establishing individual refinery baselines (see §§ 80.91–94 and also § 80.410) by providing sufficient data to establish the volume of gasoline imported to the U.S. from each refinery in 1997–98 and the annual average sulfur level of that gasoline. If the test method used to identify the sulfur level differs from the one specified in today's action, the refiner must provide sufficient information about the test method to allow us to evaluate the appropriateness of the alternative. Because this information will be new to us, we may require more time to review and approve their 1997–98 sulfur baseline. But, consistent with our previous handling of foreign refiner submissions, once we have determined that the submission is complete and the protocol has been followed, they may use the baseline while waiting for our formal approval. However, the refiner will be held to the baseline that is ultimately approved. A foreign refiner who is unable to generate adequate data to establish a 1997–98 sulfur baseline will not be permitted to generate sulfur credits in 2000–2003.

Small refiners that plan to request small refiner standards (as provided in Section IV.C.2 below) which also want to generate early sulfur ABT credits will use the same data required to define their small refiner baseline to determine their baseline for the ABT program. In other words, if a refiner becomes a small refiner under our definition and procedures, credits generated by that refinery would be calculated relative to the refinery's actual 1997–98 sulfur average. The trigger for generating sulfur credits under the ABT program (discussed in the next section) would still apply for small refiners generating credits prior to 2004 relative to their 1997–98 sulfur average. In addition, the applicable interim sulfur standard for small refiners who generate credits through sulfur reductions prior to 2004 will be calculated based on the reduced sulfur level, rather than the 1997–98 baseline level, as explained below in Section IV.C.2.

Importers and gasoline blenders will not be assigned a sulfur baseline because they are not eligible to generate early credits (prior to 2004) under the ABT program. This includes gasoline refiners who are also importers; such parties cannot generate sulfur credits prior to 2004 on the basis of their imported gasoline but may only generate credits based on the gasoline produced by their refinery(ies). It also includes oxygenate blenders, who, as discussed in Section VI below, are not subject to the sulfur standards but are responsible for compliance with the downstream provisions.[86] For importers

[86] Refiners may, however, include oxygen added downstream of the refinery when determining

Continued

and most gasoline blenders, this represents a change from our proposal, but one we believe is appropriate and necessary to ensure that the environmental benefits of the ABT program are maintained. The ABT program allows the refining industry to trade off early sulfur reductions (2000–2003) for slight delays in complying with the 30 ppm refinery average standard in 2005–2006.[87] We have designed the ABT program to ensure that sufficient credits can be generated by refiners (domestic or foreign) to enable a smooth transition to the 30 ppm standard. Importers and blenders do not have the same need for the ABT program that refiners have because they will not have to make the same level of investment in desulfurization technology and thus do not need credits generated before 2004 to help their transition to the 30 ppm average standard after 2004. Furthermore, credits could be generated by importers without the overall pool of imported gasoline becoming incrementally cleaner. For example, say that Importer A had a 1997/98 sulfur baseline of 600 ppm and Importer B had a sulfur baseline of 100 ppm. In 2002, Importer B could transfer/sell its 100 ppm gasoline to Importer A prior to unloading the fuel at the port of entry. Once the import transaction was completed, Importer A will have generated 500 ppm (multiplied by the fuel volume) credits without any fuel becoming incrementally cleaner. We are concerned that if importers and blenders were allowed to generate early credits, they would generate far more credits than needed to make the ABT program work, without necessarily achieving early environmental benefits—credits which either importers or refiners would be able to use to delay compliance with the 30 ppm standard in 2005 and beyond. This would delay the environmental benefits of our program by prolonging the industry's transition to the 30 ppm standard.

In the proposal, we also discussed the need for a baseline gasoline volume as well as a baseline sulfur level. This stemmed from the design of our current conventional gasoline anti-dumping program, which requires a baseline volume so that we can confirm that conventional gasoline is no dirtier now than it was in 1990. However, for the gasoline sulfur ABT program, we have determined that there is no need to restrict refineries' sulfur baselines (against which they can generate sulfur credits) to a specific volume of gasoline. The purpose of the ABT program is to encourage early sulfur reductions by some refineries, and we see no need to limit the amount of credits such a refinery can generate on the basis of a historic volume of gasoline production. In fact, additional volumes of cleaner gasoline should achieve additional early environmental benefits.

vi. Generating Sulfur Credits Prior to 2004

In our proposal, we discussed a credit generation trigger of 150 ppm for early credit generation (2000–2003), arguing that we wanted to encourage investment in desulfurization technologies that refineries ultimately need to get to a 30 ppm average. Many comments we received argued that the 150 ppm trigger was too restrictive, requiring capital investments that most refiners could not make earlier than 2004 (due to construction limitations, among other reasons). Thus, few credits would be generated, and without sufficient certainty that credits would be generated, refiners would not be able to count on the flexibility that the ABT program was intended to provide when planning their compliance strategies for 2004 and beyond.

Having considered these comments and reanalyzed the ability of the industry to comply with the standards in 2004 (as we discussed above at the introduction to section IV.C.1), we have concluded that the proposed 150 ppm trigger would inappropriately limit the credits available. While we want to encourage refiners to make reductions early, we do not want to preclude refiners from making less capital intensive sulfur reductions in the short term while they prepare to reach the 30 ppm average in the long term. At the same time, we believe that a refinery should be required to demonstrate that the sulfur reduction was real and not just a consequence of national variations from year to year. Hence, we are establishing a trigger which we believe represents a sulfur reduction that requires action above and beyond simple annual or even seasonal fluctuations in crude oil sulfur level or product slate variations that could have a very small impact on annual sulfur average.

During the period 2000–2003, credits can be generated annually by any refinery that produces gasoline averaging at least 10 percent lower than that refinery's baseline sulfur level. In other words, to generate credits, the refinery's annual average sulfur level for all of its gasoline on average must be 0.9 × (baseline sulfur level). Once this "trigger" is reached, credits will be calculated based on the amount of reduction from the refinery's sulfur baseline. For example, if in 2002 a refinery reduced its annual average sulfur level from a baseline of 450 ppm to 150 ppm (well below the trigger of 0.9×450=405 ppm), its sulfur credits will be determined based on the difference in annual sulfur level (450–150=300 ppm) multiplied by the volume of gasoline produced in 2002. Similarly, foreign refineries with an individual sulfur baseline can generate credits in these years as long as the annual average sulfur level of the gasoline imported to the U.S. from that refinery is lower than 90 percent of the baseline sulfur level.

Although by adopting a more modest trigger for credit generation we are enabling more credits to be generated, the environment will still benefit from our program. Although the use of a more modest trigger keyed to each refinery's sulfur baseline may allow more credits to be generated, we believe this will only occur because the credit program is providing incentives to refineries to reduce sulfur levels earlier than they would have otherwise, particularly with a strict 150 ppm trigger. Thus, more lower sulfur gasoline will be in the marketplace prior to 2004 than would otherwise have occurred, given our understanding of the state of desulfurization technologies and the likely pattern of investments by the industry. With our corporate average and cap standards, sulfur levels will continue to decrease after 2004, even if individual refineries take an added year or two to meet the 30 ppm standard.

We had also proposed that credit generation prior to 2004 would be different for reformulated gasoline than for conventional gasoline, because reformulated gasoline's assigned sulfur baseline was proposed to be 150 ppm. Thus, we proposed that credits could only be generated from reformulated gasoline if the sulfur level averaged below 150 ppm, and that the credits would be calculated based on the difference between 150 ppm and the new, lower average. Since we have not finalized a separate baseline for reformulated gasolines, we are not adopting a different process for generating credits from reformulated gasoline. All gasoline produced at the refinery in 2000 (and beyond) is considered in calculating the annual average sulfur level, compliance with the 90 percent trigger, and the sulfur credits earned, if any.

compliance with the sulfur standards and the provisions of the ABT program. This is consistent with existing provisions for reformulated and conventional gasolines.

[87] As explained in Section IV.C.1.c.ix, credits generated before 2004 expire in 2006, except for small refiners and credits used for GPA gasoline compliance.

Several states have adopted or are considering adopting gasoline sulfur control programs (see discussion at section IV.C.1.d below on state sulfur programs). While we had proposed to exclude this gasoline from sulfur credit generation, we have reconsidered our position. Gasoline produced in response to state [88] requirements can be included in the refinery's calculation of sulfur credits generated in a given year. However, this gasoline will be included in the total volume of gasoline produced by that refinery, requiring the annual average sulfur level for total gasoline produced at that refinery to exceed the trigger specified above to generate any credits at all.

vii. Generating Sulfur Credits in 2004 and Beyond

In 2004 and beyond, refineries, blenders, and importers can generate credits, but only if the actual annual sulfur level of all gasoline produced or imported averages below 30 ppm, and only for the difference between the standard and the actual annual sulfur average. (For example, a refinery producing gasoline in 2005 that averages 25 ppm can generate 30–25=5 ppm sulfur credits on the total volume of gasoline produced at that refinery.) However, since in 2004 and beyond importers are the regulated party responsible for ensuring that imported gasoline meets the sulfur standards, foreign gasoline would in effect generate sulfur credits through the importer beginning in 2004. Foreign refineries which want to send gasoline containing less than 30 ppm sulfur to the U.S. would still benefit from doing so by making appropriate arrangements with importers, which are subject to all of our standards.

viii. Using Sulfur Credits

Refineries, blenders, and importers can use sulfur credits to demonstrate compliance with the 30 ppm annual average refinery standard in 2005 and beyond, if they are unable to meet the standard with actual gasoline production. During 2005 and 2006 only, refineries may use credits banked by that refinery in 2000–2003 as a result of early sulfur reductions, or credits purchased from other refineries which have banked early sulfur credits. Blenders and importers can purchase credits from refiners (including any foreign refiners which generated early credits), or use credits they generated in 2004 and beyond. All transactions will have to be concluded by the last day of February after the close of the annual compliance period (2005, 2006, etc.).

As discussed above, 2005 is the only year when averaging and trading against the corporate average and averaging, banking, and trading against the refinery average are both allowed. In that year, sulfur credits may only be used against the 30 ppm standard for each refinery once the refiner has demonstrated compliance with the corporate pool average standard. The refiner must meet his corporate average based on actual sulfur levels or through a trade for sulfur allotments if it falls short of the 90 ppm corporate average standard. At that point, each of his refineries is evaluated for compliance with the 30 ppm refinery average standard. Those refineries that are not producing gasoline averaging 30 ppm sulfur must obtain sulfur credits generated in 2005 or earlier and/or sulfur allotments to bring the refinery's sulfur average from the actual level (a maximum of 90 ppm for each refinery, since by meeting the corporate average, even if in part through the use of allotments, each refinery in the company will be considered to average no more than 90 ppm) down to 30 ppm.

Refineries or importers which sell some or all of their gasoline in the GPA (and which have elected to participate in the phase-in) may also use sulfur credits to meet their refinery averages in 2004–2006. However, because this gasoline must be designated for sale in the GPA, they must account separately for compliance with the 150 ppm refinery average for gasoline sold in the phase-in area and with the 30 ppm refinery average for gasoline sold outside of that area. Thus, in 2004, such refiners/importers may use sulfur credits to establish compliance with the 150 ppm standard for gasoline sold in the phase-in area, if required. In 2005 and 2006, they may use credits to meet the 150 ppm standard for gasoline sold in the area and/or use credits to meet the 30 ppm standard for gasoline sold outside of the area.

As explained in section IV.C.1.b., some of the refiners participating in the GPA are exempt from the corporate average standards, but may use either sulfur credits or sulfur allotments in 2004–2006 to establish compliance with the 150 ppm refinery average standard. Those that are not exempt from the corporate average standards may use sulfur allotments only to meet the corporate average standards. For such refiners, compliance with the corporate average standard will be measured first (using allotments if needed), then compliance with the refinery average standard (using credits and/or allotments as needed) in the same manner as described above for refiners who sell all of their gasoline outside of the GPA.

Foreign refineries are not required to comply with the 30 ppm refinery standard in 2005 and beyond; instead, compliance for foreign gasoline is required by the importer. Sulfur credits generated by foreign refineries prior to 2004 will still have value, since these refineries can sell sulfur credits to U.S. refineries, blenders, or importers who need credits to meet the standard in 2005 or beyond. In fact, foreign refiner's credits could simply be transferred to the importer which is importing that refinery's gasoline into the U.S. For example, a foreign refiner could send gasoline exceeding 30 ppm on average to an importer and transfer the appropriate amount of sulfur credits it generated prior to 2004 to allow the importer to meet the 30 ppm standard. Similarly, after 2004 a foreign refiner may send gasoline containing less than 30 ppm to the U.S. through an importer, and the importer would benefit from generating credits (and presumably would include the value of these credits in the financial transaction with the foreign refinery).

As explained in Section IV.C.3.b. above, in 2005 no batch of domestically produced or imported gasoline can exceed 300 ppm, and a refiner's/importer's annual corporate pool average sulfur level cannot exceed 90 ppm, except for gasoline sold in the GPA or by small refiners complying with the standards in Table IV.C.–3. In 2006 and beyond, sulfur is capped at 80 ppm and there is no longer a corporate pool average standard. These standards (as well as the 300 ppm cap and corporate pool averages) cannot be met through the use of credits generated under the ABT program. As described above, credits may only be applied to demonstrate compliance with the 30 ppm refinery standard, not to the corporate pool average or the cap. Given the limitations that the 80 ppm cap places on sulfur levels in 2006 and beyond, we do not expect many sulfur credits to be used in future years of this program (since, even with the use of credits, no gasoline may exceed 80 ppm in these years).

We allow an individual refinery that does not meet the 30 ppm standard in a particular year to carry forward the credit debt one year. Under this provision, the refinery will have to make up the credit deficit and come into compliance with the 30 ppm standard the next calendar year, or face penalties. This provision will in no way absolve the refiner from having to meet the

[88] Excluding California.

applicable per-gallon cap standard or, when applicable, the corporate average standard. This provision will provide some relief for refiners faced with an unexpected shutdown or that otherwise were unable to obtain sufficient credits to meet the 30 ppm standard. This provision is only available through 2010. After that time, we expect many refineries to be able to consistently operate below 30 ppm, generating a pool of credits which other refineries could purchase in the event of an unforeseen upset. However, in no circumstances after 2005 can the refinery produce gasoline exceeding the 80 ppm per-gallon cap standard (with the exception of small refiners, as discussed in Section IV.C.2 below). The carry-forward provision does not apply to compliance with the 150 ppm refinery average standard applicable in the GPA.

We have some concern that the potential exists for credits to be generated by one party and subsequently purchased or used in good faith by another, and later found to have been calculated or created improperly or otherwise determined to be invalid. For this reason, we proposed that both the seller and purchaser would have to adjust their sulfur calculations to reflect the proper credits and either party (or both) could be deemed in violation of the standards and other requirements if the adjusted calculations demonstrate noncompliance with an applicable standard. One commenter, representing a number of refiners, objected to this approach.

Nevertheless, our strong preference is to hold the credit or allotment seller liable for the violation, as opposed to the credit or allotment purchaser. As a general matter we would expect to enforce a shortfall in compliance calculations (caused by the good faith purchase of invalid credits) against a good faith purchaser only in cases where we are unable to recover valid credits from the seller to cover the compliance shortfall. Moreover, in settlement of such cases we would strongly encourage the seller to purchase credits to cover the good faith purchaser's credit shortfall. Under the deficit provisions of section 80.205(e), for compliance periods through 2010, a credit shortfall may be corrected if the conditions of that section are met. EPA will consider covering a credit deficit through the purchase of valid credits a very important factor in mitigation of any case against a good faith purchaser, whether the purchase of valid credits is made by the seller or by the purchaser.

Some commenters stated that sulfur credits should be transferred directly from the refiner or importer that generated them to the party that will use them, as we had proposed. We believe that this helps to ensure that parties purchasing credits will be better able to assess the likelihood that the credits will be valid, and aids compliance monitoring. Therefore, the final rule adopts this provision, with the exception that where a credit generator transfers credits to a refiner or importer who cannot use all the credits, that transferee may transfer the credits to another refiner or importer. That second transferee cannot again transfer the credits; they must either be used or terminated by the second transferee. Nevertheless, there is nothing in the final rule that would prevent a person who is not a refiner or importer from facilitating the transfer of credits from parties that have generated them to parties who need them for compliance, *e.g.,* a broker who would act like a real estate broker. Therefore, under today's rule, any person may act as a credit or allotment broker, whether or not such person is a refiner or importer, so long as the title to the credits or allotments are transferred directly from the generator to the user. Furthermore, any party (*e.g.,* refiner, importer, or blender) who can generate and hold credits may also resell them.

ix. How Long Do Credits Last?

The ABT program is designed to encourage sulfur reductions earlier than the standards require, by providing a market for credit generation. The emissions benefits of these early reductions are most valuable in the early years of the ABT program when national average levels remain substantially higher than the final 30 ppm average standard. At the same time, these emissions reductions are offset in time by higher emissions incurred by later vehicles which use gasoline with a higher sulfur level. Because the overall intention of the gasoline sulfur program is to enable and protect Tier 2 vehicles and provide time for refiners to select and construct desulfurization equipment, sulfur credits should have a limited life to limit the degree to which later Tier 2 vehicles are exposed to higher sulfur levels.

The ABT program is also designed to ease implementation of the new standards, particularly the refinery average standard, and the credits will be of their greatest value to refineries during the first few years of the program. ABT is not intended to permit a refinery to operate substantially above the standard for a protracted time period. While limiting credit life may reduce the incentive to generate credits for some refineries, the credit program will be of relatively small value to any refinery/importer that held credits for a protracted period of time and did not need to use them. This is particularly true in 2006 and beyond, when the 80 ppm cap limits the need for and value of any credits the refinery may possess.

Hence, we are finalizing limitations on the life of credits which differ somewhat from our proposal. Credits generated prior to 2004 must be used for compliance purposes and calculations with respect to gasoline produced on or before December 31, 2006. These credits can be used to meet the 30 ppm standard in 2005 or 2006. This expiration date applies to credits used by the refinery which generated the credits, as well as credits transferred to another refinery. While the proposal presented a life through 2007 for credits generated early, we have shortened this life span one year to reflect the fact that early credits are intended to enable and ease compliance with the 30 ppm standard in the first years of the program, allowing refiners to spread out investments without compromising the environmental benefits of the program. At the beginning of 2006, all gasoline (except that produced by small refiners and that marketed in the GPA) will be capped at 80 ppm, and by the end of 2006, every refinery should be capable of producing gasoline that meets the 30 ppm standard. Hence, the value of the early credits diminishes greatly. It should be noted that early credits can be used for GPA certified gasoline through 2006 and for small refiner gasoline through 2007.

Credits generated in 2004 and beyond will have to be used within five years of the year in which they were generated. If these credits are traded to another party during that five year period, they will have to be used by the new owner within that same five years, regardless of when the transfer occurs. This is a change from our proposal, which provided for a potential maximum ten-year life for credits that were generated and then traded in the fifth year to another party. However, we believe this approach is more consistent with our environmental goals of keeping sulfur levels averaging 30 ppm in 2006 and beyond. With the 80 ppm cap, refiners will be able to use only very few credits if they are unable to meet the 30 ppm average in 2006 or beyond. Therefore, limiting credit life to five years will likely have minimal impact on the actual use of credits. A longer credit life will make tracking and enforcement difficult, and could have negative environmental consequences. Hence, we have limited credit life to five years. Consistent with our other recordkeeping and reporting requirements, the five-year expiration date will be assessed as of the last day of February after the five year deadline. Hence, for example, credits generated in 2005 will expire as of the last day of February, 2011. Again, no third-party transfers are allowed.

x. Conversion of Allotments Into Credits

A refiner or importer may convert allotments into credits for compliance with the refinery average standards in 2005 and beyond. Allotments that are generated by reducing gasoline sulfur levels to 30 ppm or higher (defined as Type ''A'' allotments) are equivalent to credits generated in 2000–2003. These allotments may be (1) used as allotments by a refiner for compliance with the corporate average standard in 2004 and 2005 or (2) converted into credits to be used by the refiner's refineries for compliance with the refinery average standard in 2005 and 2006.

Allotments that are generated by reducing gasoline sulfur levels to lower than 30 ppm (defined as Type ''B'' allotments) are equivalent to credits generated in 2004 and beyond (by producing gasoline with less than 30 ppm sulfur). Similar to Type ''A'' allotments, these allotments may be (1) used as allotments by a refiner for compliance with the corporate average standard in 2004 and 2005 or (2) converted into credits to be used by the refiner's refineries for compliance with the refinery average standard in 2005 and beyond.

Allotments or credits that are used by refiners for compliance with the GPA gasoline standards must be used by the last day of February 2007. Allotments or credits used by small refiners for compliance with the small refiner standards must be used by the last day of February 2008. Any allotments, whether Type ''A'' or ''B'', that are carried over for compliance with the corporate and refinery average standards for 2005 must be discounted by 50 percent as discussed in above. Any allotments that are converted to credits (*e.g.,* in 2004) and then carried over to 2005 are not discounted. However, once the conversion and carry-over has taken place (such that the allotments have become credits), the conversion cannot be reversed without applying the discount factor. That is to say, once a 2003 or 2004 allotment is converted to a credit and carried over to 2005, the credit can only be re-converted into an allotment that is discounted 50 percent.

d. How Are State Sulfur Programs Affected by EPA's Program?

Section 211(c)(4)(A) of the CAA prohibits states [89] from prescribing or attempting to enforce controls or prohibitions respecting any fuel characteristic or component if EPA has prescribed a control or prohibition applicable to such fuel characteristic or component under section 211(c)(1). This preemption applies to all states except California, as explained in section 211(c)(4)(B). For states other than California, the Act provides two mechanisms for avoiding preemption. First, section 211(c)(4)(A)(ii) creates an exception to preemption for state prohibitions or controls that are identical [90] to the prohibition or control adopted by EPA. Second, states may seek EPA approval of SIP revisions containing fuel control measures, as described in section 211(c)(4)(C). EPA may approve such SIP revisions, and thereby ''waive'' preemption, only if it finds the state control or prohibition ''is necessary to achieve the national primary or secondary ambient air quality standard which the plan implements.''

We are adopting the sulfur standards pursuant to our authority under section 211(c)(1). Thus, we believe that today's action results in the clear preemption of future state actions to prescribe or enforce fuel sulfur controls. [91] States with fuel sulfur control programs not already approved into their SIPs will therefore need to obtain a waiver from us under the provisions described in section 211(c)(4)(C) for all state fuel sulfur control measures, unless the state standard is identical to our sulfur standard.

Section 211(c)(4)(A) preempts state fuel controls if EPA has ''prescribed'' federal controls. We read this language to preempt non-identical state standards on the date of promulgation of the standards, as opposed to the date the standards become enforceable. Thus, today's action preempts state actions as of December 21, 1999, even though the standards will not require sulfur reductions until 2004. This interpretation is consistent with EPA actions applying other federal fuel measures. *See* 54 Fed. Reg. 19173 (May 4, 1989) (noting preemption of Massachusetts state RVP measure before start of first control period for federal RVP). We also believe this interpretation is consistent with the intent behind section 211(c)(4)(A). Though the standards are not immediately enforceable, they will have an immediate impact on refiners' investment decisions. We believe, by adopting 211(c)(4)(A), Congress intended to limit state fuel controls that differ from the federal programs, for example, in the judgments as to level of the standard or its stringency. The lead time to implement a standard should be treated the same way.

Aside from the explicit preemption in Section 211(c)(4)(A), a court could also consider whether a state sulfur control is implicitly preempted under the Supremacy Clause of the U.S. Constitution. Courts have determined that a state law is preempted by federal law where the state requirement actually conflicts with federal law by preventing compliance with both federal and state requirements, or by standing as an obstacle to accomplishment of Congressional objectives. A court could thus consider whether a given state sulfur control is preempted, notwithstanding waiver of preemption under 211(c)(4)(C), if it places such significant cost and investment burdens on refiners that refiners cannot meet both state and federal requirements in time, or if the state control would otherwise meet the criteria for conflict preemption.

2. Hardship Provision for Qualifying Refiners

This section describes various provisions for certain qualifying refiners who may face hardship circumstances.

a. Hardship Provision for Qualifying Small Refiners

In developing our gasoline sulfur program, we evaluated the need and the ability of refiners to meet the 30/80 standards as expeditiously as possible. This analysis is described in detail in the RIA. As a part of this analysis, we found that while the majority of refiners would be able to meet the needed air quality goals in the 2004–2006 time frame, there would be some refiners who would face particularly difficult circumstances which would cause them to have more difficulty, in comparison

[89] The term ''state'' or ''states'' includes political subdivisions thereof.

[90] In evaluating whether a state fuel prohibition or control is ''identical'' to a prohibition or control adopted by EPA, EPA might consider but is not limited to the following factors in comparing the measures: (1) The level of an emission reduction or pollution control standard; (2) the use of ''per gallon'' or ''averaged'' amounts in setting that level; (3) the effect on that level (if averaged) of the use of different averaging pools; (4) the lead time allowed to the affected industry for compliance; and (5) the test method(s) and sampling requirements used in determining compliance.

[91] In addition, EPA notes that there are existing federal NO_X performance standards which apply to RFG and conventional gasoline and that state controls respecting NO_X performance are also preempted under 211(c)(4)(A).

to the industry as a whole, in meeting the standards.

In order to ensure that the vast majority of the program could be implemented reasonably quickly in order to achieve the air quality benefits sooner, rather than basing the time frame on the lowest common denominator we have provided an extended phase-in for a small group of refiners that represents less than four percent of the overall gasoline volume, and a much smaller percentage in the areas of greatest environmental need. As described in more detail below, and in Chapter VIII of the RIA, we concluded that refineries owned by small businesses face unique hardship circumstances, compared to larger companies.

The primary reason for this consideration is that small businesses lack the resources available to large companies which enable the large companies (including those large companies that own small volume refineries) to raise capital for investing in desulfurization equipment. The small businesses are also likely to have insufficient time to secure loans, compete for engineering resources, and complete construction of the needed desulfurization equipment in time to meet the standards adopted today which begin in 2004.

The emissions benefits of low sulfur gasoline are needed as soon as possible, for two primary reasons: (1) To reduce ozone and other harmful air pollutants, and (2) to enable vehicle emissions control technology for Tier 2 vehicles. Since our analysis showed that small businesses in particular face hardship circumstances, we are adopting temporary, interim standards that will provide refineries owned by small businesses additional time to meet the ultimate 30 ppm refinery average and 80 ppm per gallon cap standards. This approach allows us to achieve the needed emission reductions in the 2004–2007 time frame because hardship circumstances are expected to be faced by only a small portion of the refining industry.

We believe that these temporary, interim standards are an effective way to phase in the low sulfur standards as expeditiously as is feasible thereby achieving significant air quality benefits in an expeditious manner. This section describes the special provisions we are offering small businesses to mitigate the impacts of our program on them and generally explains the process we undertook to analyze those impacts. Please refer to the RTC document for a detailed discussion of comments received on these provisions, and to the RIA for a more detailed discussion of our analysis of small refiner circumstances.

As explained in the regulatory flexibility analysis in Section VIII.B. of this document and in Chapter 8 of the RIA, we considered the impacts of our proposed regulations on small businesses. We have historically, as a matter of practice, considered the potential impacts of our regulations on small businesses, as discussed in more detail in Section IV.C.2.a.ii., below. The analysis of small business impacts conducted for this rulemaking was performed in conjunction with a Small Business Advocacy Review (SBAR) Panel we convened, pursuant to the Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA). We believe that the temporary, interim standards we are adopting for small refiners contributed to our development of a framework to achieve significant environmental benefits from lower sulfur gasoline in the most expeditious manner that is reasonably practicable. In the SBREFA amendments, Congress stated that ''uniform Federal regulatory * * * requirements have in numerous instances imposed unnecessary and disproportionately burdensome demands including legal, accounting, and consulting costs upon small businesses * * * with limited resources[,]'' and directed agencies to consider the impacts of certain actions on small entities. The final report of the Panel is available in the docket. Through the SBREFA process, the Panel provided information and recommendations regarding:

- The significant economic impact of the proposed rule on small entities;
- Any significant alternatives to the proposed rule which would ensure that the objectives of the proposal were accomplished while minimizing the economic impact of the proposed rule on small entities;
- The projected reporting, recordkeeping, and other compliance requirements of the proposed rule; and,
- Other relevant federal rules that may duplicate, overlap, or conflict with the proposed rule.

In addition to our participation in the SBREFA process, we conducted our own outreach, fact-finding, and analysis of the potential impacts of our regulations on small businesses. Many of the small refiners with whom we and the Panel met indicated their belief that their businesses may close due to the substantial costs, capital and other, of meeting the 30/80 standard without additional time. Based on these discussions and our data analysis, the Panel and we agree that small refiners would likely experience a significant and disproportionate economic hardship in reaching the objectives of our gasoline sulfur reduction program. However, the Panel also noted that the undue burden imposed upon the small refiners by our sulfur requirements could be alleviated with additional time for compliance. We agree with the Panel on both of these points.

For today's action, we have structured a temporary, interim compliance flexibility for qualifying small refiners, both domestic and foreign, based on the factors described below. Specifically, we structured this provision to address small refiner hardship while achieving air quality benefits expeditiously and ensuring that the reductions needed in gasoline sulfur coincide with the introduction of Tier 2 vehicles.

First, the compliance deadlines in the program, combined with flexibility for small refiners, will achieve the air quality benefits of the program quickly, while ensuring that small refiners will have adequate time to raise capital for infrastructure changes. Many, if not most, small refiners have limited, if any, additional sources of income beyond their refinery for financing the equipment necessary to produce low sulfur gasoline. Because these small refiners typically do not have the financial backing that larger and generally more integrated companies have, they need additional time to secure capital financing from their lenders.

Second, we believe that allowing time for sulfur-reduction technologies to be proven-out by larger refiners before small refiners have to put them in place would reduce the risks incurred by small refiners who utilize these technologies to meet the standards. The added time would likely allow for costs of these desulfurization units to decrease, thereby limiting the economic consequences for small refiners. Small refiners are disadvantaged by the economies of scale that exist for the larger refining companies—capital costs and per-barrel fixed operating costs are generally higher for them.

Finally, providing small refiners more time to comply would ensure that adequate engineering and construction resources would be available. Since most large and small refiners will need to install additional processing equipment to meet the sulfur requirements, there will be a tremendous amount of competition for technology services, engineering manpower, and construction management and labor. Our analysis shows that there are limitations to the elasticity of these resources. In addition, vendors will be more likely to contract their services with the major companies first, as their projects will offer larger profits for the vendors.

Providing this flexibility to allow small refiners to deal with hardship circumstances enables us to go forward with the phase-in of the 30 ppm sulfur standard beginning in 2004. Without this flexibility, it is possible that the benefits of the 30 ppm standard would not be achieved as quickly. By providing temporary relief to those refiners that need additional time, we are able to adopt a program that reduces gasoline sulfur levels expeditiously and in a way that is feasible for the industry as a whole.

In addition, we believe the volume of gasoline that will be eligible for the interim standards is small. We estimate that small refiners produce approximately four percent of all gasoline used in the U.S., excluding California. In most cases, gasoline produced by refiners is mixed with substantial amounts of other gasoline prior to retail distribution (due to the nature of the gasoline distribution system). This mixing generally results in only marginal increases in overall sulfur levels. Thus, the sulfur level of gasoline actually used by Tier 2 vehicles should generally be much lower than that produced by individual small refineries under this provision.

i. How Are Small Refiners Defined?

How We Defined ''Small'' Refiner in the Proposal

In identifying the small refiners most susceptible to the economic challenge of meeting the low-sulfur requirements, we closely examined the Small Business Administration's (SBA) definition of small refiner for the purposes of regulation. In that assessment we concluded that the SBA definition provided a reasonable metric for identifying small refiners that would be significantly impacted by the sulfur program requirements. By adopting the SBA definition we could expeditiously provide certainty of small refiner status to refiners who applied for the temporary compliance flexibility. Specifically, we proposed a definition where any petroleum refining company having no more than 1,500 employees throughout the corporation as of January 1, 1999 could apply for the temporary compliance flexibilities. This proposed employee limit included any subsidiaries, regardless of the number of individual gasoline-producing refineries owned by the company or the number of employees at any given refinery.

While we proposed a definition based on corporate employment, in light of the SBA definition and the SBAR Panel's recommendations, we also sought comment on alternative definitions of a small refiner. Such alternatives included definitions based on volume of crude oil processed (at a given refinery and/or corporate-wide) or volume of gasoline produced, with the understanding that any relief offered to refiners must not substantially reduce the program's environmental benefits.

Our Revised Small Refiner Definition

Based on comments received on the proposal, we are making two changes to our definition of a small refiner: we are (1) revising the employee number criterion; and, (2) adopting a cap on the corporate crude oil capacity for a refining company to qualify as a small business under today's regulations.

In regard to the employee number criterion, we are modifying how the employee number is determined, based on comments received from SBA. As mentioned above, our proposed definition applied to any petroleum refining company having no more than 1,500 employees throughout the corporation as of January 1, 1999. We selected that date to prevent companies from ''gaming'' the system. However, as SBA pointed out in its comments, the Small Business Act regulations specify that, where the number of employees is used as a size standard, as we proposed for small refiners, size determination is based on the average number of employees for all pay periods during the preceding 12 months.

Since we intended to use SBA's size standard in our proposal, we are incorporating that definition correctly in today's action. It is also worth mentioning that SBA shares our concerns about preventing companies from gaming the system and that it solved this problem specifically by using the average employment over 12 months. In effect, this approach helps to prevent companies from applying for and receiving small refiner status in bad faith. An example of an inappropriate application for small refiner status would be a refiner that temporarily reduced its workforce from 1600 employees to 1495 employees immediately before January 1, 1999 and then immediately rehired those employees after that cutoff date. Furthermore, the averaging concept was designed to properly address firms with seasonal fluctuations, according to SBA.

Second, we're amending the small refiner definition to include a corporate crude oil capacity cap. We believe such a corporate volume limitation is necessary to ensure that only truly small businesses benefit from the relaxed interim standards. Refineries that process large amounts of crude are likely to be better able to install desulfurization equipment to meet the national standards in 2004. In addition to ensuring that the interim standards target the appropriate group of refiners that need additional time, the volume limit also serves to ensure that the volume of gasoline subject to such standards is not significant. In addition, we received many comments that we should adopt a threshold based on crude capacity as specified in the Clean Air Act and used in past EPA fuel programs.

In the lead phase-down program for gasoline, we used a definition of ''small refinery'' that Congress adopted in 1977 specifically for the lead phase-down program. The definition was based on crude oil or feedstock capacity at a particular refinery (less than or equal to 50,000 barrels per calendar day (bpcd)), combined with total crude oil or feed stock capacity of the refiner that owned the refinery (less than or equal to 137,500 bpcd). In 1990, the lead phase-down program was complete and Congress removed this provision from the Act.

Shortly before the Act was amended in 1990, we set standards for sulfur content in diesel fuel, including a two-year delay for small refineries. We used the same definition of small refinery as we used in the lead phase-down program. This two-year delay, like many of the small business flexibilities in our gasoline sulfur proposal, was aimed at problems that small refineries faced in raising capital and in arranging for refinery construction.

In the 1990 amendments to the Clean Air Act, Congress rejected this small refinery provision, and instead allocated allowances to small diesel refineries under the Title IV Acid Rain program. (See CAA Section 410(h).) This approach was also aimed at helping small refineries solve the problem of raising the capital needed to make investments to reduce diesel sulfur. Congress provided allowances to small refineries that met criteria similar to that used in the lead phase-down provision—based on the crude oil throughput at a particular refinery, combined with the total crude oil throughput of the refiner that owned the refinery.

As mentioned above, the CAA definition was based on crude oil or feedstock capacity at a particular refinery, combined with total crude oil or feed stock capacity of the refiner that owned the refinery (less than or equal to 137,500 bpcd). However, given the mergers, acquisitions, and other changes that have transpired throughout the refining industry in the past few years, we believe the appropriate boundary today is a corresponding corporate crude capacity less than or equal to 155,000 bpcd.

Therefore, in consideration of the above, a refiner must meet both of the following criteria to qualify for the special small refiner provisions described in the next section:

- No more than 1500 employees corporate-wide, based on the average number of employees for all pay periods from January 1, 1998 to January 1, 1999; and
- A corporate crude capacity less than or equal to 155,000 bpcd for 1998.

ii. Standards That Small Refiners Must Meet

Upon careful review of the comments received on the proposal as well as the recommendations of the SBAR Panel, we have determined that regulatory relief in the form of delayed compliance dates is appropriate to allow small refiners, both foreign and domestic, to comply with our regulations without disproportionate burdens. From 2004 to 2007, when U.S. refiners must meet the 30/80 standard or the standards listed in Table IV.C–1 if they are participating in our ABT program, refiners meeting the corporate employee and capacity limits prescribed above are allowed to comply with somewhat less stringent requirements. These interim annual-average standards for qualifying small refiners are shown in Table IV.C–3 below.

TABLE IV.C–3.—TEMPORARY GASOLINE SULFUR REQUIREMENTS FOR SMALL REFINERS IN 2004–2007

Refinery baseline sulfur level (ppm)	Temporary Sulfur Standards (ppm)	
	Average	Cap
0 to 30	30 ppm	300 ppm.
31 to 200	Baseline Level	300 ppm.
201 to 400	200 ppm	300 ppm.
401 to 600	50% of baseline	Factor of 1.5 times the average standard.
601 and above	300	450.

The cap standards for the first two ‘‘bins’’ of refineries (that is those with baseline sulfur levels from zero to 30 and 31 to 200) have been relaxed somewhat from the proposal based on comments that the proposed standards for these two bins were more stringent than the options under discussion for all other refiners. We believe that these small refiners should be able to meet the average standards without much, if any, change to their operations but the more lenient cap will give them some flexibility for turnarounds or unexpected equipment ‘‘upsets’’.

Compliance with the standards in Table IV.C–3 is based on a refiner's demonstration that it meets our specific small refiner criteria. Refiners who qualify as a small refiner under our definition must establish a sulfur baseline for each of their participating refineries. The following sections explain these requirements in more detail to supplement the information presented above. We also explain how small refiners can apply for an extension of up to two additional years of the applicable small refiner standards, based on a variety of factors such as technology availability or financial hardship.

iii. How Do Small Refiners Apply for Small Refiner Status?

Refiners seeking small refiner status under our gasoline sulfur program must apply to us in writing no later than December 31, 2000, requesting this status. This application for small refiner status must contain the information described below.

Companies[92] seeking small refiner status must provide us with the following information:

Employment Information

- A listing of the name and address of each location where any employee of the company worked during the 12 months preceding January 1, 1999.
- The average number of employees at each location based upon the number of employees for each of the company's pay periods for the 12 months preceding January 1, 1999.
- The type of business activities carried out at each location.

Crude Capacity Information

- The total corporate crude oil capacity of the refiner as reported to the Energy Information Administration (EIA) of the U.S. Department of Energy (DOE).

For refineries owned by joint ventures, the total employment of both (all) companies must be considered in determining whether the 1,500 employee limit is met. In addition, a refiner who reactivates a refinery that was shut down or non-operational between January 1, 1998 and January 1, 1999, may apply for small refiner status no later than June 1, 2002. In this case, we will consider the information provided to determine the correct period for judging compliance with the 1500 threshold. Where appropriate we will look at the most recent 12 months of employment information.

Refiners seeking small refiner status must also provide us with the total crude capacity of their corporation (the sum of all individual refinery capacities for multiple-refinery companies, including any and all subsidiaries) as reported to EIA for 1998 (published by EIA in 1999). The information submitted to EIA is presumed to be correct. However, in cases where a company disputes this information, we will allow 60 days after the company submits its application for small refiner status for that company to petition the Agency with the appropriate data to correct the record. For reactivated refineries owned by a small refiner, we will consider the information provided to determine the correct period for judging compliance with the corporate capacity threshold. Where appropriate, we will look at the most recent year of crude capacity information.

If a refiner with approved small refiner status later exceeds the 1,500 employee threshold without merger or acquisition or the corporate capacity of 155,000 bpcd, its refineries could keep their individual refinery standards. This is to avoid stifling normal company growth and is subject to our finding that the company did not apply for and receive the small refiner status in bad faith.

[92] Company means the business structure of the refinery whether privately or publicly owned.

iv. How Do Small Refineries Apply for a Sulfur Baseline?

A qualifying small refiner, domestic or foreign, may apply for an individual sulfur baseline by December 31, 2000 for any refinery owned by the company by providing the following information:

• A calculation of the refinery's sulfur baseline using its average gasoline sulfur level based on 1997 and 1998 production data,[93] and

• The average volume of gasoline (including conventional and reformulated) produced in these two years.

As we proposed, baseline sulfur levels and gasoline volumes are averaged over two years (1997 and 1998) to account for any production-related anomalies that may have occurred in 1997 or 1998. For the overall program, however, we are only using 1997 and 1998 data for the reasons described in Section IV.C.1, above. For any refiner who reactivates a refinery that was shut down or non-operational between January 1, 1998 and January 1, 1999, we will use the most recent information available for baseline establishment purposes.

The regulations specify the information to be submitted to support the baseline application. The baseline calculations should include any oxygen added to the gasoline at the refinery. This application would be submitted at the same time the refiner applies for small business status; confirmation of small business status would not be required to apply for an individual sulfur baseline. Pending refinery baseline approval, we will assign standards to each of the company's refineries in accordance with Table IV.C.–3.

Oxygenate blenders, regardless of their size, are not eligible for the small refiner individual baselines and standards because they would not experience circumstances similar to those of small refining companies. That is, oxygenate blenders do not have the burden of capital costs to install desulfurization equipment, which is the primary reason for allowing small refiners to have a relaxed compliance schedule.

v. Volume Limitation on Use of a Small Refinery Standard

Except as noted below, the volume of gasoline subject to a small refinery's individual standards is limited to the average volume of gasoline the refinery produced from crude oil during the baseline years (1997 and 1998), excluding the volume of gasoline produced using blendstocks produced at another refinery and exports.[94] Under this approach, the baseline volume for a small refinery would reflect only the volume of gasoline produced from crude oil during the 1997 and 1998 baseline years.

However, to ensure that the overall sulfur in gasoline from small refiners does not greatly increase under the terms of the small refiner extension and result in overall gasoline pool sulfur levels higher than anticipated, the volume would be limited beginning in 2004 to the volume of gasoline that is the lesser of: (1) 105 percent of the baseline volume, or (2) the volume of gasoline produced during the year from crude oil. Any volume of gasoline produced during an averaging period in excess of this limitation is subject to the corporate average standards that apply to all other refiners (*i.e.,* the corporate average standards listed in Table IV.C.–1).

In 2006 and 2007, the refinery averages of Table IV.C.–1 will apply. In this case, the small refinery's annual average standard will be adjusted based on the excess volume in a manner similar to the compliance baseline equation for conventional gasoline under Section 80.101(f) of Part 40 of the Code of Federal Regulations. However, the small refinery's per-gallon cap standard will not be adjusted.

This limitation assures that small refineries receive relief only for gasoline produced from crude oil, that is the portion of the refinery operation requiring capital investment to meet lower sulfur standards.

vi. Extensions Beyond 2007 for Small Refiners

Beginning January 1, 2008, all small companies' refineries must meet the national sulfur standard of 30 ppm on average and the 80 ppm cap, except small refineries under IV.C.2.i. that apply for and receive an extension of their small refiner status and unique standards. An extension will provide a given small refinery up to an additional two years to comply with the national standards. An extension must be requested in writing and must specify the factors that demonstrate a significant economic hardship to qualify the refinery for such an extension. Factors considered for an extension could include, but are not limited to, the refinery's financial position; its efforts to procure necessary equipment and to obtain design and engineering services and construction contractors; the availability of desulfurization equipment, and any other relevant factors.

In order for us to consider an extension, a refiner must submit a detailed request for an extension by January 1, 2007, demonstrating that it has made best efforts to obtain necessary financing, and must provide detailed information regarding any lack of success in obtaining financing. This information shall include, but may not be limited to copies of loan applications for the necessary financing for the construction of appropriate sulfur reduction technology as well as the application of financing for other equipment procurements or improvements in this time frame. If financing has been disapproved or is otherwise unsuccessful, the refiner shall provide documents supporting the basis for that disapproval and evidence of efforts to pursue other means of financing. If we determine that the refiner has made the best efforts possible to achieve compliance with the national standards by January 1, 2008, but has been unsuccessful for reasons beyond its control, we will consider granting the hardship extension initially for the 2008 averaging period. If further relief is appropriate for good reasons, we will consider a further extension through the 2009 averaging period but in no case will this relief be provided unless the refiner can demonstrate conclusively that it has financing in place and that it will be able to complete construction and meet the national gasoline sulfur standards no later than December 31, 2009.

Compliance Plans for Demonstrating a Commitment To Produce Low Sulfur Gasoline

This final rule includes a compliance plan provision for those refiners who may seek a hardship extension of their approved interim standards. This provision requires that those refiners with approved interim standards who seek a hardship extension must submit a series of reports to EPA discussing and describing their progress toward producing gasoline that meets the 30/80 ppm standards by January 1, 2008. We expect that small refiners will need to begin preparations to meet the national standards in 2008 by 2004. However, we understand that the potential exists for some small refiners to face additional hardship circumstances that will warrant more time to meet the standards. For this reason, we have adopted provisions (see above) allowing

[93] Includes batch number, volume, and sulfur content for each batch of gasoline produced in 1997 and 1998.

[94] In addition to gasoline produced from crude oil, a small refinery's baseline volume would include gasoline produced from purchased blendstocks where the blendstocks are substantially transformed using a refinery processing unit.

refiners subject to the interim standards to petition us and make a showing that additional time is needed to meet the national standards. To properly evaluate these hardship applications, we are requiring demonstrations of good faith efforts towards assessing the economic feasibility, along with the business and technical practicality of ultimately producing low sulfur gasoline. Such progress reports must be submitted for a refiner to receive consideration in any future determinations regarding hardship extensions. However, these reports are not required from refiners who will not be seeking a hardship extension.

By June 1, 2004, such refiners would need to submit preliminary information in the form of a report outlining its time line for compliance and a project plan discussing areas such as permits, engineering plans (*e.g.,* design and construction), and capital commitments for making the necessary modifications to produce low sulfur gasoline. Documents showing activities and progress in these areas should be provided if available.

By no later than June 1, 2005, these small refiners would need to submit a report to us stating in detail progress to date based on their time line and project plan. This should include copies of approved permits for construction of the equipment, contracts for design and construction, and any available evidence of having secured the necessary financing to complete the required construction. If any difficulties in meeting this requirement are anticipated, the refiner must submit a detailed report of all efforts to date and the factors that may cause delay, including costs, specification of engineering or other design work still needed and reasons for delay, specification of equipment needed and any reasons for delay, potential equipment suppliers and history of negotiations, and any other relevant information. If unavailability of equipment is a factor, the report must include a discussion of other options considered, and the reasons these other options are not feasible.

In addition, the small refiner would need to provide evidence by June 1, 2006, that on-site construction has begun at its refinery(s) and that absent unforeseen circumstances or problems, they will be producing complying gasoline (30/80 ppm) by January 1, 2008. While the submission of these progress reports is evidence of a refiner's good faith efforts to comply by 2008, it does not bind the refiner to make gasoline in 2008. There are several reasons why a refiner may choose to exit the gasoline-production business in 2008 that go beyond the low sulfur gasoline requirement.

As a result of a refiner's efforts in moving toward compliance with the 2008 standards, for market, economic, business, or technical reasons, the company could choose not to make gasoline in 2008. Although we do not believe this will be the likely outcome for small refiners, we cannot preclude it. Any refiner that makes such a determination in its progress reports will have until 2008 to transition out of gasoline production, but will not be considered for a extension of hardship relief.

vii. Can Small Refiners Participate in the ABT Program?

As described in IV.C.1.c.i above, any refinery (including those owned by small refiners) can generate sulfur allotments (in ppm-gallons) in 2003 by producing gasoline containing less than 60 ppm sulfur on an annual-average basis. Once this 60 ppm trigger is reached, allotments will be calculated based on the amount of reduction from 120 ppm [95]. However, these allotments may be discounted depending on the actual sulfur level. If a refinery fully demonstrates compliance by producing gasoline with an annual average sulfur level of 0 to 30 ppm, the allotments retain their full value—they are not discounted at all. For actual sulfur levels of 31–60 ppm, which are indicative of a partial demonstration, the allotments are discounted 20 percent.

During the period 2000–2003, refineries owned by small refiners can also generate credits by producing gasoline averaging at least 10 percent lower than that refinery's baseline sulfur level. In other words, to generate credits, the refinery's annual average sulfur level for all of its gasoline on average must be 0.9 × (baseline sulfur level). Once this ''trigger'' is reached, credits will be calculated based on the amount of reduction from the refinery's sulfur baseline. For example, if in 2002 a refinery reduced its annual average sulfur level from a baseline of 450 ppm to 150 ppm (well below the trigger of 0.9 × 450 = 405 ppm), its sulfur credits would be determined based on the difference in annual sulfur level (450—150 = 300 ppm) multiplied by the volume of gasoline produced in 2002. Similarly, small foreign refiner-owned refineries with an individual sulfur baseline can generate credits in these years as long as the annual average sulfur level of the gasoline exported to the U.S. from that refinery is lower than 90 percent of the baseline sulfur level.

During the period 2004–2007, refineries owned by small refiners will be permitted to generate credits but only if their actual annual sulfur level of all gasoline produced or imported averages below their refinery standard, and only for the difference between the standard and the actual annual sulfur average.

A refinery (owned by a small refiner) wishing to participate in the ABT program can sell credits beginning as soon as January 1, 2000 but may wait until December 31, 2000 to apply for small refiner status. However, the standards assigned to that refinery (as presented in Table IV.C–3 above) will be based on the sulfur level from which credits were generated, not the baseline sulfur level, since the refiner would have already demonstrated the ability to meet the lower sulfur level. For compliance purposes and to give refineries certainty regarding the gasoline sulfur standards to which they will be held during 2004–2007, the standards for a small refiner refinery participating in ABT will be set based on the refinery's lowest sulfur average for any year between 1999 and 2003.

Using the example above, a refinery (owned by a refiner with small refiner status) with a 1997–98 baseline sulfur level of 450 ppm would have an interim average standard of 450/2 = 225 ppm and a cap of 225 × 1.5 = 338 ppm. If that refinery generated 300 sulfur credits in 2002 by producing gasoline with 150 ppm sulfur, then that refinery's average sulfur standard for 2004–2007 would be ratcheted down to 150 ppm with a cap of 300 ppm. However, that refinery would still be able to use the 300 credits that it had generated and banked in 2002 for compliance with its 150 ppm standard.

Based on the comments received on our proposal, we are allowing small refineries to use credits and/or allotments that they generated and/or to purchase credits and/or allotments from another refinery to meet their average standard during 2004–2007. We solicited comment on whether small refiners subject to the interim standards should be permitted to use credits towards meeting those standards, and several small refiners who already produce very clean gasoline commented that the special small refiner standards do not benefit them in any way. These refiners argued that if they could generate sufficient sulfur credits in 2000–2003, or could obtain such credits

[95] If a refinery has a baseline sulfur level higher than 120 ppm (as described below in IV.C.1.c.v.), then credits are generated from the baseline to 120 ppm and allotments from 120 ppm to the new sulfur level (and discounted 20 percent if applicable).

through purchases from other refiners, they would not participate in the small refiner program but would instead participate in the sulfur ABT program. But since they are not positioned to generate credits (due to their already low sulfur levels), and have little certainty of being able to purchase credits, they need the relief provided by the small refiner provisions. We concur with these concerns and thus permit small refiners to use ABT credits and allotments. Small refiners may only use ABT credits and/or allotments to comply with their refinery average standard, not the per-gallon caps applied to their gasoline.

At any time, a small refiner can choose to ''opt out'' of the small refiner program and, beginning the next calendar year, comply with the standards in Table IV.C–2. The refiner would have to notify us of this change in its compliance program. Once a small refiner leaves the small refiner program, however, it would not be eligible to re-enter the small refiner program.

b. Temporary Waivers From Low Sulfur Requirements in Extreme Unforeseen Circumstances

In the final rule, EPA is adopting a provision permitting refiners to seek a temporary waiver from the sulfur standards in certain circumstances. Such waivers will be granted at EPA's discretion. Under this provision a refiner may seek permission to distribute gasoline that does not meet the applicable low sulfur standards for a brief time period, based on the refiner's inability to produce complying gasoline because of extreme and unusual circumstances outside the refiner's control that could not have been avoided through the exercise of due diligence. This provision is similar to a provision in EPA's RFG regulations, and is intended to provide refiners short-term relief in unanticipated circumstances such as an accidental refinery fire or a natural disaster. The short-term waiver provision is intended to address unanticipated circumstances that cannot be reasonably foreseen at this time or in the near future

The conditions for obtaining such a waiver that are similar to those in the RFG regulations. These conditions are necessary and appropriate to ensure that any waivers that are granted are limited in scope, and that refiners do not gain economic benefits from a waiver. Therefore, refiners seeking a waiver must show that the waiver is in the public interest, that the refiner was not able to avoid the nonconformity, that it will make up the air quality detriment associated with the waiver, as well as any economic benefit from the waiver, and that it will meet the applicable sulfur standards as expeditiously as possible.

c. Temporary Waivers Based on Extreme Hardship Circumstances

In addition to the provision for short-term relief in unanticipated circumstances, we are adopting a provision for relief based on extreme hardship circumstances. In developing our sulfur program, we considered whether any refiners would face particular difficulty in complying with the standards in the lead time provided. As described in Section IV.C.2.a., we concluded that refineries owned by small businesses would experience more difficulty in complying with the standards on time because, as a group, they have less ability to raise capital necessary for refinery investments, face proportionately higher costs because of economies of scale, and are less able to successfully compete for limited engineering and construction resources. However, it is possible that other refiners who do not meet our criteria for the interim standards also face particular difficulty in complying with the sulfur standards on time. Therefore, we are including in the final rule a provision allowing us, at our discretion, to grant temporary waivers from the sulfur standards based on a showing of extreme hardship circumstances. We do not anticipate, nor do we expect there is a need for, granting temporary waivers that apply to more than approximately one percent of the national gasoline pool in any given year. This provision would allow refiners (domestic and foreign) to request a waiver from the sulfur standards based on a showing of unusual circumstances that result in extreme hardship and significantly affect the ability to comply by the applicable date. As with the small refiner interim standards, this provision furthers our overall environmental goals of achieving low sulfur gasoline nationwide as soon as possible. By providing short-term relief to those refiners that need additional time because they face hardship circumstances, we can adopt a program that reduces gasoline sulfur beginning in 2004 for the majority of the industry that can comply by then.

As described above, EPA understands that this program will require significant economic investments by the refining industry. We have adopted a program with sufficient flexibilities (including an ABT program, allotment trading, a geographic phase-in, and interim standards for qualifying small refiners) to make these investments reasonable and feasible over the time frame in which the standards are phased in. Because the refining industry encompasses a wide variety of individual circumstances, and our program phases in based on the lead time we believe is reasonable for the industry as a whole, there may be unusual circumstances that impose extreme hardship and significantly affect an individual refinery's ability to comply in the lead time provided. However, we do not intend for this waiver provision to encourage refiners to delay planning and investments they would otherwise make in anticipation of receiving relief from the applicable requirements. In addition, we want to limit the environmental impact of any hardship waivers from compliance with the standards. Thus, we anticipate that hardship waivers will only be granted in rare circumstances.

Because of the significant environmental benefits of lowering sulfur in gasoline, we will administer this provision in a manner consistent with continuing to ensure the environmental objectives of the regulation. In our analysis of the interim small refiner standards, we concluded that only a minimal portion of the national gasoline pool would potentially be impacted by the less stringent interim standards, due to the relatively small production volume of these facilities. To limit the potential environmental impact of this hardship provision, we reserve the discretion to deny applications where we find that granting a waiver would result in an unacceptable environmental impact. While this determination will be made on a case-by-case basis, we do not expect there is a need for, nor do we anticipate, granting waivers that apply to more than approximately one percent of the total national pool of gasoline in any given year, or to more than a minimal percentage of the gasoline supply of an area known to have significant air quality problems.

There are several factors we will consider in evaluating a petition for additional time to comply. This could include refinery configuration, severe economic limitations, and other factors that prevent compliance in the lead time provided. Applications for a waiver must include information that will allow us to evaluate all appropriate factors. EPA will consider whether the refinery configuration or operation is unique or atypical, how much of a refinery's gasoline is produced using an FCC unit, its hydrotreating capacity relative to its total crude capacity, total reformer unit throughput capacity relative to total production, gasoline production in proportion to other refinery products, and other relevant factors. A refiner may also face severe economic limitations that result in a demonstrated inability to raise capital to make necessary investments to comply in time, which can be shown by an unfavorable bond rating, inadequate resources of the refiner and its parent and/or subsidiaries, or other relevant factors. In addition, we will look at the total crude capacity of the refinery and its parent corporation. Finally, we will consider where the gasoline will be sold in evaluating the environmental impacts of granting a waiver.

This provision is intended to address unusual circumstances that we expect will be foreseeable now or in the immediate future, such as unique and atypical gasoline refinery operations or a demonstrated inability to raise capital. These kinds of circumstances should be apparent at this time or in the near future, so refiners seeking additional time under this provision must apply for relief by September 1, 2000. A refiner seeking a waiver must show that unusual circumstances exist that impose extreme hardship and significantly affect its ability to meet the standards on time, and that it has made best efforts to comply with the standards, including efforts to obtain credits and/or allotments towards compliance. Applicants for a hardship waiver must also submit a plan demonstrating how the standards will be achieved as expeditiously as possible. In submitting the plan, it must include a timetable for obtaining the necessary capital, contracting for engineering and construction resources, and obtaining permits. EPA will review and act on applications, and, if a waiver is granted, will specify a time period, not to extend beyond January 1, 2008 (the date by which all gasoline is expected to meet the 30 ppm refinery average and 80 ppm per gallon cap standards), for the waiver.

If a waiver is granted, EPA will impose as a condition of the waiver other reasonable requirements, including antibacksliding requirements to ensure no deterioration in the sulfur level of gasoline and interim sulfur standards that the refiner must meet. This is appropriate since some refiners who may qualify for a waiver can achieve some sulfur reductions, and even reductions to levels above 30 ppm will result in some environmental benefits. While this provision allows EPA to waive the per gallon standards as well as the average standards, EPA would not allow gasoline sulfur to exceed the highest per gallon cap applicable to a refiner under the interim small refiner standards described in Section IV.C.2. Once all applications have been received, EPA will consider the appropriate process to follow in reviewing and acting on applications, including whether to conduct a notice and comment decision-making process.

3. Streamlining of Refinery Air Pollution Permitting Process

a. Brief Summary of Proposal

Industry commenters expressed concern over the ability to obtain permits to construct and operate the facility modifications needed to meet the Tier 2 rule requirements by the end of 2004. As part of the preamble to the proposed rule, we outlined possible approaches to provide greater certainty and to expedite potentially applicable permit processes. In general, we solicited comments on whether and how policy options might be designed so as to exempt Tier 2 projects from major New Source Review (NSR) and/or to expedite the processing of permits where such requirements would apply. In particular, we solicited comment on whether the major NSR process could be expedited if: (1) EPA provided guidance on Lowest Achievable Emission Rate (LAER) requirements or Best Available Control Technology (BACT) determinations; (2) emissions reductions could be made available or designated for offsetting Tier 2 activities; (3) EPA developed model permits, or (4) EPA assisted the States in resolving source-specific permitting issues as they would arise. The Agency also solicited comments on how the title V operating permit requirements, where applicable, might need to be integrated with the relevant NSR process.

In proposing various mechanisms to expedite the permitting of Tier 2 projects, we recognized that a combination of measures might be needed, since the situations could vary widely among individual refineries due to differences in such factors as available equipment capacity, amount of sulfur in the crude oil, and applicable State regulations. Source-specific analyses are also necessary to establish what sulfur reduction techniques can be applied, to determine the applicable permitting requirements, and to evaluate what controls will be necessary as a result of these requirements. We indicated our intent to offer assistance where needed.

b. Significant Comments Received

The most significant comments received on the proposal concerning the timing impacts due to air permit requirements are presented below. These commenters focused exclusively on the requirements to obtain a preconstruction permit under the NSR program. Generally, commenters only concerns regarding the title V operating permit program were that the States' ongoing efforts to issue these permits might create a backlog which could delay the issuance of NSR permits for Tier 2 projects. A more detailed discussion of comments received on the proposal and EPA's response are contained in the Response To Comments document and is filed in the Docket for this action.

We received written and oral comments from refineries about the permit requirements associated with Tier 2 projects. Refiners emphasized the need for certainty. They pointed out the need to secure preconstruction permits within 18 months (*e.g.,* 6 months to prepare and file NSR applications and another 12 months to issue the permit) and the need for permitting authorities to commit appropriate resources to meet this time frame. State and local air pollution control agencies did not support providing exemptions from emissions control and permitting requirements. Rather, agency commenters stated that they could accomplish the permitting requirements in the necessary time frames, provided that complete permit applications were received in a timely manner and refiners conferred with their regulatory agencies soon after the Tier 2 requirements are promulgated. They also indicated that the major NSR process could be expedited and have more certainty (i.e., permits could be processed in 6 to 9 months) if EPA would provide guidance on emissions controls, emissions monitoring, and offsets. In general, environmental and community groups pointed out that the remedies under traditional permitting practices should be exhausted before additional flexibility is granted for Tier 2 projects.

c. Today's Action

Based on the comments and other information received in response to the proposal, EPA believes that it is not necessary or appropriate to explore further the development of possible options which would exempt Tier 2 projects from the normally applicable preconstruction review process. This position is supported by: (1) The comments of States that industry can, in general, apply and receive NSR permits in time to comply with Tier 2; and (2) the recognition of industry's potential ability to use emissions reductions to net Tier 2 projects out of major NSR which would otherwise be applicable. Nonetheless, we believe that actions should be taken to facilitate early compliance, to add certainty to the anticipated permitting actions and schedules, and to minimize the possibility of delay. Accordingly, EPA is taking two types of actions to promote these objectives.

First, as previously discussed, we have structured the final gasoline sulfur program to allow additional lead time for many refiners (i.e., certain refineries would be able to make desulfurization changes later than the proposed 2004 compliance date to meet Tier 2 requirements). This approach will help address the concerns over the availability of necessary new equipment and permitting backlogs caused by many refineries acting to obtain permits and order equipment within relatively the same time period.

Second, we intend to take several actions (described in more detail below) to expedite and impart greater certainty in obtaining necessary major NSR permits. As a result of comments received on the proposal, and the lead time provided in the final gasoline sulfur program, we believe that the vast majority of permits can be issued within the necessary time frames, provided that refineries submit their preconstruction applications in a timely manner and regulatory authorities prioritize the issuance of these permits. We also intend to assist States and refiners on a case-by-case basis in their efforts to address any unique permitting problems that might arise and, thus, remedy potential problems that could cause unanticipated delays. In the unlikely event permitting delays occur, EPA will work with refiners and the state/local permitting agencies on a case-by-case basis, where a refinery has unique circumstances that necessitate unique treatment.

While today's strategy will help expedite the permitting process, refineries that trigger major NSR as a result of producing low sulfur gasoline will still have to install the stringent level of emissions control technology required by the Act. However, we intend to issue guidance to assist states in making decisions about the levels of control technology, as described more below. In addition, the Agency wishes to clarify that, in our efforts to provide greater certainty and to facilitate more expeditious permitting, we are in no way shortcutting existing opportunities for public participation. We recognize the importance of public participation in making permitting decisions and intend that the measures adopted to address permitting concerns will not diminish the opportunities for public participation.

i. Major New Source Review

The major NSR program, as it applies to existing major stationary sources of air pollution, requires that a preconstruction permit be issued before a source makes a physical change or change in its method of operation of any project that would result in a significant net emissions increase. As described in the proposal, the steps taken by certain refineries to implement gasoline sulfur reductions to meet today's rule could result in emissions increases in one or more pollutants which may trigger the requirements for this type of preconstruction permit. A number of the refineries are located in areas designated as nonattainment for at least one pollutant. The nonattainment NSR requirements pursuant to part D of the Act would apply to any such refinery undergoing a major modification. For those refineries located in attainment or unclassifiable areas, permit requirements for the prevention of significant deterioration (PSD) of air quality must be met for major modifications.

The EPA recognizes the importance of timely major NSR (as applicable) permit actions for refineries to proceed with necessary changes to meet the new low sulfur gasoline standard. We encourage refineries to begin discussions with permitting authorities and to submit permit applications—as early as possible. In addition, based on comments received, we believe that there are a few key areas in which assistance would be useful toward helping States issue timely permits to the applicable refineries:

• *Federal guidance on emissions control technology requirements.*

Refineries subject to major NSR review will be required to undergo a source-specific evaluation to apply either BACT or LAER, depending upon the applicable program requirements. For example, the evaluation for BACT is case-by-case and takes into account the alternative technologies available to control pollution from a particular emissions unit or process, and considers the energy, environmental, economic and other costs associated with each technology. We intend to issue guidance setting out a level of emissions that, in our view, would be expected to satisfy the requirements for BACT for certain emissions units associated with refinery desulfurization projects. While States would not be required to use the results to establish BACT for a particular refinery subject to review and EPA's guidance on a control technology may not be appropriate where there exists unusual site-specific circumstances, such guidance would add the certainty of EPA's expectations.

Since negotiation of an appropriate BACT level often is one of the most time consuming aspects of permitting, we believe this EPA guidance will significantly expedite the process. The federal guidance on BACT, by including an evaluation of the most stringent control levels currently being achieved or required, will also provide federal guidance on LAER. The EPA plans to make a draft of this guidance available for public review and comment in January 2000. Final guidance would then be prepared, after relevant comments are considered, in time for States, refiners, and the public to consider in preparing and reviewing permit applications and proposed permits.

• *Availability of offsets.*

Refineries located in nonattainment areas must offset any proposed significant emissions increases with an equal or greater amount of emissions reductions from other sources, usually coming from within the same nonattainment area. We believe that vehicle emissions reductions resulting from the use of low sulfur gasoline can be used as offsets for the refineries, as long as the statutory and regulatory criteria for creditable offsets are satisfied and States decide to provide for this opportunity in their SIP attainment demonstration. We believe generally that this option should be available to States since only a small fraction of the total vehicle emissions reductions in any county would be needed to offset refinery emissions increases resulting from implementation of gasoline desulfurization projects. Generally, the reductions must also occur in the same nonattainment area as the location of the refinery for which the offsets are required. The EPA plans to issue the appropriate guidance early in the year 2000 to help a State to determine whether and to what extent it may wish to use vehicle emissions reductions as offsets for Tier 2 projects.

• EPA refinery permitting teams.

We intend to assemble special EPA teams, comprised of Headquarters and Regional Office experts, that will track the overall progress in permit issuance and will be available to assist State and local permitting authorities, refineries, and the public upon request to resolve site-specific permitting issues. These teams will be comprised of persons who are knowledgeable about permitting programs and refinery operations and can provide expert assistance to troubleshoot permitting issues that may arise. As appropriate, the teams will work with stakeholders on a case-by-case basis to evaluate site-specific approaches to regulatory compliance within existing policy and regulations.

ii. Environmental Justice

The Tier 2/gasoline sulfur rule will help achieve significant nationwide reductions in the emissions of nitrogen oxides (NOx), volatile organic compounds (VOC), particulate matter (PM), and sulfur dioxide (SO_2). These reductions will improve air quality across the country and will provide increased protection to the public against a wide range of health effects, including chronic bronchitis, respiratory illnesses, and aggravation of asthma symptoms. Furthermore, the Tier 2/gasoline sulfur rule will achieve environmental benefits in the local areas where refineries are located, due to reductions in tail pipe emissions from vehicles driven in those areas. Although we expect residual emissions increases at some refineries even after installing the stringent level of emissions controls required under the Act, for the vast majority of areas, we believe that these potential refinery emissions increases will be very small compared to the Tier 2 benefits in those same local areas.

We believe it is important to understand and address concerns relating to potential localized emissions increases from refineries that make significant process changes to meet the requirements of the Tier 2 rule. We believe that, among other things, the keys to addressing any potential concerns are as follows:

- Providing meaningful community involvement early and throughout the process;
- Determining what information and actions would eliminate concerns; and
- Determining what EPA, States, and industry can do to make the permitting process smoother by ensuring ongoing community involvement in the decision making process and by building trust among stakeholders.

To this end, the Agency has already taken some actions to try to mitigate potential environmental justice concerns. First, EPA's Office of Air and Radiation and the Alternative Dispute Resolution Team within EPA's Office of the Administrator implemented a national convening process which was designed to bring together a broad spectrum of stakeholders to explore with them their perceptions and views of issues associated with Tier 2 permitting and to assess the potential for a collaborative process to address specific implementation issues at some time in the future. The convening was carried out by an outside neutral party who conducted interviews with representatives from selected EPA offices, States, industry, environmental groups, and environmental justice organizations. Second, EPA held informational briefings and provided background materials to the National Environmental Justice Advisory Council's (NEJAC) [96] Air and Water Subcommittee and Enforcement Subcommittee to provide an opportunity for them to provide feedback and recommendations to the Agency. Finally, in October 1999, we met with both national environmental groups and environmental justice advocacy representatives, to discuss their views on the permitting aspects of the proposed rule.

The EPA is committed to continue working with all stakeholders to resolve specific Environmental Justice issues if and when they arise. To fulfill this commitment, we plan to undertake additional actions in the future, including providing education and outreach about the rule and its impacts in local communities, developing permitting guidance through a public process and addressing Title VI petitions if they arise.

D. What Are the Economic Impacts, Cost Effectiveness and Monetized Benefits of the Tier 2 Program?

Consideration of the economic impacts of new standards for vehicles and fuels has been an important part of our decision making process for this final rule. The following sections describe first the costs associated with meeting the new vehicle standards and the new fuel standards. This will be followed with a discussion of the cost effectiveness of the rule. Lastly, we will discuss the results of a benefit-cost assessment that we have prepared.

Full details of our cost analyses, including information not presented here, can be found in the RIA associated with this rule. Also, our response to comments on the cost, cost effectiveness, and monetized benefits analyses are contained in the Response to Comments document for this rule.

1. What Are the Estimated Costs of the Vehicle Standards?

To perform a cost analysis for the standards, we first determined a package of likely technologies that manufacturers could use to meet the standards and then determined the costs of those technologies. In making our estimates we have relied on our own technology assessment which included publicly available information, such as that developed by California, as well as confidential information supplied by individual manufacturers, and the results of our own in-house testing.

In general, we expect that the Tier 2 standards will be met through refinements of current emissions control components and systems rather than through the widespread use of new technology. Furthermore, smaller lighter-weight vehicles and trucks will generally require less extensive improvements than larger vehicles and trucks. More specifically, we anticipate a combination of technology upgrades such as the following:

- Improvements to the catalyst system design, structure, and formulation plus in some cases an increase in average catalyst size and loading;
- Air and fuel system modifications including changes such as improved microprocessors, improved oxygen sensors, leak free exhaust systems, air assisted fuel injection, and calibration changes including improved precision fuel control and individual cylinder fuel control;
- Engine modifications, possibly including an additional spark plug per cylinder, an additional swirl control valve, or other hardware changes needed to achieve cold combustion stability;
- Increased use of fully electronic exhaust gas recirculation (EGR); and
- Increased use of secondary air injection for 6 cylinder and larger engines.

The costs for MDPVs have been included here with the LDT4 cost estimates. We expect that the technologies needed to meet the Tier 2 standards for the MDPVs will be very similar to those for LDT4s. However, the MDPVs cost estimates are somewhat higher than for LDT4s. Vehicles over 8,500 pounds GVWR are currently certified to heavy-duty engine emissions standards using the heavy-duty test procedures. This, at least in part, has led to differences in baseline technologies compared to current LDT4s. Vehicles above 8,500 pounds, for example, are currently equipped with technologies such as close coupled catalysts and secondary air injection to a lesser extent. Therefore, we expect higher incremental costs for the MDPVs compared to LDT4s. There is further information on the costs for MDPVs in the RIA.

[96] The NEJAC was chartered in 1993 expressly to give the EPA Administrator independent advice, consultation, and recommendations on environmental justice matters. NEJAC members come from state, tribal, and local governments; tribal and indigenous citizen's organizations; business and industry; academia; and environmental advocacy and grassroots community groups.

Using a typical mix of changes for each group, we projected costs separately for LDVs, the different LDT classes, and for different engine sizes (4, 6, 8, 10-cylinder) within each class. For each group we developed estimates of both variable costs (for hardware and assembly time) and fixed costs (for R&D, retooling, and certification).

Cost estimates based on the current projected costs for our estimated technology packages represent an expected incremental cost of vehicles in the near-term. For the longer term, we have identified factors that would cause cost impacts to decrease over time. First, since fixed costs are assumed to be recovered over a five-year period, these costs disappear from the analysis after the fifth model year of production. Second, the analysis incorporates the expectation that manufacturers and suppliers will apply ongoing research and manufacturing innovation to making emission controls more effective and less costly over time. Research in the costs of manufacturing has consistently shown that as manufacturers gain experience in production and use, 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.[97] These reductions in production costs are typically associated with every doubling of production volume. Our analysis incorporates the effects of this ''learning curve'' by projecting that the variable costs of producing the Tier 2 vehicles decreases by 20 percent starting with the third year of production. We applied the learning curve reduction only once since, with existing technologies, there would be less opportunity for lowering production costs than would be the case with the adoption of new technology.

We have prepared our cost estimates for meeting the Tier 2 standards using a baseline of NLEV technologies for LDVs, LDT1s, and LDT2s, and Tier 1, or current technologies for LDT3s, LDT4s and MDPVs. These are the standards that vehicles would be meeting in 2003.[98] We have not specifically analyzed smaller incremental changes to technologies that might occur due to the interim standards between the baseline and Tier 2. In most cases, we believe these changes will not be significant based on current certification levels and manufacturers will maximize carry-over. For others, manufacturers can use averaging and other program flexibilities to avoid redesigning vehicles twice within a relatively short period of time. We believe this is likely to be an attractive approach for manufacturers due to the savings in R&D and other resources.

For the total annual cost estimates, we projected that manufacturers will start the phase-in of Tier 2 vehicles with LDVs in 2004 and progress to heavier vehicles until all LDT2s meet Tier 2 standards in 2007. For LDT3s and LDT4s, we projected some sales of Tier 2 LDT3s prior to 2008 for purposes of averaging in the interim program and that the phase-in of Tier 2 vehicles would end with LDT4s and MDPVs in 2009.

Finally, we have incorporated what we believe to be a conservatively high level of R&D spending at $5,000,000 per vehicle line (with annual sales of 100,000 units per line). We have included this large R&D effort because calibration and system optimization is likely to be a critical part of the effort to meet Tier 2 standards. However, we believe that the R&D costs may be generous because the projection ignores the carryover of knowledge from the first vehicle lines designed to meet the standard to others phased-in later.

The evaporative emissions standards we are finalizing today for LDVs, LDTs and MDPVs are feasible with relatively small cost impacts. We estimate the cost of system improvements to be about $4 per vehicle, for all vehicle classes. This incremental cost reflects the cost of moving to low permeability materials, improved designs or low-loss connectors. R&D for the evaporative emissions standard is included in the R&D estimates given above for the tailpipe standards. We have included no projections of learning curve reductions for the evaporative standard.

Table IV.D.–1 provides our estimates of the per vehicle increase in purchase price for LDVs, LDTs, and MDPVs. The near-term cost estimates in Table IV.D.–1 are for the first years that vehicles meeting the standards are sold, prior to cost reductions due to lower productions costs and the retirement of fixed costs. The long-term projections take these cost reductions into account. We have sales weighted the cost differences for the various engine sizes (4-, 6-, 8-, 10-cylinder) within each category.

TABLE IV.D.–1.—ESTIMATED PURCHASE PRICE INCREASES DUE TO TIER 2 TAILPIPE STANDARDS

	LDV	LDT1	LDT2	LDT3	LDT4/ MDPVs[a]
Tailpipe standards:					
Near-term (year 1)	$78	$70	$125	$245	$258
Long-term (year 6 and beyond)	49	45	97	199	208
Evaporative Standard	4	4	4	4	4

Notes:
[a] Weighted average.

We did not receive comments disagreeing with the technology projections or technology cost estimates contained in the proposal. We have, however, revised our cost estimates somewhat based on new information available since the proposal. We moderately lowered our cost estimates due to adjustments we have made in our technology projections. Based on the results of our vehicle testing program described above in section IV.A.1., we now believe that a few of the hardware changes we had anticipated are not likely to be needed to meet the standards. Albeit there is always fluctuation, the spot prices of precious metals have increased somewhat since the proposal and we have adjusted our analysis to reflect those changes.

Overall, the cost estimates are within 5 percent of those in the proposal for LDVs and LLDTs. The changes noted above moderately lowered the costs for HLDTs compared to the proposal. The cost increase due to the inclusion of MDPVs offsets most of the lowered costs

[97] ''Learning Curves in Manufacturing,'' Linda Argote and Dennis Epple, Science, February 23, 1990, Vol. 247, pp. 920–924.

[98] Even though the NLEV program ends in the Tier 2 timeframe, we have not included the NLEV program costs or benefits in our analysis, since EPA analyzed and adopted NLEV previously.

for the LDT4 category. The resulting cost estimate for the LDT4/MDPVs tailpipe standards is also within 5 percent of the cost estimates for LDT4s contained in the proposal. The detailed technology and cost analyses are available in the RIA.

We are also finalizing OBD II requirements and onboard vapor recovery (ORVR) requirements for MDPVs. We have estimated that OBD II will cost about $80, which includes the costs of additional sensors and system improvements. We have estimated ORVR system costs to be about $10. The $10 cost for ORVR does not include any fuel cost savings over the life of the vehicles due the recover of fuel vapor during refueling. ORVR provides a fuel cost savings because the vapors are captured, and burned in the engine, rather than escaping to the atmosphere. We estimate the savings over the life of the vehicle to be about $6. These costs are not reflected in Table IV.D.–1.

2. Estimated Costs of the Gasoline Sulfur Standards

As we explained at the beginning of Section IV.C, we expect that most refiners will have to install capital equipment to meet the gasoline sulfur standard. Presuming that refiners will want to minimize the cost involved, the majority of refiners are expected to desulfurize the gasoline blendstock produced by the fluidized catalytic cracker (FCC) unit, although a few may choose to desulfurize the feed to the FCC unit. Recent advances have led to significant improvements in the hydrotreating technologies used for FCC gasoline desulfurization. Since these improved technologies represent the lowest cost options and are expected to be used by most refiners needing to install desulfurization equipment, we have based our cost estimates primarily on their use. However, in acknowledgment that some refiners, particularly those which make investment decisions in the near term, are likely to select more traditional approaches using proven technologies, we have included the costs for currently proven desulfurization technologies in our analysis, as well. This is different from the analysis we did in support of our proposal, where we assumed that all refiners would take advantage of the most improved technologies we were aware of at that time.

For our analysis of the costs of controlling gasoline sulfur, we estimated the costs in five different regions of the country (Petroleum Administration Districts for Defense, or PADDs) for reductions from the current PADD average gasoline sulfur level down to a 30 ppm average. We then combined the regional costs to develop an average national individual refinery cost, and used this figure to calculate national aggregate capital and operating costs. In our proposal we estimated a single cost for desulfurizing gasoline, using as an assumption for the purpose of analysis that all refiners would upgrade their refineries by 2004 and that all would choose one of two improved technologies we knew of at the time. We then reduced this cost over time to reflect expected cost reductions due to further technology advancements and reduced operating costs due to improved understanding of the technologies and refinery debottlenecking. Based on improved information about the availability of technologies, we have now analyzed the costs of controlling sulfur on a year-by-year basis beginning with 2004, to be consistent with our analysis of the rate at which the industry would invest in desulfurization technologies over the first years of the program and the changing technology selections (and costs) that would accompany this phase-in (discussed in Section IV.C.1 above). A detailed description of our calculations can be found in the Regulatory Impact Analysis; the reader can refer to the draft RIA released with the proposed rule for more information on our prior analysis.

We estimate that, on average, refineries which install equipment to meet the 30 ppm average standard will invest about $44 million for capital equipment and spend about $16 million per year for each refinery to cover the operating costs associated with these desulfurization units. Since this average represents many refineries diverse in size and gasoline sulfur level as well as a mix of desulfurization technologies, some refineries will pay more and others less than the average costs. When the average per-refinery cost is aggregated for all the gasoline expected to be produced in this country in 2008 (the first year that all refiners will be required to meet the 30 ppm standard, unless any small refiners are granted a extension of hardship relief), the total investment for desulfurization processing units (spread between 2003 and 2007) is estimated to be about $4.3 billion, and operating costs for these units is expected to be about $1.3 billion per year.

Using our estimated capital and operating costs for domestic refineries, we calculated the average per-gallon cost of reducing gasoline sulfur down to 30 ppm for each year as the program is implemented. Using a capital cost amortization factor (based on a seven percent rate of return on investment) and including no taxes, we estimated the average national cost for desulfurizing gasoline to be about 1.7–1.9 cents per gallon as the program is phased in. This cost is the cost to society of reducing gasoline sulfur down to 30 ppm that we used for estimating cost effectiveness. Table IV.D.–2 below summarizes our estimates of per-gallon gasoline cost increases for select years.

TABLE IV.D.–2.—ESTIMATED PER-GALLON COST FOR DESULFURIZING GASOLINE IN FUTURE YEARS

Year	Cost (cents/gallon)
2004	1.9
2005	1.9
2006	1.7
2007	1.7
2008–2018	1.7
2019+	1.3

Although the costs shown here are slightly higher than we projected in the proposal, overall, we believe our revised costs are consistent with those in the proposal and that our improved methodology and information are the source of the differences. As stated earlier in this section, we believe this analysis more accurately reflects the actual investment decisions of individual refiners over the years in which the industry is phasing down sulfur levels. Furthermore, we have also made a number of other adjustments to our analysis of capital and operating costs for each individual technology based on new information received from the technology vendors and information we obtained during the comment period. For example, we now include eight different technologies in our analysis, including some more traditional approaches, whereas in the proposal we only considered two new technologies. Hence, the range of costs is broader. In addition, as explained in the RIA, we now believe we underestimated the capital costs of desulfurization slightly in the proposal based on our calculation of the costs of providing hydrogen to the processes. We believe our analysis now reflects the most up-to-date information about the costs of installing and operating the various desulfurization technologies included in our analysis. These adjustments are explained in detail in the Regulatory Impact Analysis.

We still believe that over time, particularly in 2006–8 when the last refineries will be making investments, the costs of gasoline desulfurization equipment will be significantly lower than it is today. Some of the technologies expected to be selected in this time frame (specifically, the new adsorption technologies which we didn't know about when we proposed these requirements) are projected to cost about half of what the older technologies cost. Furthermore, with time refiners will have to replace existing desulfurization equipment (as equipment ages), and by then they will have a number of low cost alternatives to choose from. Thus, as Table IV.D.–2 shows, the long term estimated costs for gasoline desulfurization are lower than those we projected in our proposal.[99]

3. What Are the Aggregate Costs of the Tier 2/Gasoline Sulfur Final Rule?

Using current data for the size and characteristics of the vehicle fleet and making projections for the future, the per-vehicle and per-gallon fuel costs described above can be used to estimate the total cost to the nation for the emission standards in any year. Figure IV.D.–1 portrays the results of these projections.[100]

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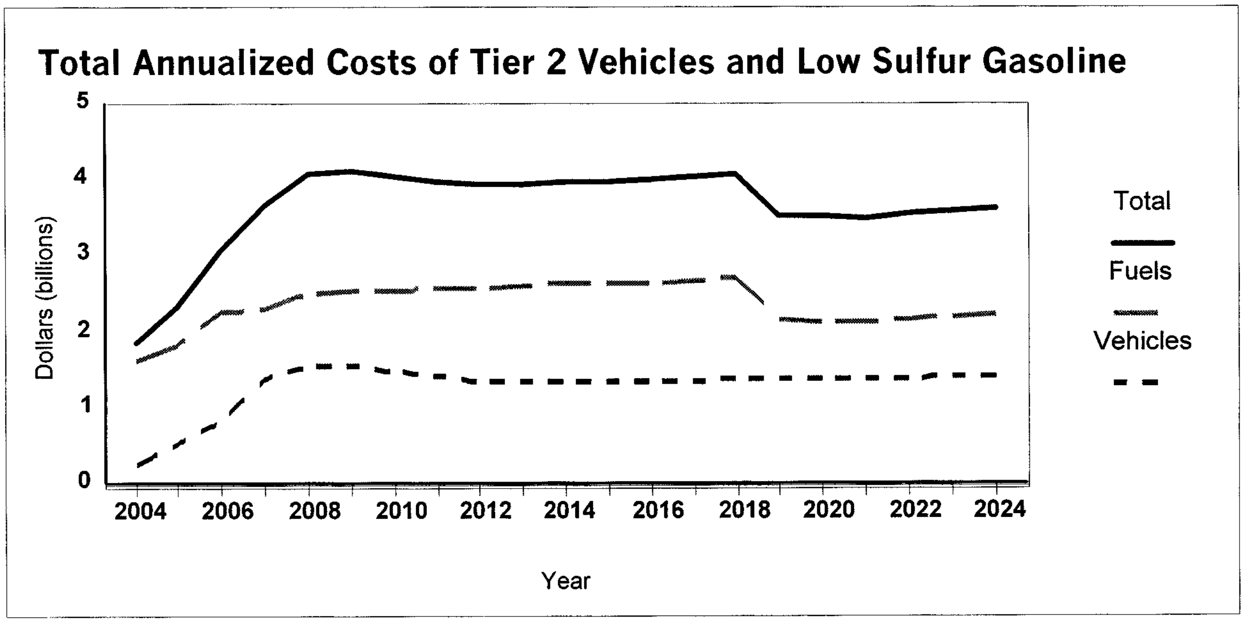
Figure IV.D. -1



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As can be seen from the figure, the annual cost starts out at about $1.9 billion per year and increases over the phase-in period to about $4.1 billion in 2008. Total annualized costs are projected to remain at about $4 billion through 2018. After 2018, annualized fuel costs are projected to decrease somewhat due to the use of new technologies which would enable refiners to produce low sulfur fuel at a lower cost. The gradual rise in costs long term is due to the effects of projected growth in vehicle sales and fuel consumption. The RIA provides further detail regarding these cost projections.

4. How Does the Cost-effectiveness of This Program Compare to Other Programs?

This section summarizes the cost-effectiveness analysis conducted by EPA and its results. The purpose of this analysis is to show that the reductions from the vehicle and fuel controls being finalized today are cost-effective in comparison to alternative means of attaining or maintaining the NAAQS. This analysis involves a comparison of our program not only to past measures, but also to other potential future measures that might be employed to attain and maintain the NAAQS. Both EPA and states have already adopted numerous control measures, and remaining measures tend to be more expensive than those previously employed. As we employ the most cost-effective available measures first, more expensive ones tend to become necessary over time.

The emission reductions used to calculate the cost-effectiveness levels reported here are based on those reductions used for our air quality analysis modeling and benefits analysis. This was done to maintain consistency in the analyses. As noted in Section III.B. above, we have updated our inventory model since the air quality modeling inventories were calculated. In Chapter III of our RIA, Table III.A.–3 compares the updated Tier 2 model with the air quality analysis modeling and shows that the emission reductions expected from Tier 2/gasoline sulfur will be substantially greater than the amounts originally calculated. If the

[99] For a sensitivity analysis of our cost estimates using alternative assumptions, please see Chapter V of the RIA.

[100] Figure IV.D.–1 is based on the amortized costs from Tables IV.D.–1 and IV.D.–2. Actual capital investments, particularly important for fuels, would occur prior to and during the initial years of the program, as described above in section IV.D.2.

updated numbers were incorporated into our cost-effectiveness we would expect the results to be improved over those shown in this section.

We received a number of comments on our cost-effectiveness analysis in response to our NPRM. Our responses to these comments can be found in the Response To Comments document.

a. Cost-Effectiveness of This Program

We have calculated the cost-effectiveness of the exhaust emission/gasoline sulfur standards and the evaporative emission standards, based on two different approaches. The first considers the net present value of all costs incurred and emission reductions generated over the life of an average Tier 2 vehicle. This per-vehicle approach focuses on the cost-effectiveness of the program from the point of view of the Tier 2 vehicles which will be used to meet the new requirements, and is the method used in our proposal. However, the per-vehicle approach does not capture all of the costs or emission reductions from the Tier 2/gasoline sulfur program since it does not account for the use of low sulfur gasoline in pre-Tier 2 vehicles. Therefore, we have also calculated an aggregate cost-effectiveness using the net present value of costs and emission reductions for all in-use vehicles over a 30-year time frame.

As described earlier in the discussion of the cost of this program, the cost of complying with the new standards will decline over time as manufacturing costs are reduced and amortized capital investments are recovered. To show the effect of declining cost in the per-vehicle cost-effectiveness analysis, we have developed both near term and long term cost-effectiveness values. More specifically, these correspond to vehicles sold in years one and six of the vehicle and fuel programs. Vehicle cost is constant from year six onward. Fuel costs per gallon continue to decline slowly in the years past year six; however, the overall impact of this decline is small and we have decided to use year six results for our long term cost-effectiveness. Chapter VI of the RIA contains a full description of this analysis, and you should look in that document for more details of the results summarized here.

The aggregate approach to calculating the cost-effectiveness of our program involves the net present value of all nationwide emission reductions and costs for a 30-year period beginning with the start of the program in 2004. This timeframe captures both the early period of the program when very few Tier 2 vehicles will be in the fleet, and the later period when essentially all vehicles in the fleet will meet Tier 2 standards. We have calculated the aggregate cost-effectiveness using the net present value of the nationwide emission reductions and costs for each calendar year. These emission reductions and costs are summarized in Sections III.B, III.C, and IV.D.3, and are given for every calendar year in the RIA. For more information on how the aggregate cost-effectiveness was calculated please refer to the RIA.

Our per-vehicle and aggregate cost-effectiveness values are given in Tables IV.D.–3 and IV.D.–4. Table IV.D.–3 summarizes the per-vehicle, net present value lifetime costs, $NMHC+NO_X$ emission reductions, and resulting cost-effectiveness results for our Tier 2/gasoline sulfur program using sales weighted averages of the costs (both near term and long term) and emission reductions of the various vehicle classes affected. Table IV.D.–4 provides the same information from the program aggregate perspective. It includes the net present value of the 30-year stream of vehicle and fuel costs, $NMHC+NO_X$ emission reductions, and the resulting aggregate cost-effectiveness. For simplicity, we have used the midpoint of our estimated range of 20 to 65 percent for the irreversibility effect. The full range of irreversibility would only cause the cost-effectiveness values to differ from those in Table IV.D–3, for example, by $60/ton to $100/ton. Note that, even though we are setting new standards for PM, those standards are already being met, so there is no cost associated with the new PM standard and therefore no separate cost-effectiveness analysis for PM.

Tables IV.D.–3 and IV.D.–4 also display cost-effectiveness values based on two approaches to account for the reductions in SO_2 and tailpipe emitted sulfate particulate matter (PM) associated with the reduction in gasoline sulfur. While these reductions are not central to the program and are therefore not displayed with their own cost-effectiveness, they do represent real emission reductions due to our program. The first set of cost-effectiveness numbers in the tables simply ignores these reductions and bases the cost-effectiveness on only the $NMHC+NO_X$ reductions from Tier 2/gasoline sulfur. The second set accounts for these ancillary reductions by crediting some of the cost of the program to SO_2 and PM reduction. The amount of cost allocated to SO_2 and PM is based on the cost-effectiveness of SO_2 and PM emission reductions that could be obtained from alternative, potential future EPA programs.

TABLE IV.D–3.—PER-VEHICLE COST-EFFECTIVENESS OF THE STANDARDS

Cost basis	Discounted lifetime vehicle & fuel costs	Discounted lifetime NMHC + NO_X reduction (tons)	Discounted lifetime cost-effectiveness per ton	Discounted lifetime cost-effectiveness per ton with SO_2 and direct PM credit[a]
Near term cost (production year 1)	$243	0.110	$2,211	$1,717
Long term cost (production year 6)	205	0.110	1,863	1,368

Notes:
[a] $51 credited to SO_2 ($4,800/ton), $4 to direct PM ($10,000/ton).

TABLE IV.D–4.—AGGREGATE COST-EFFECTIVENESS OF THE STANDARDS

Discounted aggregate vehicle & fuel costs	Discounted aggregate NMHC + NO_X reduction (tons) (millions)	Discounted aggregate cost-effectiveness per ton	Discounted aggregate cost-effectiveness per ton with SO_2 and direct PM credit [a]
$48.1 billion	23.5	$2,047	$1,311

Notes:
[a] $13.8 billion credited to SO_2 ($4,800/ton), $3.5 billion to direct PM ($10,000/ton).

b. How Does the Cost-Effectiveness of This Program Compare With Other Means of Obtaining Mobile Source NO_X + NMHC Reductions?

In comparison with other mobile source control programs, we believe that our program represents the most cost-effective new mobile source control strategy currently available that is capable of generating substantial NO_X + NMHC reductions. This can be seen by comparing the cost-effectiveness of today's program with a number of mobile source standards that EPA has adopted in recent years. Table IV.D.–5 summarizes the cost-effectiveness of several recent EPA actions.

TABLE IV.D.–5.—COST-EFFECTIVENESS OF PREVIOUSLY IMPLEMENTED MOBILE SOURCE PROGRAMS

Program	$/ton [a] NO_X+NMHC
2004 Highway HD Diesel stds	204–399
Nonroad Diesel engine stds	410–650
Tier 1 vehicle controls	1,980–2,690
NLEV	1,859
Marine SI engines	1,128–1,778
On-board diagnostics	2,228

Notes: [a] Costs adjusted to 1997 dollars.

We can see from the table that the cost-effectiveness of the Tier 2/gasoline sulfur standards falls within the range of these other programs. Engine-based standards (the 2004 highway heavy-duty diesel standards, the nonroad diesel engine standards and the marine spark-ignited engine standards) have generally been less costly than Tier 2/gasoline sulfur. Vehicle standards, most similar to today's program, have values comparable to or higher than Tier 2/gasoline sulfur.

The values in Table IV.D.–5 might imply that further reductions in NO_X and VOC from heavy-duty engines could be more cost-effective than the reductions that will be produced from our Tier 2/gasoline sulfur program. However, we do not believe that to be the case. While we are indeed developing a proposal for further control from heavy-duty engines, we expect that substantial further emission reductions will require advanced after-treatment devices. These devices will be more costly than methods used to meet our past standards, and will have difficulty functioning properly without changes to diesel fuel. We therefore expect that the cost effectiveness of future heavy-duty standards is not likely to be significantly less than the cost effectiveness of today's rule.

On the light-duty vehicle side, the last two sets of standards were Tier 1 and NLEV, which had cost-effectiveness comparable to or higher than Tier 2/gasoline sulfur. Compared to engines, these levels reflect the advanced (and more expensive) state of vehicle control technology, where standards have been in effect for a much longer period than for engines. Considering the increased stringency of the Tier 2 standards, it is noteworthy that the cost-effectiveness of Tier 2/gasoline sulfur is in the same range as these actions. Based on these results, Tier 2/gasoline sulfur is a logical and consistent next step in vehicle control.

In conclusion, we believe that the Tier 2/Gasoline Sulfur program is a cost-effective program for mobile source NO_X + NMHC control. We are unable to identify another mobile source control program that would be more cost-effective than Tier 2/gasoline sulfur while also producing equivalent reductions in NO_X and NMHC emissions in the same timeframe as our program.

c. How Does the Cost-Effectiveness of This Program Compare With Other Known Non-Mobile Source Technologies for Reducing NO_X + NMHC?

In evaluating the cost-effectiveness of the Tier 2/Gasoline Sulfur program, we also considered whether our program is cost-effective in comparison with alternative means of attaining or maintaining the NAAQS other than mobile source programs. As described below, we have concluded that Tier 2/Gasoline Sulfur is cost-effective considering the anticipated cost of other technologies that will be needed to help attain and maintain the NAAQS.

In the context of the Agency's rulemaking to revise the ozone and PM NAAQS, [101] the Agency compiled a list of additional known technologies that could be considered in devising new emission reductions strategies.[102] Through this broad review, over 50 technologies were identified that could reduce NO_X or VOC. The cost-effectiveness of these technologies averaged approximately $5,000/ton for VOC and $13,000/ton for NO_X. These values clearly indicate that not only are future emission control strategies likely to be more expensive (less cost-effective) than past strategies, but the cost-effectiveness of our Tier 2/Gasoline Sulfur program falls at the lower end of the range for potential future strategies.

In addition, our Tier 2/Gasoline Sulfur program will deliver critical further reductions that are not readily obtainable by any other means known to the Agency. If all of the technologies modeled in the NAAQS analysis costing less than $10,000/ton were implemented nationwide, they would produce NO_X emission reductions of about 2.9 million tons per year. The Tier 2/Gasoline Sulfur program by itself will generate about 2.8 million tons per year once fully implemented. Given the continuing need for further emission reductions, we believe that Tier 2/Gasoline Sulfur control is clearly a cost-effective approach for attaining and maintaining the NAAQS.

We recognize that the cost-effectiveness calculated for Tier 2/Gasoline Sulfur is not strictly comparable to a figure for measures targeted at nonattainment areas, since Tier 2/Gasoline Sulfur is a nationwide program. However, there are several additional considerations that have led us to conclude that Tier 2/Gasoline Sulfur is cost-effective considering

[101] This rulemaking was remanded by the D.C. Circuit Court on May 14, 1999. However, the analyses completed in support of that rulemaking are still relevant, since they were designed to investigate the cost-effectiveness of a wide variety of potential future emission control strategies.

[102] ''Regulatory Impact Analyses for the Particulate Matter and Ozone National Ambient Air Quality Standards and Proposed Regional Haze Rule,'' Appendix B, ''Summary of control measures in the PM, regional haze, and ozone partial attainment analyses,'' Innovative Strategies and Economics Group, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC, July 17, 1997.

alternative means of attaining and maintaining the NAAQS.

First of all is the fact that the cost effectiveness of Tier 2/Gasoline Sulfur is so much better than the numbers developed for the NAAQS analysis. It is only 20 percent as costly per ton as the $10,000 per ton upper limit employed in that analysis for selecting suitable strategies even though, as noted above, Tier 2/Gasoline Sulfur will produce almost the same level of emission reduction. Furthermore, as a national program, Tier 2/Gasoline Sulfur can be implemented as a single unified rule without the need for individual action by each of the states.

In dealing with the question of comparing local and national programs, it is also relevant to point out that, because of air transport, the need for NO_X control is a broad regional issue not confined to non-attainment areas only. To reach attainment, future controls will need to be applied over widespread areas of the country. In the analyses supporting the recent NO_X standards for highway diesel engines,[103] we looked at this question in some detail and concluded that the regions expected to impact ozone levels in ozone nonattainment areas accounted for over 85% of total NO_X emissions from a national heavy-duty engine control program. Similarly, NO_X emissions in attainment areas also contribute to particulate matter nonattainment problems in downwind areas. Thus, the distinction between local and national control programs for NO_X is less important than it might appear.

Finally, the statute indicates that in considering the cost-effectiveness of Tier 2/Gasoline Sulfur EPA should consider not only attainment, but also maintenance of the standards. Tier 2/Gasoline Sulfur—unlike nonattainment area measures—will achieve attainment area reductions that, among other effects, will help to maintain air quality that meets the NAAQS. These reductions relate not only to the ozone and PM NAAQS, but also to SO_2 and NO_2, and to CO.

In summary, given the array of controls that will have to be implemented to make progress toward attaining and maintaining the NAAQS, we believe that the weight of the evidence from alternative means of providing substantial NO_X + NMHC emission reductions indicates that the Tier 2/Gasoline Sulfur program is cost-effective. This is true from the perspective of other mobile source control programs or from the perspective of other stationary source technologies that might be considered.

5. Does the Value of the Benefits Outweigh the Cost of the Standards?

While relative cost-effectiveness is the principal economic policy criterion established for these standards in the Clean Air Act (see CAA § 202(i)), further insight regarding the merits of the standards can be provided by benefit-cost analysis. The purpose of this section is to summarize the methods we used and results we obtained in conducting an analysis of the economic benefits of the Tier 2 program, and to compare these economic benefits with the estimated costs of the rule. In summary, the results of our analysis using the EPAs preferred approach to valuing premature mortality indicate that the economic benefits of the Tier 2/gasoline sulfur standards will likely exceed the costs of meeting the standards by about $20 billion (1997$).

a. What Is the Purpose of This Benefit-Cost Comparison?

Benefit-cost analysis (BCA) is a useful tool for evaluating the economic merits of proposed changes in environmental programs and policies. In its traditional application, BCA estimates the economic ''efficiency'' of proposed changes in public policy by organizing the various expected consequences and representing those changes in terms of dollars. Expressing the effects of these policy changes in dollar terms provides a common basis for measuring and comparing these various effects. Because improvement in economic efficiency is typically defined to mean maximization of total wealth spread among all members of society, traditional BCA must be supplemented with other analyses in order to gain a full appreciation of the potential merits of new policies and programs. These other analyses may include such things as examinations of legal and institutional constraints and effects; engineering analyses of technology feasibility, performance and cost; or assessment of the air quality need.

In addition to the narrow, economic efficiency focus of most BCAs, the technique is also limited in its ability to project future economic consequences of alternative policies in a definitive way. Critical limitations on the availability, validity, or reliability of data; limitations in the scope and capabilities of environmental and economic effect models; and controversies and uncertainties surrounding key underlying scientific and economic literature all contribute to an inability to estimate the economic effects of environmental policy changes in exact and unambiguous terms. Under these circumstances, we consider it most appropriate to view BCA as a tool to inform, but not dictate, regulatory decisions such as the ones reflected in today's rule.

Despite the limitations inherent in BCA of environmental programs, we consider it useful to estimate the potential benefits of today's action both in terms of physical changes in human health and welfare and environmental change, and in terms of the estimated economic value of those physical changes.

b. What Was Our Overall Approach to the Benefit-Cost Analysis?

The basic question we sought to answer in the BCA was: ''What are the net yearly economic benefits to society of the reduction in mobile source emissions likely to be achieved by the final Tier 2 program?'' In designing an analysis to answer this question, we selected a future year for analysis (2030) that is representative of full-implementation of the program (*i.e.,* when the U.S. car and light truck population is virtually only Tier 2 vehicles). We also adopted an analytical structure and sequence similar to that used in the ''section 812 studies'' [104] to estimate the total benefits and costs of the entire Clean Air Act. Moreover, we used many of the same models, and assumptions actually used in the section 812 studies, and other Regulatory Impact Analyses (RIA's) prepared by the Office of Air and Radiation. By adopting the major design elements, models, and assumptions developed for the section 812 studies and other RIA's, we have largely relied on methods which have already received extensive review by the independent Science Advisory Board, by the public, and by other federal agencies.

c. What Are the Significant Limitations of the Benefit-Cost Analysis?

Every BCA examining the potential effects of a change in environmental protection requirements is limited to some extent by data gaps, limitations in model capabilities (such as geographic coverage), and uncertainties in the underlying scientific and economic

[103] Final Regulatory Impact Analysis: Control of Emissions of Air Pollution from Highway Heavy-Duty Engines, September 16, 1997.

[104] The ''section 812 studies'' refers to (1) US EPA, Report to Congress: The Benefits and Costs of the Clean Air Act, 1970 to 1990, October 1997 (also known as the ''section 812 Retrospective); and (2) the first in the ongoing series of prospective studies estimating the total costs and benefits of the Clean Air Act (see EPA report number: EPA–410–R–99–001, November 1999).

studies used to configure the benefit and cost models. Deficiencies in the scientific literature often result in the inability to estimate changes in health and environmental effects, such as potential increases in premature mortality associated with increased exposure to carbon monoxide. Deficiencies in the economics literature often result in the inability to assign economic values even to those health and environmental outcomes which can be quantified, such as changes in visibility in residential areas. While these general uncertainties in the underlying scientific and economics literatures are discussed in detail in the RIA and its supporting documents and references, the key uncertainties which have a bearing on the results of the BCA of today's action are:

• The exclusion of potentially significant benefit categories (*e.g.,* health and ecological benefits of incidentally controlled hazardous air pollutants),

• Errors in measurement and projection for variables such as population growth,

• Variability in the estimated relationships of health and welfare effects to changes in pollutant concentrations.

In addition to these uncertainties and shortcomings which pervade all analyses of criteria air pollutant control programs, a number of limitations apply specifically to the BCA of today's action. Though we used the best data and models currently available, we were required to adopt a number of simplifying assumptions and to use data sets which, while reasonably close, did not match precisely the conditions and effects expected to result from implementation of the standards. For example, to estimate the effects of the program at full implementation we projected vehicle miles traveled and populations in the year 2030. These assumptions may play a significant role in determining the magnitude of the benefits estimate. In addition, although the emissions data sets used for this analysis have been updated from those used in the proposal, they may not anticipate the emissions reductions realized by other future actions and by expected near-future control programs. For example, it is possible that the Tier 2/gasoline sulfur standards will not be the governing vehicle emissions standards in 2030. In the years before 2030, the benefits from the Tier 2 program will be less than those estimated here (significantly less in the early years), because the Tier 2 fleet will not be fully phased in.

Finally, the implementation period for phasing-in the rule requirements is a critical period that deserves careful evaluation. The benefit-cost analysis for 2030 is not significantly affected by alternative phase-in decisions, the primary impact of which will occur in the 2005–2015 time frame. As a result, the analysis of phase-in alternatives must rely on other types of analysis (*e.g.,* cost-effectiveness analysis).

The key limitations and uncertainties unique to the BCA of the final rule, therefore, include:

• Uncertainties in the estimation of future year emissions inventories and air quality,

• Uncertainties associated with the extrapolation of air quality monitoring data to some unmonitored areas required to better capture the effects of the standards on affected populations, and

• Uncertainties associated with the effect of potential future actions to limit emissions.

Despite these uncertainties, which are discussed in more detail or referenced in the RIA, we believe the BCA provide a reasonable indication of the expected economic benefits of the Tier 2 program in 2030 under one set of assumptions. This is because the analysis focuses on estimating the economic effects of the *changes* in air quality conditions expected to result from today's action, rather than focusing on developing a precise prediction of the *absolute* levels of air quality likely to prevail in 2030. An analysis focusing on the changes in air quality can give useful insights into the likely economic effects of emission reductions of the magnitude expected to result from today's rule.

d. How Has the Benefit-Cost Analysis Changed From Proposal?

We significantly improved the analysis that was presented at proposal. For the final rule, EPA updated the emissions inventory from 1990 to 1996 using updated models, refined the projections of the effects of the rule when it is fully implemented, and updated our air quality modeling to reflect new programs issued since 1990. In addition, we also updated our assumptions for estimating physical effects and monetary benefits based on recommendations from the EPA's Science Advisory Board (SAB) during the summer of 1999. Details on these recommendations can be found in the advisory statements published by the SAB.[105] All of the changes made since the analysis at proposal serve to update and improve the analysis.

e. How Did We Perform the Benefit-Cost Analysis?

The analytical sequence begins with a projection of the mix of technologies likely to be deployed to comply with the new standards, and the costs incurred and emissions reductions achieved by these changes in technology. The Tier 2 program has various cost and emission related components, as described earlier in this section. These components would begin at various times and in some cases would phase in over time. This means that during the early years of the program there would not be a consistent match between cost and benefits. This is especially true for the vehicle control portions of the program, where the full vehicle cost would be incurred at the time of vehicle purchase, while the fuel cost along with the emission reductions and benefits would occur throughout the lifetime of the vehicle.

To develop a benefit-cost number that is representative of a fleet of Tier 2 vehicles, we need to have a stable set of cost and emission reductions to use. This means using a future year where the fleet is fully turned over and there is a consistent annual cost and annual emission reduction. For the Tier 2 program, this stability would not occur until well into the future. For this analysis, we selected the year 2030. The resulting analysis represents a snapshot of benefits and costs in a future year in which the light-duty fleet consists almost entirely of Tier 2 vehicles. As such, it depicts the maximum emission reductions (and resultant benefits) and among the lowest costs that would be achieved in any one year by the program on a ''per mile'' basis. (Note, however, that net benefits would continue to grow over time beyond those resulting from this analysis, because of growth in population and vehicle miles traveled.) Thus, based on the long-term costs for a fully turned over fleet, the resulting benefit-cost ratio will be close to its maximum point (for those benefits which we have been able to value).

To present a BCA, we designed the cost estimate to reflect conditions in the same year as the benefit valuation. Costs are, therefore, developed for the year 2030 fleet. For this purpose we used the long term cost once the capital costs have been recovered and the manufacturing learning curve

[105] Full documentation of the SAB recommendations can be found at their website (*www.epa.gov/sab*) under the following references: EPA–SAB–COUNCIL–ADV–98–003, 1998; EPA–SAB–COUNCIL–ADV–99–05, 1999; EPA–SAB–COUNCIL–ADV–99–012, 1999; EPA–SAB–COUNCIL–ADV–00–001, 1999; and EPA–SAB–COUNCIL–ADV–00–002, 1999.

reductions have been realized, since this will be the case in 2030.

We also made adjustments in the costs to account for the fact that there is a time difference between when some of the costs are expended and when the benefits are realized. The vehicle costs are expended when the vehicle is sold, while the fuel related costs and the benefits are distributed over the life of the vehicle. We resolved this difference by using costs distributed over time such that there is a constant cost per ton of emissions reduction and such that the net present value of these distributed costs corresponds to the net present value of the actual costs.

The resulting adjusted costs are somewhat greater than the expected actual annual cost of the program, reflecting the time value adjustment. Thus, the costs presented in this section do not represent expected actual annual costs for 2030. Rather, they represent an approximation of the steady-state cost per ton that would likely prevail in that time period. The benefit cost ratio for the earlier years of the program would be expected to be lower than that based on these costs, since the per-vehicle costs are larger in the early years of the program while the benefits are smaller.

In order to estimate the changes in air quality conditions which would result from these emissions reductions, we developed two separate, year 2030 emissions inventories to be used as inputs to the air quality models. The first, baseline inventory, reflects the best available approximation of the county-by-county emissions for NO_X, VOC, and SO_2 expected to prevail in the year 2030 in the absence of the standards. To generate the second, control case inventory, we first estimated the change in vehicle emissions, by pollutant and by county, expected to be achieved by the 2030 control scenario described above. We then took the baseline emissions inventory and subtracted the estimated reduction for each county-pollutant combination to generate the second, control case emissions inventory. Taken together, the two resulting emissions inventories reflect two alternative states of the world and the differences between them represent our best estimate of the reductions in emissions which would result from our control scenario.

With these two emissions inventories in hand, the next step was to ''map'' the county-by-county and pollutant-by-pollutant emission estimates to the input grid cells of two air quality models and one deposition model. The first model, called the Urban Airshed Model (UAM), is designed to estimate the tropospheric ozone concentrations resulting from a specific inventory of emissions of ozone precursor pollutants, particularly NO_X and NMHC. The second model, called the Climatological Regional Dispersion Model Source-Receptor Matrix model (S–R Matrix), is designed to estimate the changes in ambient particulate matter and visibility which would result from a specific set of changes in emissions of primary particulate matter and secondary particulate matter precursors, such as SO_2, NO_X, and NMHC. Also, nitrogen loadings to watersheds were estimated using factors derived from previous modeling from the Regional Acid Deposition Model (RADM). By running both the baseline and control case emissions inventories through these models, we were able to estimate the expected 2030 air quality conditions and the changes in air quality conditions which would result from the emissions reductions expected to be achieved by the Tier 2 program.

After developing these two sets of year 2030 air quality profiles, we used the same health and environmental effect models used in the section 812 studies to calculate the differences in human health and environmental outcomes projected to occur with and without the proposed standards. Specifically, we used the Criteria Air Pollutant Modeling System (CAPMS) to estimate changes in human health outcomes, and the Agricultural Simulation Model (AGSIM) to estimate changes in yields of a selected few agricultural crops. In addition, the impacts of reduced visibility impairment and estimates of the effect of changes in nitrogen deposition to a selection of sensitive estuaries were estimated using slightly modified versions of the methods used in the section 812 studies. Several air quality-related health and environmental benefits, however, could not be calculated for the BCA of today's proposed standards. Changes in human health and environmental effects due to changes in ambient concentrations of carbon monoxide (CO), gaseous sulfur dioxide (SO_2), gaseous nitrogen dioxide (NO_2), and hazardous air pollutants could not be included. In addition, some health and environmental benefits from changes in ozone and PM could not be included in our analysis (*i.e.,* commercial forestry benefits).

To characterize the total economic value of the reductions in adverse effects achieved across the lower 48 states,[106] we used the same set of economic valuation coefficients and models used in the section 812 studies, as approved by the SAB. The net monetary benefits of the Tier 2 program were then calculated by subtracting the estimated costs of compliance from the estimated monetary benefits of the reductions in adverse health and environmental effects.

The last step of the analysis is to characterize the uncertainty surrounding our estimate of benefits. Again, we follow the recommendations of the SAB for the presentation of uncertainty. They recommend that a primary estimate should be presented along with a description of the uncertainty associated with each endpoint. At proposal, our characterization of uncertainty was based on an estimated range of benefits which might occur if important but uncertain underlying factors were allowed to vary. This approach, however, is criticized by the SAB because while the low- or high-end estimates provided for individual endpoints was ''plausible,'' the probability of all of the assumptions in these estimates occurring simultaneously was likely to be small.

Therefore, for the final Tier 2/gasoline sulfur rule, the benefit analysis adopts an approach similar to the section 812 study. Our analysis first presents our estimate for a primary set of benefit endpoints followed by a presentation of ''alternative calculations'' of key health and welfare endpoints to characterize the uncertainty in this primary set. However, the adoption of a value for the projected reduction in the risk of premature mortality is the subject of continuing discussion within the economic and public policy analysis community within and outside the Administration. In response to the sensitivity on this issue, we provide estimates reflecting two alternative approaches for mortality benefits: the EPAs preferred approach using the value of a statistical life, and an alternative approach using the value of a statistical life years. These are discussed further in section f. of this presentation. The presentation of the alternative calculations for certain endpoints seeks to demonstrate how much the overall benefit estimate might vary based on the value EPA has given to a parameter (which has some uncertainty associated with it) underlying the estimates for human health and environmental effect incidence and the economic valuation

[106] Though California is included based on the expectation that reductions in surrounding states will achieve some benefits in California, this analysis does not assume additional reductions in California emissions beyond those already achieved by prevailing standards.

of those effects. These alternative calculations represent conditions that are possible to occur, however, EPA has selected the best supported values based on current scientific literature for use in the primary estimate. The alternate calculations include:

• Presentation of an estimated confidence interval around the Primary estimate of benefits to characterize The standard error in the C-R and valuation studies used in developing benefit estimates for each endpoint;
• Valuing PM-related premature mortality based on a different C-R study;
• Value of avoided premature mortality incidences based on statistical life years;
• Consideration of reversals in chronic bronchitis treated as lowest severity cases;
• Value of visibility changes in all Class I areas;
• Value of visibility changes in Eastern U.S. residential areas;
• Value of visibility changes in Western U.S. residential areas;
• Value of reduced household soiling damage; and
• Avoided costs of reducing nitrogen loadings in east coast estuaries.

For instance, the study by Dockery, et al. estimates of the relationship between PM exposure and premature mortality is a plausible alternative to the Pope, et al. study used for the Primary estimate of benefits. The SAB has noted that ‘‘the study had better monitoring with less measurement error than did most other studies’’ (EPA–SAB–COUNCIL–ADV–99–012, 1999). The Dockery study had a more limited geographic scope (and a smaller study population) than the Pope, et al. study and the Pope study appears more likely to mitigate a key source of potential confounding. The Dockery study also covered a broader age category (25 and older compared to 30 and older in the Pope study) and followed the cohort for a longer period (15 years compared to 8 years in the Pope study). For these reasons, the Dockery study is considered to be a plausible alternative estimate of the avoided premature mortality incidences associated with the final Tier 2/gasoline sulfur rule. The alternative estimate for mortality can be substituted for the valuation component in our primary estimate of mortality benefits to observe how the net benefits of the program may be influenced by this assumption. Unfortunately, it is not possible to combine all of the assumptions used in the alternate calculations to arrive at different total benefit estimates because, it is highly unlikely that the selected combination of alternative values would all occur simultaneously. Therefore, it is better to consider each alternative calculation individually to assess the uncertainty in the estimate.

In addition to the estimate for the primary set of endpoints and alternative calculations of benefits, our RIA also presents an appendix with supplemental benefit estimates and sensitivity analyses of other key parameters in the benefit analysis that have greater uncertainty surrounding them due to limitations in the scientific literature. Supplemental estimates are presented for premature mortality associated with short-term exposures to PM and ozone, asthma attacks, occurrences of moderate or worse asthma symptoms, and an estimate of the avoided incidences of premature mortality in infants.

Even with our efforts to fully disclose the uncertainty in our estimate, this uncertainty presentation method does not provide a definitive or complete picture of the true range of monetized benefits estimates. This approach, as implemented in this BCA, does not reflect important uncertainties in earlier steps of the analysis, including estimation of compliance technologies and strategies, emissions reductions and costs associated with those technologies and strategies, and air quality and deposition changes achieved by those emissions reductions. Nor does this approach provide a full accounting of all potential benefits associated with the Tier 2/gasoline sulfur standards, due to data or methodological limitations. Therefore, the uncertainty range is only representative of those benefits that we were able to quantify and monetize.

f. What Were the Results of the Benefit-Cost Analysis?

The BCA for the Tier 2 program reflects a single year ‘‘snapshot’’ of the yearly benefits and costs expected to be realized once the standards have been fully implemented and non-compliant vehicles have all been retired. Near-term costs will be higher than long-run costs as vehicle manufacturers and oil companies invest in new capital equipment and develop and implement new technologies. In addition, near-term benefits will be lower than long-run benefits because it will take a number of years for Tier 2-compliant vehicles to fully displace older, more polluting vehicles. However, as described earlier, we have adjusted the cost estimates upward to compensate for some of this discrepancy in the timing of benefits and costs and to ensure that the long-term benefits and costs are calculated on a consistent basis. The resulting adjusted long-term cost value is given in Table IV.D.–5a. Because of the adjustment process, the cost estimates should not be interpreted as reflecting the actual costs expected to be incurred in the year 2030. Actual program costs can be found in Section IV.D.3.

TABLE IV.D.–5A.—ADJUSTED COST OF THE TIER 2/GASOLINE SULFUR RULE FOR COMPARISON TO BENEFITS

Cost basis	Adjusted cost (billions of dollars)
Long term [a]	5.3

Notes:
[a] Note that this estimate of cost is only for purposes of comparing with our 2030 benefits estimate. See Figure IV.D.–1 for our portrayal of total annualized cost of the rule.

With respect to the benefits, several different measures of benefits can be useful to compare and contrast to the estimated compliance costs. These benefit measures include (a) the tons of emissions reductions achieved, (b) the reductions in incidences of adverse health and environmental effects, and (c) the estimated economic value of those reduced adverse effects. Calculating the cost per ton of pollutant reduced is particularly useful for comparing the cost-effectiveness of the new standards or programs against existing programs or alternative new programs achieving reductions in the same pollutant or combination of pollutants. The cost-effectiveness analysis presented earlier in this preamble provides such calculations on a per-vehicle basis. Considering the absolute numbers of avoided adverse health and environmental effects can also provide valuable insights into the nature of the health and environmental problem being addressed by the rule as well as the magnitude of the total public health and environmental gains potentially achieved by the rule. Finally, when considered along with other important economic dimensions —including environmental justice, small business financial effects, and other outcomes related to the distribution of benefits and costs among particular groups— the direct comparison of quantified economic benefits and economic costs can provide useful insights into the potential magnitude of the estimated net economic effect of the rule, keeping in mind the limited set of effects we are able to monetize.

Table IV.D.–6 presents the EPAs preferred approach to estimate the benefits of both the estimated reductions in adverse effect incidences and the estimated economic value of those incidence reductions. Specifically, the table lists the avoided incidences of individual health and environmental effects, the pollutant associated with each of these endpoints, and the estimated economic value of those avoided incidences. For several effects, particularly environmental effects, direct calculation of economic value in response to air quality conditions is performed, eliminating the intermediate step of calculating incidences. As the table indicates, we estimate that the Tier 2 program will produce 2300 fewer cases of chronic bronchitis, and we also see significant improvements in minor restricted activity days (with an estimated 6,255,500 fewer cases). Our estimate also incorporates significant reductions in impacts on children's health, showing reductions of 7,900 cases of acute bronchitis, 87,200 fewer cases of lower respiratory symptoms, and 86,600 fewer cases of upper respiratory symptoms in asthmatic children.

Total monetized benefits, however, are driven primarily by the estimated 4300 fewer premature fatalities. The adoption of a value for the projected reduction in the risk of premature mortality is the subject of continuing discussion within the economic and public policy analysis community within and outside the Administration. In response to the sensitivity on this issue, we provide estimates reflecting two alternative approaches. The first approach—supported by some in the above community and preferred by EPA—uses a Value of a Statistical Life (VSL) approach developed for the Clean Air Act Section 812 benefit-cost studies. This VSL estimate of $5.9 million (1997$) was derived from a set of 26 studies identified by EPA using criteria established in Viscusi (1992), as those most appropriate for environmental policy analysis applications.

An alternative, age-adjusted approach is preferred by some others in the above community both within and outside the Administration. This approach was also developed for the Section 812 studies and addresses concerns with applying the VSL estimate—reflecting a valuation derived mostly from labor market studies involving healthy working-age manual laborers—to PM-related mortality risks that are primarily associated with older populations and those with impaired health status. This alternative approach leads to an estimate of the value of a statistical life year (VSLY), which is derived directly from the VSL estimate. It differs only in incorporating an explicit assumption about the number of life years saved and an implicit assumption that the valuation of each life year is not affected by age.[107] The mean VSLY is $360,000 (1997$); combining this number with a mean life expectancy of 14 years yields an age-adjusted VSL of $3.6 million (1997$).

Both approaches are imperfect, and raise difficult methodological issues which are discussed in depth in the recently published Section 812 Prospective Study, the draft EPA Economic Guidelines, and the peer-review commentaries prepared in support of each of these documents. For example, both methodologies embed assumptions (explicit or implicit) about which there is little or no definitive scientific guidance. In particular, both methods adopt the assumption that the risk versus dollars trade-offs revealed by available labor market studies are applicable to the risk versus dollar trade-offs in an air pollution context.

EPA currently prefers the VSL approach because, essentially, the method reflects the direct, application of what EPA considers to be the most reliable estimates for valuation of premature mortality available in the current economic literature. While there are several differences between the labor market studies EPA uses to derive a VSL estimate and the particulate matter air pollution context addressed here, those differences in the affected populations and the nature of the risks imply both upward and downward adjustments. For example, adjusting for age differences may imply the need to adjust the $5.9 million VSL downward as would adjusting for health differences, but the involuntary nature of air pollution-related risks and the lower level of risk-aversion of the manual laborers in the labor market studies may imply the need for upward adjustments. In the absence of a comprehensive and balanced set of adjustment factors, EPA believes it is reasonable to continue to use the $5.9 million value while acknowledging the significant limitations and uncertainties in the available literature. Furthermore, EPA prefers not to draw distinctions in the monetary value assigned to the lives saved even if they differ in age, health status, socioeconomic status, gender or other characteristic of the adult population.

[107] Specifically, the VSLY estimate is calculated by amortizing the $5.9 million mean VSL estimate over the 35 years of life expectancy associated with subjects in the labor market studies. The resulting estimate, using a 5 percent discount rate, is $360,000 per life-year saved in 1997 dollars. This annual average value of a life-year is then multiplied times the number of years of remaining life expectancy for the affected population (in the case of PM-related premature mortality, the average number of $ life-years saved is 14.

Those who favor the alternative, age-adjusted approach (i.e. the VSLY approach) emphasize that the value of a statistical life is not a single number relevant for all situations. Indeed, the VSL estimate of $5.9 million (1997 dollars) is itself the central tendency of a number of estimates of the VSL for some rather narrowly defined populations. When there are significant differences between the population affected by a particular health risk and the populations used in the labor market studies—as is the case here—they prefer to adjust the VSL estimate to reflect those differences. While acknowledging that the VSLY approach provides an admittedly crude adjustment (for age though not for other possible differences between the populations), they point out that it has the advantage of yielding an estimate that is not presumptively biased. Proponents of adjusting for age differences using the VSLY approach fully concur that enormous uncertainty remains on both sides of this estimate—upwards as well as downwards—and that the populations differ in ways other than age (and therefore life expectancy). But rather than waiting for all relevant questions to be answered, they prefer a process of refining estimates by incorporating new information and evidence as it becomes available.

In addition to the presentation of mortality valuation, this table also indicates with a "B" those additional health and environmental benefits which could not be expressed in quantitative incidence and/or economic value terms. A full listing of the benefit categories that could not be quantified or monetized in our estimate are provided in Table IV.D.–8. For instance, visibility is expected to improve in all areas of the country, with the largest improvements occurring in heavily populated residential areas (*e.g.,* 21% of the metropolitan areas show an improvement of 0.5 deciviews or more). However, due to limitations on sources to value these effects, we include a "B" in the primary estimate table for this category. Likewise, the Tier 2/gasoline sulfur rule will also provide progress for some estuaries to meet their goals for reducing nitrogen deposition (*e.g.,* nitrogen loadings for the Albemarle/ Pamlico Sound are reduced by 27% of their reductions goal), however, this endpoint is also displayed with a "B" in the table. A full appreciation of the overall economic consequences of the Tier 2/gasoline sulfur standards requires consideration of all benefits and costs expected to result from the new standards, not just those benefits and costs which could be expressed here in dollar terms.

In summary, the VSL approach—the approach EPA prefers—yields a monetized benefit estimate of $25.2 billion in 2030. The alternative, age-adjusted VSLY approach (presented in Table IV.D.7) yields monetary benefits of approximately $13.8 billion in 2030.

TABLE IV.D.–6.—EPA PREFERRED ESTIMATE OF THE ANNUAL QUANTIFIED AND MONETIZED BENEFITS ASSOCIATED WITH IMPROVED AIR QUALITY RESULTING FROM THE TIER 2/GASOLINE SULFUR RULE IN 2030

Endpoint	Pollutant	Avoided incidence[c] (cases/year)	Monetary benefits[d] (millions 1997$)
Premature mortality[a, b] (adults, 30 and over)	PM[b]	4,300	$23,380
Chronic asthma (adult males, 27 and over)	Ozone	400	10
Chronic bronchitis	PM	2,300	730
Hospital Admissions from Respiratory Causes	Ozone and PM	2,200	20
Hospital Admissions from Cardiovascular Causes	Ozone and PM	800	10
Emergency Room Visits for Asthma	Ozone and PM	1,200	<1
Acute bronchitis (children, 8–12)	PM	7,900	<1
Lower respiratory symptoms (LRS) (children, 7–14)	PM	87,100	<5
Upper respiratory symptoms (URS) (asthmatic children, 9–11)	PM	86,500	<5
Shortness of breath (African American asthmatics, 7–12)	PM	17,400	<1
Work loss days (WLD) (adults, 18–65)	PM	682,900	70
Minor restricted activity days (MRAD)/Acute respiratory symptoms	Ozone and PM	5,855,000	270
Other health effects[c]	Ozone, PM, CO, HAPS	$U_1+U_2+U_3+U_4$	$B_1+B_2+B_3+B_4$
Decreased worker productivity	Ozone		140
Recreational visibility (86 Class I Areas)	PM		370
Residential visibility	PM		B_5
Household soiling damage	PM		B_6
Materials damage	PM		B_7
Nitrogen Deposition to Estuaries	Nitrogen		B_8
Agricultural crop damage (6 crops)	Ozone		220
Commercial forest damage	Ozone		B_9
Other welfare effects[e]	Ozone, PM, CO, HAPS		$B_{10}+B_{11}+B_{12}+B_{13}$
Monetized Total[f, g]			$25,220+B

Notes:

[a] Premature mortality associated with ozone is not separately included in this analysis. It is assumed that the Pope, et al. C–R function for premature mortality captures both PM mortality benefits and any mortality benefits associated with other air pollutants. Also note that the valuation assumes the 5 year distributed lag structure described earlier.

[b] PM reductions are due to reductions in NO_X and SO_2 resulting from the Tier 2/Gasoline Sulfur rule.

[c] Incidences are rounded to the nearest 100.

[d] Dollar values are rounded to the nearest 10 million.

[e] The Ui are the incidences and the Bi are the values for the unquantified category i. A detailed listing of unquantified PM, ozone, CO, and HAPS related health and welfare effects is provided in Table IV.D.–8.

[f] B is equal to the sum of all unmonetized categories, i.e. $B_1+B_2+ * * * +B_{13}$.

[g] These estimates are based on the EPA preferred approach for valuing reductions in premature mortality, the VSL approach. This approach and an alternative, age-adjusted approach—the VSLY approach—are discussed more fully in section f above.

TABLE IV.D.–7.—TIER 2/GASOLINE SULFUR RULE: 2030 MONETIZED BENEFITS ESTIMATES FOR ALTERNATIVE PREMATURE MORTALITY VALUATION APPROACHES

[Millions of 1997 dollars]

Premature mortality valuation approach	PM mortality benefits	Total benefits
Value of statistical life (VSL) ($5.9 million per life saved)[a]	$23,380	$25,220 + B
Value of statistical life-years (VSLY) ($360,000 per life-year saved, which implies $3.6 million per life saved, based on the mean of 14 life years saved)[a,b].	11,900	13,790 + B

Notes:

[a] Premature mortality estimates are determined assuming a 5 year distributed lag, which applies 25 percent of the incidence in year 1 and 2, and then 16.7 percent of the incidence in years 3, 4, and 5.

[b] The VSLY estimate is calculated by amortizing the $5.9 million mean VSL estimate over the 35 years of life expectancy associated with subjects in the labor market studies used to obtain the VSL estimate. The resulting estimate, using a 5 percent discount rate, is $360,000 per life-year saved in 1997 dollars. This approach is discussed more fully in section f above.

TABLE IV.D.–8.—ADDITIONAL, NON-MONETIZED BENEFITS OF THE TIER 2/GASOLINE SULFUR STANDARDS

Pollutant	Unquantified effects
Ozone Health	Premature mortality.[a] Increased airway responsiveness to stimuli. Inflammation in the lung Chronic respiratory damage Premature aging of the lungs Acute inflammation and respiratory cell damage Increased susceptibility to respiratory infection Non-asthma respiratory emergency room visits Reductions in screening of UV–b radiation
Ozone Welfare	Decreased yields for commercial forests Decreased yields for fruits and vegetables Decreased yields for non-commercial crops Damage to urban ornamental plants Impacts on recreational demand from damaged forest aesthetics Damage to ecosystem functions
PM Health	Infant mortality Low birth weight Changes in pulmonary function Chronic respiratory diseases other than chronic bronchitis Morphological changes Altered host defense mechanisms
Nitrogen and Sulfate Deposition Welfare	Impacts of acidic sulfate and nitrate deposition on commercial forests Impacts of acidic deposition to commercial freshwater fishing Impacts of acidic deposition to recreation in terrestrial ecosystems Reduced existence values for currently healthy ecosystems Impacts of nitrogen deposition on commercial fishing, agriculture, and forests Impacts of nitrogen deposition on recreation in estuarine ecosystems
CO Health	Premature mortality [a] Behavioral effects Hospital admissions—respiratory, cardiovascular, and other Other cardiovascular effects Developmental effects Decreased time to onset of angina Non-asthma respiratory ER visits
HAPS Health	Cancer (benzene, 1,3-butadiene, formaldehyde, acetaldehyde) Anemia (benzene) Disruption of production of blood components (benzene) Reduction in the number of blood platelets (benzene) Excessive bone marrow formation (benzene) Depression of lymphocyte counts (benzene) Reproductive and developmental effects (1,3-butadiene) Irritation of eyes and mucus membranes (formaldehyde) Respiratory irritation (formaldehyde) Asthma attacks in asthmatics (formaldehyde) Asthma-like symptoms in non-asthmatics (formaldehyde) Irritation of the eyes, skin, and respiratory tract (acetaldehyde)
HAPS Welfare	Direct toxic effects to animals Bioaccumlation in the food chain

[a] Premature mortality associated with ozone and carbon monoxide is not separately included in this analysis. It is assumed that the Pope, et al. C–R function for premature mortality captures both PM mortality benefits and any mortality benefits associated with other air pollutants.

In addition, in analyzing the present rule, we recognized that the benefits estimates were subject to a number of uncertainties with other parameters. In Table IV D–9, we present alternative calculations representing the effect of different assumptions on individual elements of the benefits analysis and on the total benefits estimate. For example, this table can be used to answer questions like ''What would total benefits be if we were to use the Dockery, et al. C–R function to estimate avoided premature mortality?'' This table also displays some assumptions that can be made to value some of the categories that are indicated with a ''B'' in the primary estimate. Overall, this table provides alternative calculations both for valuation issues (e.g., the correct value for a statistical life saved) and for physical effects issues (e.g., how reversals in chronic illnesses are treated). We show how the alternative assumption being valued would change the resulting total primary estimate, and the percentage change from the primary estimate associated with the alternative calculation. This table is not meant to be comprehensive. Rather, it reflects some of the key issues identified by EPA or commenters as likely to have a significant impact on total benefits.

TABLE IV.D.–9.—ALTERNATIVE BENEFITS CALCULATIONS FOR THE TIER 2 GASOLINE SULFUR RULE IN 2030

Alternative calculation	Impact on primary benefit estimate (million 1997$)
5th percentile of ''measurement'' uncertainty distribution	−$20,300 (−81%)
95th percentile of ''measurement'' uncertainty distribution	+33,900 (+134%)
PM-related premature mortality based on Dockery et al.	+30,200 (+120%)
Value of avoided premature mortality incidences based on statistical life years.	−11,500 (−46%)
Reversals in chronic bronchitis treated as lowest severity cases	+280 (+1%)
Value of visibility changes in all class I areas	+180 (+1%)
Value of visibility changes in eastern U.S. residential areas	+420 (+2%)
Value of visibility changes in western U.S. residential areas	+130 (+1%)
Household soiling damage	+110 (+1%)
Avoided costs of reducing nitrogen loadings in east coast estuaries	+160 (+1%)

The estimated adjusted cost of implementing the final Tier 2 program is $5.3 billion (1997$), while the estimate of monetized benefits using EPA's preferred approach for monetizing reductions in PM-related premature mortality—the VSL approach—are $25.2 billion (1997$). Monetized net benefits using EPA's preferred method for valuing avoided incidences of premature mortality are approximately $19.9 billion (1997$). Using the alternative, age-adjusted approach—the VSLY approach—total monetized benefits are projected to be around $13.8 billion (1997$). Monetized net benefits using this approach are approximately $8.5 billion (1997$). Therefore, implementation of the Tier 2 program will provide society with a net gain in social welfare. Tables VI.D.–10a and IV.D.–10b summarize the costs, benefits, and net benefits for the two alternative valuation approaches.

TABLE IV.D.–10A.—2030 ANNUAL MONETIZED COSTS, BENEFITS, AND NET BENEFITS FOR THE FINAL TIER 2/GASOLINE SULFUR RULE: EPA PREFERRED ESTIMATE USING THE VALUE OF STATISTICAL LIVES SAVED APPROACH TO VALUE REDUCTIONS IN PREMATURE MORTALITY[a]

	Billion 1997 (dollars)
Adjusted compliance costs	$5.3
Monetized PM-related benefits[b].	24.7+B_{PM}
Monetized Ozone-related benefits[b].	0.5+B_{Ozone}
Monetized net benefits[c,d]	19.9+B

Notes:

[a] For this section , all costs and benefits are rounded to the nearest 100 million. Thus, figures presented in this chapter may not exactly equal benefit and cost numbers presented in earlier sections of the chapter.

[b] Not all possible benefits or disbenefits are quantified and monetized in this analysis. Potential benefit categories that have not been quantified and monetized are listed in Table IV.D.–8. Unmonetized PM-and ozone-related benefits are indicated by B_{PM}. And B_{Ozone}, respectively.

[c] B is equal to the sum of all unmonetized benefits, including those associated with PM, ozone, CO, and HAPS.

[d] These estimates are based on the EPA preferred approach for valuing reductions in premature morality, the VSL approach. This approach and an alternative, age-adjusted approach—the VSLY approach—are discussed more fully in section f above.

Table IV.D.–10b.—2030 Annual Monetized Costs, Benefits, and Net Benefits for the Final Tier 2/ Gasoline Sulfur Rule: Alternative Estimates Using the Value of Statistical Life Years Saved Approach to Value Reductions in Premature Mortality[a]

	Billion 1997 (dollars)
Adjusted compliance costs	$5.3
Monetized PM-related benefits[b].	$13.3+$B^{PM}$
Monetized Ozone-related benefits[b].	$0.5+$B^{Ozone}$
Monetized net benefits[c, d]	$8.5+B

Notes:

[a] For this section, all costs and benefits are rounded to the nearest 100 million. Thus, figures presented in this chapter may not exactly equal benefit and cost numbers presented in earlier sections of the chapter.

[b] Not all possible benefits or disbenefits are quantified and monetized in this analysis. Potential benefit categories that have not been quantified and monetized are listed in Table IV.D.–8. Unmonetized PM-and ozone-related benefits are indicated by B_{PM}. And B_{Ozone}, respectively.

[c] B is equal to the sum of all unmonetized benefits, including those associated with PM, ozone, CO, and HAPS.

[d] The VSLY estimate is calculated by amortizing the $5.9 million mean VSL estimate over the 35 years of life expectancy associated with subjects in the labor market studies used to obtain the VSL estimate. The resulting estimate, using a 5 percent discount rate, is $360,000 per life-year saved in 1997 dollars. This approach is discussed more fully in section f above.

V. Other Vehicle-Related Provisions

The section describes several additional provisions of today's final rule that were not previously discussed in this preamble.[108]

A. Final Tier 2 CO, HCHO and PM Standards

Tables IV.B.–4 and –5 in Section IV.B.4.a. above presented the Tier 2 standards for carbon monoxide (CO), formaldehyde (HCHO), and particulate matter (PM). The following paragraphs discuss our selection of these specific standards.

1. Carbon Monoxide (CO) Standards

Beyond aligning carbon monoxide (CO) standards for all LDVs and LDTs, and harmonizing with California vehicle technology, reduction in CO emissions is not a primary goal of the Tier 2 program. However, we note that more than three-fourths of CO emissions in 1997 came from mobile sources and that there are currently 20 officially designated CO nonattainment areas in the U.S. These areas include 47 counties with a combined population of 34 million. In addition, there are 23 officially designated maintenance areas also with a combined population of 34 million. Further, CO is a deadly gas that leads to accidental poisoning fatalities and injuries. Also, CO may play a role in ozone formation by increasing the reactivities of VOCs in the atmosphere.

Although there remain many areas of nonattainment and maintenance for the

[108] Generally the provisions of this section V that apply to HLDTs also apply to MDPVs. See section IV.B.4.g for a thorough discussion of the main program elements and how they impact MDPVs.

CO NAAQS, and those areas include large populations, the broad trends indicate that ambient levels are being reduced and the amount of further reductions needed to meet the CO NAAQS will not be as substantial as for the ozone NAAQS. The reductions in this program will help ensure that emissions and ambient levels of CO continue to decline, which will contribute to the attainment and maintenance of the CO NAAQS in current nonattainment areas. These standards will also ensure that CO levels do not increase in the future, which could exacerbate any CO attainment and maintenance concerns. Our analysis estimating of the tons of CO reduction due to the Tier 2/Gasoline Sulfur program is found in Chapter III of the RIA.

Thus the CO standards we are finalizing for all Tier 2 LDVs and LDTs are essentially the same as those from the NLEV program for LDV/LLDTs. These standards will harmonize with CalLEV II CO standards except at California's SULEV level (EPA Bin 2). This lone divergence will not pose additional burden to manufacturers because the federal Tier 2 CO standards for these vehicles will be less stringent than California's. Bins applicable during the interim programs will include CO values from the NLEV program for LDV/LLDTs and from the Cal LEV I program for HLDTs.[109] In our NPRM, we proposed tighter CO standards than California for certain higher bins. Based upon comment, we are aligning our CO standards with those of California to help ensure that carry over between the two programs can occur.[110] This alignment is consistent with our goal of bringing all LDVs and all categories of LDTs under common standards that allow for technology to be harmonized to the extent possible with California. Despite these minor changes, we still expect the standards in today's rule to lead to CO reductions.

2. Formaldehyde (HCHO) Standards

Similar to our approach to CO standards, we are aligning all Tier 2 LDVs and LDTs under the formaldehyde standards from the NLEV program or CalLEV II program. HLDTs, which are not subject to the NLEV program, will become subject to federal formaldehyde standards for the first time under the provisions of this rulemaking.

Formaldehyde is a hazardous air pollutant and EPA is required to regulate motor vehicle formaldehyde under section 202(l) of the Act. The standards finalized today are primarily of concern for methanol and methane (compressed natural gas or CNG)-fueled vehicles, because formaldehyde is chemically similar to methanol and methane and is likely to be produced when methanol or methane are not completely burned in the engine. HLDTs are not included under the NLEV program and will therefore not face formaldehyde standards as LDVs and LLDTs will in 2001 (1999 in the northeast states). We believe it is appropriate to bring HLDTs under HCHO standards in this rulemaking. Applying formaldehyde standards to HLDTs will be consistent with our goals of aligning standards for all LDVs and LDTs regardless of fuel type and harmonizing technologically with California standards wherever possible and reasonable and the burden will be minimal. Consequently, we are including formaldehyde standards for HLDTs under the Tier 2 program as well as under the interim programs.

3. Use of NMHC Data To Show Compliance with NMOG Standards; Alternate Compliance With Formaldehyde Standards

In response to comments, we are finalizing a provision to allow manufacturers to demonstrate compliance with the interim and Tier 2 NMOG standards using NMHC data (non-methane hydrocarbons) for gasoline and diesel vehicles. For these vehicles, NMOG and NMHC emissions are very similar and testing for NMHC is considerably simpler and cheaper than measuring NMOG. Data available to us show that NMHC emissions at levels expected from interim and Tier 2 LDVs and LDTs can be adjusted to represent NMOG emissions by a small multiplicative factor. We are finalizing to accept NMHC test results to demonstrate compliance with the NMOG standards, but are requiring that the NMHC results be multiplied by 1.04. We will permit the use of other adjustment factors based upon comparative testing.

A drawback to NMHC testing is that NMHC testing does not yield formaldehyde results as NMOG testing does. We noted in the NPRM that HCHO is actually a component of NMOG and that we expect that all vehicles able to meet the proposed Tier 2 or interim standards (including methanol and CNG-fueled vehicles) will readily comply with the HCHO standards. In fact, based upon a review of certification data, we believe that gasoline and diesel vehicles will be far below the HCHO standards, perhaps by as much as 90%. (See the Response to Comments document for details)

To reduce testing costs while harmonizing with the CalLEV II standards we are finalizing a provision that will permit manufacturers of gasoline and diesel vehicles to demonstrate compliance with the formaldehyde standards based on engineering judgement. This provision will apply only to diesel and gasoline fueled vehicles and will require manufacturers to make a demonstration in their certification application that vehicles having similar engine and vehicle size and engine and aftertreatment technologies have been shown to exhibit compliance with the applicable formaldehyde standard for their full useful life. This demonstration will be similar to that currently required for gasoline vehicles to demonstrate compliance with the particulate matter standard (see 40 CFR 86.1829(b)(1)), and should be readily available from California vehicles where NMOG testing is required and formaldehyde data is routinely generated.

4. Particulate Matter (PM) Standards

We proposed to adopt tighter PM standards. For Tier 2 vehicles, we proposed PM bin values such that PM would consistently be 0.01 g/mi or less. To provide manufacturers with flexibility, we proposed a 0.02 g/mi PM standard for vehicles that certify to the highest Tier 2 bins. As we have indicated elsewhere in this preamble, we anticipate that low sulfur diesel fuel will be available by 2007 to enable diesel vehicles to utilize advanced diesel technologies and meet these PM standards.

For the interim standards we proposed a PM standard of 0.06 g/mi for the highest bins. We received considerable comment from manufacturers and others about the PM standards we proposed. In the final rule, we are raising the PM standard to 0.08 g/mi for bin 10. For HLDTs, manufacturers would likely have had to use advanced diesel technologies to attain our proposed interim standards and these technologies require low sulfur diesel fuel. Since we do not expect that fuel to be widely available until the 2006–2007 timeframe, we are raising the PM standard so that diesels are not barred from the interim program by a fuel situation beyond their manufacturers' control.

PM standards are primarily a concern for diesel-cycle vehicles, but they also apply to gasoline and other otto-cycle

[109] We recognize that the standards we are finalizing for interim LDT4s are more stringent than for equivalent vehicles (MDV3s) under Cal LEV I. Still our interim HLDT standards harmonize with Cal LEV I standards applicable to MDV2s.

[110] Ibid.

vehicles. We will continue to permit otto-cycle vehicles to certify to PM standards based on representative test data from similar technology vehicles.

B. Useful Life

The ''useful life'' of a vehicle is the period of time, in terms of years and miles, during which a manufacturer is formally responsible for the vehicle's emissions performance. For LDVs and LDTs, there have historically been both ''full useful life'' values, approximating the average life of the vehicle on the road, and ''intermediate useful life'' values, representing about half of the vehicle's life. We proposed and are finalizing several changes to the current useful life provisions for LDVs and LDTs.

1. Mandatory 120,000 Mile Useful Life

We are finalizing our proposal to equalize full useful life values for all Tier 2 LDVs and LDTs at 120,000 miles. Congress, in directing EPA to perform the Tier 2 study, also directed EPA to consider changing the useful lives of LDVs and LDTs. Manufacturers have made numerous advances in quality, materials and engineering that have led to longer actual vehicle lives and data show that each year of a vehicle's life, people are driving more miles. Current data indicate that passenger cars are driven approximately 120,000 miles in their first ten years of life. Trucks are driven further. Current regulatory useful lives are 10 years/100,000 miles for LDV/LLDTs and 11 years/120,000 miles for HLDTs. We project, based on our Tier 2 model, that approximately 13 percent of light-duty NO_X and 11 percent of light-duty VOCs is produced between 100,000 and 120,000 miles. Given the trend toward longer actual vehicle lives and increases in annual mileage, we believe that it is reasonable to extend the regulatory useful life requirements California, in its LEV II program, has adopted full useful life standards for all LDVs and LDTs of 10 years or 120,000 miles, whichever occurs first. The time period for federal LDV/LLDTs will be 10 years, but will remain at 11 years for HLDTs consistent with the Clean Air Act. Intermediate useful life values, where applicable, will remain at 5 years or 50,000 miles, whichever occurs first. Where manufacturers elect to certify Tier 2 vehicles for 150,000 miles to gain additional NO_X credits, as discussed below, the useful life of those vehicles will be 15 years and 150,000 miles. We are not harmonizing with California on the mandatory useful life for evaporative emissions of 15 years and 150,000 miles, but rather this useful life will be mandatory for evaporative emissions only when a manufacturer elects optional 150,000 mile exhaust emission certification.

We proposed to extend the useful life of interim LDV/LLDTs to 10 years/120,000 miles beginning in 2004. Based upon extensive comment, we are not finalizing that provision and the useful lives of interim LDV/LLDTs will remain unchanged to help facilitate their carryover from the NLEV program into the interim program. Commenters provided persuasive argument that the proposed provision, along with others, would impose a large workload burden on manufacturers because they would be unable to carry over certification data from 2003 and would have to recertify virtually all of their LDV/LLDTs in 2004. Manufacturers stressed that this would be an especially unproductive use of their resources because these vehicles would all have to be recertified again as they were phased into the Tier 2 standards between 2005 and 2007. This change in the final rule will have only minimal impact on the benefits of our program.

2. 150,000 Mile Useful Life Certification Option

We are adopting as proposed a provision to provide additional NO_X credit in the fleet average calculation for vehicles certified to a useful life of 150,000 miles. A manufacturer certifying a test group to a 150,000 mile useful life will incorporate those vehicles into its corporate NO_X average as if they were certified to a full useful life standard 0.85 times the applicable 120,000 mile NO_X standard. To use this option, the manufacturer will have to agree to (1) certify the engine family to the applicable 120,000 mile exhaust and evaporative standards at 150,000 miles for all pollutants; and (2) increase the mileage on the single extra-high mileage in-use test vehicle from a minimum of 90,000 miles to a minimum of 105,000 miles.

Today's vehicles are lasting longer and being driven farther than those built in past years and we believe it is reasonable to encourage the development of more durable emission control systems. Consequently we believe it is appropriate to provide incentives to manufacturers to certify their vehicles to extended useful lives beyond 120,000 miles. This is why we proposed and are today finalizing additional NO_X credits for Tier 2 vehicles certified to a useful life of 150,000 miles.

In the final rule we are adding an option that, for a test group certified to a 150,000 mile useful life, the manufacturer may choose between the additional credits or a waiver of intermediate life standards. Commenters suggested that some vehicles would be discriminated against by our intermediate life standards, because they might have flat deterioration curves, and could meet our full life standards, but not the lower intermediate life standards. We are reluctant to give up our intermediate life standards, because we believe they provide an additional measure of certainty that vehicles will meet standards. Nonetheless, we believe that certification to a longer useful life is an important goal and that manufacturers who do so will likely use technologies that have very flat deterioration curves. This option provides manufacturers with the flexibility to certify vehicles without having to comply with intermediate life standards. In exchange they must comply with full life standards for considerably longer mileage.

C. Supplemental Federal Test Procedure (SFTP) Standards [111]

1. Background

Supplemental Federal Test Procedure (SFTP) standards require manufacturers to control emissions from vehicles when operated at high rates of speed and acceleration (the US06 test cycle) and when operated under high ambient temperatures with air conditioning loads (the SC03 test cycle). The existing light duty SFTP requirements begin a three year phase-in in model year 2000 for Tier 1 LDV/LLDTs.[112] For HLDTs, SFTP requirements begin a similar phase-in in 2002. Intermediate and full useful life SFTP standards exist for all categories of Tier 1 vehicles except that SFTP standards do not apply to diesel fueled LDT2s and HLDTs. Table V.A.–1 shows the full useful life federal SFTP requirements applicable to Tier 1 vehicles.

[111] SFTP requirements do not apply to MDPVs. We plan to address the applicability of SFTP standards and test procedures to MDPVs in a future rulemaking.

[112] For vehicles included in the NLEV program, this phase-in becomes a four year phase-in beginning in 2001.

TABLE V.A.–1.—FULL USEFUL LIFE FEDERAL SFTP STANDARDS APPLICABLE TO TIER 1 VEHICLES

Vehicle category	$NMHC + NO_X$ (weighted g/mi) [a]	CO (g/mi) [b]		
		US06	SC03	Weighted
LDV/LDT1 (gasoline)	0.91	11.1	3.7	4.2
LDV/LDT1 (diesel)	2.07	11.1	—	4.2
LDT2	1.37	14.6	5.6	5.5
LDT3	1.44	16.9	6.4	6.4
LDT4	2.09	19.3	7.3	7.3

Notes:
[a] Weighting for $NMHC+NO_X$ and optional weighting for CO is 0.35x(FTP)+0.28x(US06)+0.37x(SC03).
[b] CO standards are stand alone for US06 and SC03 with option for a weighted standard.

2. SFTP Under the NLEV Program

The NLEV program includes SFTP requirements for LDVs, LDT1s and LDT2s. These requirements impose the Tier 1 intermediate and full useful life SFTP standards on Tier 1 and TLEV vehicles, but impose only 4000 mile standards adopted from California LEV I program on LEVs and ULEVs.[113]

NLEV SFTP standards for LEVs and ULEVs are shown in Table V.A.–2. Table V.A.–2 also includes the California LEV I SFTP standards for LDT3s and 4s. The standards in that table do not provide for a weighted standard for $NMHC+ NO_X$ or for CO, but rather employ separate sets of standards for the US06 and SC03 tests. Also, while the NLEV and CAL LEV I SFTP standards apply to gasoline and diesel vehicles, they do not include a standard for diesel particulates (PM).

TABLE V.A.–2.—SFTP STANDARDS FOR LEVS AND ULEVS IN THE NLEV/CAL LEV I PROGRAM

[4000 Mile Standards]

	US06		SC03	
	$NMHC+NO_X$ (g/mi)	CO (g/mi)	$NMHC+NO_X$ (g/mi)	CO (g/mi)
LDV/LDT1	0.14	8.0	0.20	2.7
LDT2	0.25	10.5	0.27	3.5
LDT 3 (Calif MDV 2)	0.4	10.5	0.31	3.5
LDT 4 (Calif MDV 3)	0.6	11.8	0.44	4.0

3. SFTP Standards for Interim and Tier 2 LDVs and LDTs: As Proposed

Since no significant numbers of vehicles certified to SFTP standards will enter the fleet until 2001, manufacturers raised concerns during the development of the NPRM regarding significant changes to the SFTP program before its implementation. We stated in the NPRM that it was reasonable not to increase SFTP stringency beyond NLEV/CalLEV I levels for the Tier 2 program, but we proposed to include SFTP standards adjusted for intermediate and full useful life deterioration where there are currently only 4000 mile standards.

Full useful life standards for Tier 2 vehicles are consistent with our mandate under the Clean Air Act. We derived the full and intermediate useful life standards in the NPRM by applying deterioration allowances from our draft MOBILE 6 model to the existing 4000 mile standards for LDVs and LLDTs. For HLDTs we applied similarly derived deterioration allowances to California's LEV I SFTP standards for MDV2s and MDV3s, which are the corresponding categories to LDT3s and LDT4s in the California LEV I program. The full and intermediate useful life SFTP standards we proposed would have applied to all Tier 2 vehicles including Tier 2 LDT3s and LDT4s. Further, since our interim standards are derived from NLEV and Cal LEV I standards, we proposed that our full life SFTP standards would apply to all interim LDV/LLDTs beginning in 2004.[114]

4. Final SFTP Standards for Interim and Tier 2 LDVs and LDTs

Based upon extensive comment from manufacturers, we are persuaded that our proposed intermediate and full life SFTP standards need more review and should possibly be reexamined in a separate rulemaking. Manufacturers were quite concerned that the technique we used to obtain the intermediate and full life SFTP standards led to standards that were overly stringent. They argued that they have little experience with SFTP compliant vehicles given the current infancy of the program and they do not know whether SFTP emissions can be reasonably be expected to deteriorate like FTP emissions. Consequently, in today's notice, we are finalizing a program that will adopt the existing NLEV/Cal LEV I 4000 mile standards and utilize adjusted full life standards from the Tier 1 program, instead of values derived by applying the draft MOBILE 6 model.

These standards will apply to all Tier 2 vehicles and to all interim LDV/LLDTs. We proposed and are finalizing that interim HLDTs meet Tier 1 SFTP standards which do not finish their phase-in until the 2004 model year.

With regard to intermediate and full life SFTP standards, the preamble to the final rule implementing the SFTP program for the Tier 1 SFTP emission standards (61 FR 54856) provided a formula for computing SFTP standards to apply under more stringent future

[113] This disparity arose because neither EPA nor CARB had full useful life SFTP standards for LEVs or ULEVs when the NLEV program was adopted. Since a major requirement of the NLEV program was harmony with California standards, EPA adopted the California SFTP standards in place for the NLEV time frame (2001 and later).

[114] Except that, we proposed to permit TLEV vehicles (EPA interim Bin 10 in Table IV.B.–4), which are not subject to new SFTP standards under NLEV, to continue to meet Tier 1 SFTP standards, and to permit HLDTs under the interim programs to continue to meet Tier 1 SFTP standards that do not fully phase in until the 2004 model year.

FTP standards. In the Tier 1 program, SFTP standards represent a weighted average of FTP, US06 and SC03 standards. The three components are weighted by factors of 0.35, 0.28, and 0.37 respectively. The formula simply adjusts the Tier 1 *SFTP* weighted average standards downward to reflect the decrease in the component *FTP* standards. The weighting factors remain the same and the US06 and SC03 standards remain the same, but the SFTP standard becomes tighter because the FTP component becomes smaller. These standards will take effect for all LDV/LLDTs beginning in 2004 and will phase in with the Tier 2 standards for HLDTs in 2008 and 2009. The formula is as follows:

New SFTP Standard = Old SFTP Standard − [0.35 × (Tier 1 FTP standard − New FTP Standard)]

In today's final rule, we will employ this formula to compute full useful life SFTP standards for all Tier 2 vehicles and for interim LDV/LLDTs. Because we are also adopting the California 4000 mile SFTP standards for these vehicles, we are not adopting intermediate life SFTP standards, so as to avoid the burden of three sets of SFTP standards.

LDT3 and LDT4 SFTP standards do not currently apply to diesels. Further, the standards applicable to Tier 1 diesel LDVs and LDT1s are less stringent than gasoline standards and do not apply to the SC03 cycle. There are no SFTP standards under Tier 1 for diesel LDT2s. In this final rule, we are applying the same approach we are using with other standards in this document to the Tier 2 and interim SFTP standards. Consequently, we are finalizing that Tier 2 vehicles and interim LDV/LLDTs with diesel or gasoline engines must comply with the same $NMHC+NO_X$ and CO SFTP limits. Thus, in computing Tier 2 SFTP full life standards for diesel LDVs and LDT1s from Tier 1 values, the values for diesels must be determined from the standards applicable to gasoline vehicles of the same category.

Because we lack certainty as to whether diesel vehicles can comply with the 4,000 mile SFTP standards for gasoline vehicles that we are adopting from the NLEV and Cal LEV I programs, we are providing an option that diesel LDV/LLDTs may comply with intermediate life SFTP standards instead.[115] Manufacturers must calculate intermediate life standards using the same approach described for full life standards, but must substitute appropriate intermediate life values in the equation above. This provision will only apply through model year 2006, and thus will likely only impact interim non-Tier 2 vehicles, given the very small market share that diesels occupy and given our expectation that they will be the last LDV/LLDTs phased into Tier 2 standards. We noted above that interim non-Tier 2 HLDTs will have the option of meeting Tier 1 SFTP standards. Thus diesel HLDTs will not have to comply with the 4,000 mile standards in the interim years and the option we are providing for LDV/LLDTs is not needed for HLDTs.

5. Adding a PM Standard to the SFTP Standards

We requested comment on the appropriate SFTP PM standards for diesel vehicles. We suggested it would be appropriate to establish a margin above the applicable FTP PM standard to serve as the SFTP standard. EPA has implemented such margins in recent consent decrees, under which heavy-duty engine manufacturers have agreed not to exceed emission levels 1.25 times the applicable exhaust standards (including PM standards) when engines are operated over a wide range of operating conditions. We received comments in favor of an SFTP PM standard of 1.25 times the FTP standard and we received many comments from manufacturers against setting any SFTP PM standard until more data become available.

We believe it is reasonable to include an SFTP standard for PM. However, we are uncertain as to the technical appropriateness of the 1.25 value for passenger vehicles. Further, the 1.25 value would lead to an SFTP standard for PM that would not match the stringency of the other SFTP standards we are finalizing. Consequently, we are finalizing a procedure for computing diesel PM standards that is nearly identical to the procedure for computing weighted SFTP standards for $NMHC+NO_X$ and CO described above. We believe standards computed in this way will be readily feasible for both gasoline and diesel vehicles.

To compute the SFTP PM standards, manufacturers will use the same formula described above for $NMHC+NO_X$ and CO. Where that formula calls for the Tier 1 *SFTP* standard to be inserted, manufacturers must insert the Tier 1 *FTP* standard. This is because, under Tier 1 standards, there is no SFTP standard for PM. However, the Tier 1 weighted SFTP standards are equal to the Tier 1 FTP standards (or the sum of the Tier 1 FTP standards in the case of $NMHC+NO_X$). Using the Tier 1 FTP PM standards in this way will lead to a Tier 2 SFTP PM standard whose stringency is appropriately matched to the other pollutants.

For HLDTs , we proposed and are finalizing that Tier 1 SFTP standards would apply through the interim program. because of the late start of SFTP phase-in for Tier 1 vehicles. We see no reason to impose SFTP PM standards on these vehicles during the interim period when their manufacturers will be under pressure to develop diesel vehicles to comply with the Tier 2 standards. Also, if we were to impose an FTP PM standard on the interim vehicles, it would likely be matched to the interim phase in for HLDTs and manufacturers would simply defer compliance for diesels until the last phase-in year (2007). The manufacturers would then have to recertify to the Tier 2 standards by 2009. Given the relatively small number of diesel vehicles, we believe the most reasonable approach is to defer SFTP PM standards for HLDTs until the Tier 2 phase-in. Consequently, we are finalizing that Tier 2 HLDTs will have to comply with an SFTP PM standard computed as described above.

For LDV/LLDTs we are also including the SFTP PM standard for the Tier 2 vehicles. There are only a few diesel LDV/LLDTs currently produced and no large increase in their numbers is expected. We see little environmental benefit in imposing the SFTP PM standard on interim vehicles.

6. Future Efforts Relevant to SFTP Standards

We are very concerned about ''off cycle'' emissions, *i.e.* those emissions that occur under vehicle operational modes that are not captured in the FTP. SFTP standards help to address our concerns and we believe that they should apply to all vehicles, regardless of fuel. Our final rule essentially promulgates Tier 1 SFTP standards that are reduced to represent the reduction in the FTP component standards. As we indicate under our discussion of SFTP for medium duty passenger vehicles (see section IV.B.4.g) we expect to conduct a rulemaking to establish appropriate ''Tier 2'' SFTP standards for all Tier 2 vehicles. In that rule, we expect to reexamine the US06 and SC03 test cycles and their applicability to vehicles using different fuels and technologies,

[115] The 4,000 mile standards under NLEV are phased-in in such a way that diesels would not likely be subject to them until the 2004 model year, given their very small market share. Today's rulemaking effectively supercedes the NLEV program beginning with the 2004 model year. In other words, while NLEV contains 4,000 mile SFTP standards for diesels, they are not likely to ever impact diesel LDV/LLDTs.

including whether these cycles are the most appropriate ones for diesels. We will also examine whether it is necessary to have different sets of standards for different vehicle sizes or whether it is possible to establish one set of standards for all vehicles.

D. LDT Test Weight

Historically, HLDTs (LDT3s and LDT4s) have been emission tested at their adjusted loaded vehicle weight (ALVW), while LDVs, LDT1s, and LDT2s have been tested at their loaded vehicle weight (LVW). ALVW is equivalent to the curb weight of the truck plus half its maximum payload, while LVW is equivalent to the curb weight of the truck plus a driver and one adult passenger (300 pounds). As we are equalizing standards and useful lives across LDVs and all categories of LDTs, we believe it is appropriate to test all the vehicles under the same conditions. Therefore, we are finalizing as proposed to test HLDTs at their loaded vehicle weight. We believe this is appropriate because the standards we are imposing on HLDTs under Tier 2 are considerably more stringent than the Tier 1 standards. Further, one of our reasons for bringing HLDTs under the same standards as passenger cars is that these trucks include many vans and sport utility vehicles that are often used as passenger cars with just one or two passengers. Lastly, we note that testing HLDTs at LVW is consistent with the way they have been tested for fuel economy purposes for many years. Consequently, we believe it is appropriate to test them at LVW.

The NPRM proposed that all HLDTs would certify using LVW beginning in the 2004 model year. Based upon comments, the final rule will allow the certification of HLDTs based on ALVW until those vehicles are phased into the Tier 2 standards in 2008 and 2009 at which time they must be tested at LVW. This will enhance carryover of California vehicles to the Federal interim program in cases where the California vehicles meet our interim standards.

E. Test Fuels

As discussed elsewhere in this preamble, the NLEV program was adopted virtually in its entirety from California's program. Because California's standards were developed around the use of California Phase II reformulated gasoline (RFG) as the exhaust emission test fuel, we adopted California Phase II test fuel as the exhaust emission test fuel for gasoline-fueled vehicles in the federal NLEV program, although we recognized at the time that vehicles outside of California would be unlikely to operate on that fuel in use. In the NPRM we proposed interim programs that were derived from NLEV (for LDV/LLDTs) and the CAL LEVI program (for HLDTs), and we proposed to accept certification test results generated on California fuel, but indicated that we might test or require in-use testing on federal fuel.

Based upon comment we are finalizing provisions to permit, for interim vehicles, that if a test group has been certified to the exhaust emission standards using California fuel and is being carried into the interim program from NLEV or is being carried across from California LEV I certification, then we will not test or require in-use exhaust testing on federal fuel. This change is intended to help address recertification workload concerns raised by manufacturers. For new certification not carried across from California LEV I or carried over from NLEV, and for any Tier 2 vehicles, we will accept exhaust certification test results based on California fuel for 50 state vehicles only, but we will reserve the right to perform or require certification confirmatory testing and in-use testing on federal test fuel.

We recognize that manufacturers may want to perform calibration changes on vehicles carried across from the California LEV I program or carried over from NLEV program. These calibration changes will likely be aimed at certifying the test group to the lowest possible NO_X value. We believe that these calibration changes would be appropriate, provided they can still be covered by the existing worst case durability data vehicle. We will perform or require certification confirmatory testing and in-use emission testing on these vehicles using California fuel.

Because differences exist between the California and federal evaporative emission testing procedures, we proposed to continue to require the use of federal certification fuel as the test fuel in evaporative emission testing. Under current programs, where California and federal evaporative emission standards are essentially the same, California accepts evaporative results generated on the federal procedure (using federal test fuel), because available data indicates the federal procedure to be a ''worst case'' procedure. The evaporative standards California has adopted for their LEV II program are more stringent than those we are finalizing in this document. In the NPRM, we requested comment and supporting emission test data on whether vehicles certified to CalLEV II evaporative standards using California fuels will necessarily comply with the federal Tier 2 evaporative standards, including ORVR standards, when tested with federal test fuel. While we got comments from manufacturers advocating that we accept the results of California evaporative testing to demonstrate compliance with the federal evaporative standards, we received no supporting data. Still, given the fairly large difference between California and federal evaporative standards, it seems reasonable that a vehicle meeting the California standards under California fuels and test conditions might also meet federal standards under federal fuels and conditions. We believe it may be possible for manufacturers to establish a relationship between the two sets of standards, fuels and conditions that would enable us to grant federal certification based upon data showing conformity with the California standards under California fuels and conditions. Consequently, we are including a provision in the certification regulations to enable manufacturers to obtain federal evaporative certification based upon California results, if they obtain advance approval from EPA. EPA will review test data from manufacturers to establish whether it is appropriate to accept California data to demonstrate compliance with federal standards.

F. Changes to Evaporative Certification Procedures To Address Impacts of Alcohol Fuels

Current certification procedures, including regulations under the new CAP2000 program,[116] allow manufacturers to develop their own durability process for calculating deterioration factors for evaporative emissions. The regulations (§ 86.1824–01) permit manufacturers to develop service accumulation (aging) methods based on ''good engineering judgement''. The manufacturer's durability process must be designed to predict the expected evaporative emission deterioration of in-use vehicles over their full useful lives. We proposed and are finalizing requirements that these aging methods include the use of alcohol fuels to address concerns that alcohol fuels increase the permeability and thus the evaporative losses from hoses and other evaporative components. Based upon comment, we are also finalizing an option to the requirement that the manufacturer use the alcohol fuel. Under this option, the manufacturer may demonstrate to EPA using good engineering judgement

[116] The Compliance Assurance Program, (64 FR 23906) takes effect in the 2000 model year.

acceptable to EPA that its durability process for calculating evaporative emission deterioration factors accurately predicts deterioration under prolonged exposure to alcohol fuels.

We have reviewed data indicating that the permeability, and therefore the evaporative losses, of hoses and other evaporative components can be greatly increased by exposure to fuels containing alcohols.[117] Alcohols have been shown to promote the passage of hydrocarbons through a variety of different materials commonly used in evaporative emission systems. Data from component and fuel line suppliers indicate that alcohols cause many elastomeric materials to swell, which opens up pathways for hydrocarbon permeation and also can lead to distortion and tearing of components like ''O'' ring seals. Ethers such as MTBE and ETBE have a much smaller effect. Alcohol-resistant materials such as fluoroelastomers are available and are currently used by manufacturers to varying extents.

Alcohols do not impact evaporative components and hoses immediately, but rather it may take as long as one year of exposure to alcohol fuels for permeation rates to stabilize. The end result is higher permeation and increased in-use evaporative emissions.[118]

Today, roughly 10% of fuel sold in the U.S. contains alcohol, mainly in the form of ethanol, and such fuels are often offered in ozone nonattainment areas. We believe it is appropriate to ensure that evaporative certification processes expose evaporative components to alcohols and do so long enough to stabilize their permeability. Therefore, we are finalizing our proposal to the evaporative certification requirements to require manufacturers to develop their deterioration factors using a fuel that contains the highest legal quantity of ethanol available in the U.S.

To implement this change, we are modifying the Durability Demonstration Procedures for Evaporative Emissions found at § 86.1824–01. The amendments will require manufacturers not using an approved option, to age their systems using a fuel containing the maximum concentration of alcohols allowed by EPA in the fuel on which the vehicle is intended to operate, *i.e.,* a ''worst case'' test fuel. (Under current requirements, this fuel would be about 10% ethanol, by volume.) We are also modifying the Durability Demonstration Procedures to require manufacturers to ensure that their aging procedures are of sufficient duration to stabilize the permeability of the fuel and evaporative system materials. These modifications will take place as vehicles are phased into the evaporative emission standards contained in this final rule.

We requested comment on alternative ways by which manufacturers could document or demonstrate that their components are made of materials whose permeability is not significantly affected by alcohols. We received no comments responsive to this request, but we did receive comments that EPA should not change the CAP2000 provision allowing manufacturers to develop their own durability process for calculating evaporative emission deterioration factors ''using good engineering judgement''. We do not wish to foreclose the possibility that an alternative method may exist or may arise in the future. Consequently, in the final rule we will permit manufacturers to use an optional method based on good engineering judgement acceptable to EPA. As an example, one method would be for the manufacturer to show that it is exclusively using materials documented in the technical literature to have low permeability in the presence of alcohols.

G. Other Test Procedure Issues

California's LEV II program implements a number of minor changes to exhaust emissions test procedures. We have evaluated these changes and found that, for tailpipe emissions, the California test procedures fall within ranges and specifications permitted under the Federal Test Procedure.

With regard to hybrid electric vehicles (HEVs) and zero emission vehicles (ZEVs), we believe that these vehicles will be predominantly available in California, or that they will typically be first offered for sale in California, because of California's ZEV requirement, which promotes the sale of HEVs and ZEVs. Where manufacturers market HEVs or ZEVs outside of California, it is likely that they will market the same vehicles in California. Consequently, we are finalizing our proposal to incorporate by reference California's exhaust emission test procedures for HEVs and ZEVs.[119]

In the NLEV program, we provided a specific formula used by California that could be used to compute an HEV contribution factor to NMOG emissions. This formula took into consideration the range without engine operation of various types of HEVs and had the effect of reducing the NMOG emission standard for a given emission bin (for HEV vehicles only). This would have obvious beneficial effects on a manufacturer's calculation of its corporate NMOG average.

The technology of HEVs is under rapid change and we do not believe that we can design a formula now that will accurately predict the impact of HEVs on corporate average NO_X emissions in the Tier 2 time frame. Consequently, we are finalizing the proposed provision by which manufacturers could propose HEV contribution factors for NO_X to EPA. If approved, these factors can be used in the calculation of a manufacturer's fleet average NOx emissions and will provide a mechanism to credit an HEV for operating with no emissions over some portion of its life.

These factors will be based on good engineering judgement and will consider such vehicle parameters as vehicle weight, the portion of the time during the test procedure that the vehicle operates with zero emissions, the zero emission range of the vehicle, NO_X emissions from fuel-fired heaters and any measurable NO_X emissions from on-board electricity production and storage.

The final NLEV rule (*See* 62 FR pg 31219, June 6, 1997) incorporated by reference California's NMOG measurement procedure and adopts California's approach of using Reactivity Adjustment Factors (RAFs) to adjust vehicle emission test results to reflect differences in the impact on ozone formation between an alternative-fueled vehicle and a vehicle fueled with conventional gasoline. As has been discussed elsewhere in this preamble, the NLEV program is a special case in which California standards and provisions were adopted virtually in their entirety. In the preamble to the final NLEV rule (*See* 62 FR 31203), we expressed our reservations about the use of RAFs. We also addressed our reservations about the use of reactivity factors developed in California in a program that spans a range of climates and geographic locations across the United States in the final rule on reformulated gasoline (RFG) (see 59 FR 7220). We continue to be concerned about the validity of RAFs to predict ozone formation nationwide and asked the National Academy of Sciences to

[117] Numerous SAE papers examine the permeability of fuel and evaporative system materials as well as the influence of alcohols on permeability. See, for example SAE Paper #s 910104, 920163, 930992, 970307, 970309, 930992, and 981360, copies of which are in the docket for this rulemaking.

[118] *Ibid.*

[119] 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; adopted August 5, 1999.

look at the scientific evidence in support of the use of these factors nationwide. While we have recently received a report from NAS,[120] we have not yet developed a final position on how RAFs should be treated in federal regulations. We are finalizing as proposed not to permit the use of RAFs in the Tier 2 program.

The issue of RAFs is relevant primarily to alcohol and CNG-fueled vehicles. RAFs are not relevant at all if a manufacturer elects to use NMHC data to show compliance with the NMOG standards. While, in our final rule, alcohol and CNG vehicles will have to comply with NMOG standards beginning in 2004 and while we desire to harmonize with California when practical and reasonable, we will not permit the use of RAFs for Tier 2 vehicles and interim non-Tier 2 vehicles. We note that we are finalizing a provision from the NPRM that permits dual fueled and flexible fueled vehicles to elect an NMOG value from the next higher bin when they are tested on an alternative fuel. This provides flexibility in compliance with applicable NMOG standards for these vehicles. We do not believe that dedicated alcohol or CNG vehicles should have any problems complying with the NMOG standards we are finalizing and consequently the relief these vehicles might get when RAFs are employed is unnecessary.

In its LEV II program, California is also implementing a number of changes to evaporative emission test procedures.[121] Many of these changes address the evaporative emission testing of hybrid electric vehicles. We proposed not to adopt California's changes, because California uses different test temperatures and different test fuel in its evaporative emission testing of gasoline vehicles than we use in the federal program. The preamble to the final NLEV rule (*See* 62 FR 31227) explains that California and EPA are reviewing an industry proposal to streamline and reconcile the California and federal procedures. That work has not been completed. However, where California adopts procedures specific to HEVs and ZEVs, we are adopting those procedures, except that our testing will occur at lower temperatures, and use a fuel determined by EPA to be representative of federal usage (for HEVs only).

[120] Ozone-Forming Potential of Reformulated Gasoline, May 1999. National Academy of Sciences; National Academy Press. Available from the NAS web site: http://www.nap.edu.

[121] California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles. Adopted August 5, 1999.

H. Small Volume Manufacturers

Our final rule includes the following flexibilities intended to assist all manufacturers in complying with the stringent proposed standards without harm to the program's environmental goals as presented in the NPRM:

- A four year phase-in of the standards for LDV/LLDTs;
- A delayed phase-in for HLDTs;
- The freedom to select from specific bins of standards;
- A standard that can be met through averaging, banking and trading of NO_X credits;
- Provisions for NO_X credit deficit carryover; and,
- Provisions for alternative phase-in schedules.

These flexibilities apply to all manufacturers, regardless of size, and in general we believe they eliminate the need for more specific provisions for small volume manufacturers.[122] However, we proposed and are finalizing one additional flexibility for small volume manufacturers. Today's rule exempts small volume manufacturers from the 25%, 50% and 75% Tier 2 phase-in requirements applicable to the 2004, 2005 and 2006 LDV/LLDTs and the 50% phase-in requirement applicable to 2008 HLDTs. Instead, small volume manufacturers will simply comply with the appropriate Tier 2 100% requirement in the 2007 and 2009 model year. In the phase-in years, small volume manufacturers will simply comply with the appropriate interim standards for all of their vehicles, except that we will also exempt small volume manufacturers from the 25%, 50% and 75% phase-in requirements for the 0.20 g/mi corporate average NO_X standard applicable to interim HLDTs in 2004–2006. Small volume HLDT manufacturers must simply comply with the interim standards, including the corporate average NO_X standard, in 2007 for 100% of their vehicles. During model years 2004–2006, these same small volume manufacturers must comply with any of the applicable bins of standards for 100% of their HLDTs.[123, 124] Provisions to deal with the leadtime issue related to HLDTs and outlined in section IV.B. apply to small volume manufacturers. Therefore unless the small volume manufacturer wants to use the optional NMOG standards for interim LDT2s and LDT4s, it may optionally meet the Tier 1 standards for its 2004 model year HLDTs, provided it commences its model year for those vehicles before the fourth anniversary date of today's rulemaking.

As explained in the NPRM, we will continue to apply the federal small volume manufacturer provisions, which provide relief from emission data and durability showing and reduce the amount of information required to be submitted to obtain a certificate of conformity. In addition, the CAP2000 program contains reduced in-use testing requirements for small volume manufacturers.

Exempting small volume manufacturers from the Tier 2 and interim HLDT phase-in requirements eliminates a dilemma that phase-in percentages can pose to a manufacturer that has a limited product line, *i.e.,* how to address percentage phase-in requirements if the manufacturer makes vehicles in only one or two test groups. We have implemented similar provisions for small entities in other rulemakings. Approximately 15–20 manufacturers that currently certify vehicles, many of which are independent commercial importers (ICIs), will qualify. These manufacturers represent just a fraction of one percent of LDVs and LDTs produced. We do not believe that this provision will have any measurable impact on air quality.

[122] We define small volume manufacturers to be those with total U.S. sales of less than 15,000 highway units per year. Independent commercial importers (ICIs) with sales under 15,000 per year are included under this term.

[123] For a graphical illustration of the phase-ins through time, see Table IV.B.–2.

[124] 2005–2006 for vehicles where the small volume manufacturer commences its 2004 model year for all its 2004 vehicles before the fourth anniversary date of the signature of this rule.

1. Special Provisions for Independent Commercial Importers (ICIs)

We requested comment in the NPRM as to whether ICIs should be exempted from the interim and Tier 2 fleet average NO_X standards. We explained that ICIs may not be able to predict their sales and control their fleet average emissions because they may be dependent upon vehicles brought to them by individuals attempting to import uncertified vehicles. We noted that the NLEV program is optional for ICIs and that ICIs are specifically prohibited, under existing regulations, from complying with the fleet average NMOG standard under the NLEV program. (*See* 40 CFR 85.1515(c)). Also, the existing regulations specifically bar ICIs from participating in any emission related averaging, banking or trading program. (*See* 40 CFR 85.1515(d)). We expressed our concern that if we do not amend this provision, ICIs would likely just pick the least stringent bin available to certify their vehicles. This would create an inequity for other manufacturers, especially other small volume manufacturers that must comply with the fleet average NO_X standards.

Since we do not believe it is wise to finalize a provision that could lead to an inequity like this, and since averaging may not be workable for ICIs, we are finalizing that ICIs must comply with the standards from the bin that contains the relevant fleet average NO_X standard, *e.g.,* in model years 2007 and later an ICI would have to use bin 5 or below for all of its LDV/LLDTs. However, if an ICI is able to purchase credits or to certify to bins below the one containing the fleet average NO_X standard, we will permit the ICI to bank credits for future use. Where an ICI desires to certify to bins above the fleet average standard, we will permit them to do so if they have adequate and appropriate credits. Where an ICI desires to certify to bins above the fleet average standard and does not have adequate or appropriate credits to offset the vehicles, we will permit the manufacturer to obtain a certificate for vehicles using those bins, but will condition the certificate such that the manufacturer can only produce vehicles if it first obtains credits from other manufacturers or from other vehicles certified to lower bins during that model year.

We do not believe that ICIs can predict or estimate their sales of various vehicles well enough to participate in a program that will allow them leeway to produce some vehicles to higher bins now, knowing that they will sell vehicles from lower bins later. We also do not believe that we can reasonably assume that an ICI that certifies and produces vehicles one year, will certify or even be in business the next, consequently, we are also not permitting ICIs to utilize the deficit carryforward provisions of the rule.

Essentially, ICIs will be allowed the major benefits of the averaging, banking and trading program, but will be constrained from getting into a situation where they can ever produce vehicles to higher bins that they can not cover with credits at the time they produce the vehicles.

2. Hardship Provision for Small Volume Manufacturers

The panel convened under the Small Business Regulatory Enforcement Fairness Act recommended that we seek comment on the inclusion of a hardship provision. We requested comment on whether we should include such a provision in the NPRM. Based upon comment, we are including a limited hardship provision in the final rule that will be applicable to small volume manufacturers.

Small volume manufacturers include companies that independently import motor vehicles (Independent Commercial Importers or ICIs), companies that modify vehicles to operate on alternative fuels, companies that produce specialty vehicles by modifying vehicles produced by others, and companies that produce small quantities of their own vehicles, but rely on major manufacturers for engines and other vital emission related components. In these businesses, predicting sales is difficult and it is often necessary to rely on others for technology.

This provision will provide limited relief in the case where a small volume manufacturer is unable to comply with the phase-in dates or average NO_X standard. The manufacturer will need to provide evidence that, despite its best efforts, it cannot meet implementation dates or required NO_X averages.

Appeals for hardship relief must be made in writing, must be submitted before the earliest date of noncompliance, must include evidence that the noncompliance will occur despite the manufacturer's best efforts to comply and must include evidence that severe economic hardship will be faced by the company if the relief is not granted. Hardship relief will only be granted for the first year after a new standard is finally implemented. For small volume manufacturers, which are already exempted from the phase-in schedules for the interim and Tier 2 programs, this means that relief would be available for the final phase-in year for the LDV/LLDT Tier 2 phase-in (2007), for the final phase-in year for the interim HLDT phase-in (2007), and the final phase-in year for the Tier 2 HLDT phase-in (2009). Relief will also be available for manufacturers that did not opt into NLEV and must meet our interim standards for all their LDV/LLDTs in 2004, and relief will be available for HLDTs and MDPVs which must be brought under our interim program in the 2004 model year.

We will work with the applicant to ensure that all other remedies available under this rule, e.g., use of banked or purchased credits, are exhausted before granting additional relief, and will limit the period of relief to one year. Note that in our discussion of the credit deficit carryforward provision in section IV.B.4.d.vi, we indicate that we are not permitting small volume manufacturers to carry deficits forward until they have demonstrated compliance with the NO_X averaging provisions for one year. This is to prevent small volume manufacturers, that have already received additional time due to the waiver of the phase-in requirements, from gaining even more time to finally comply through the credit deficit carryforward provisions.

To avoid this provision creating a self-implementing problem, by which the very existence of the hardship provision prompts small volume manufacturers to delay development, acquisition and application of new technology, we want to make clear that we expect this provision to be rarely used. Our final rule contains numerous flexibilities for all manufacturers and it waives the phase-in steps for small volume manufacturers, which effectively provides them more time. We expect small manufacturers, to prepare for the applicable implementation dates in today's rule.

I. Compliance Monitoring and Enforcement

1. Application of EPA's Compliance Assurance Program, CAP2000

The CAP2000 program (64 FR 23905, May 14, 1999) streamlines and simplifies the procedures for certification of new vehicles and will also require manufacturers to test in-use vehicles to monitor compliance with emission standards. The CAP2000 program was developed jointly with the State of California and involved considerable input and support from manufacturers. As the name implies, it can be implemented as early as the 2000 model year.

We are finalizing our proposal that the Tier 2 and the interim requirements will be implemented subject to the requirements of the CAP2000 program. Certain CAP2000 requirements are being slightly modified to reflect changes to useful lives, standard structure and other aspects of the Tier 2 program, but we proposed no major changes to fundamental principles of the CAP2000 program, and we are not adding any major changes with today's final rule.

Although we proposed changes to useful lives, we did not propose to amend the 50,000 mile minimum mileage used in manufacturer in-use verification testing or in-use confirmatory testing under the CAP2000 program at this time. The CAP2000 in-use program is not yet implemented and we believe it is appropriate to allow manufacturers to gain experience with procuring and testing vehicles at the 50,000 mile level before making significant changes. However, where one vehicle from each in-use test group would have a minimum mileage of 75,000 miles under the CAP2000 program, we proposed and are finalizing, consistent with California, to change that figure to 90,000 miles for Tier 2 vehicles.

We may, in our own in-use program, procure and test vehicles at mileages higher than 50,000 and pursue remedial actions (e.g., recalls) based on that data. We may also use that data as the basis to initiate a rulemaking to make changes in the CAP2000 in-use requirements, if the data indicate significant non-conformity at higher mileages.

We are finalizing certification test fuel specifications consistent with our final fuel sulfur requirements. Given the phase-in for low sulfur fuel we are finalizing in this rulemaking, we recognize that 2004 to 2007 vehicles (and vehicles certified in earlier model years to bank early NO_X credits) may be exposed to higher sulfur levels early in their lives. Because of this sulfur exposure, these vehicles could experience problems with OBD indicator light illuminations.

Consistent with our approach under the NLEV program, we will consider requests from manufacturers to permit OBD systems that function properly on low sulfur fuel, but exhibit sulfur-induced passes when operated on higher sulfur fuel. For OBD systems that exhibit sulfur-induced indicator light illumination, we will consider requests to modify such vehicles on a case-by-case basis.

2. Compliance Monitoring

We plan no new compliance monitoring activities or programs for Tier 2 vehicles. These vehicles will be subject to the certification and manufacturer in-use testing provisions of the CAP2000 rule. Also, we expect to continue our own in-use testing program for exhaust and evaporative emissions. We will pursue remedial actions when substantial numbers of properly maintained and used vehicles fail any standard in either in-use testing program.

Consistent with our approach under NLEV we will consider requests, prior to manufacturer or EPA in-use testing to permit preconditioning procedures designed solely to remove the effects of high sulfur gasoline on vehicles produced through the 2007 model year.

We retain the right to conduct Selective Enforcement Auditing of new vehicles at manufacturer's facilities. In recent years, we have discontinued SEA testing of new LDVs and LDTs, because compliance rates were routinely at 100%. We recognize that the need for SEA testing may be reduced by the low mileage in-use testing requirements of the CAP2000 program. However, we expect to re-examine the need for SEA testing as standards tighten under the NLEV, interim, and Tier 2 programs.

We have established a data base to record and track manufacturers' compliance with NLEV requirements including the corporate average NMOG standards. We expect to monitor manufacturers' compliance with the Tier 2 and interim corporate average NO_X standards in a similar fashion and also to monitor manufacturers' phase-in percentages for Tier 2 vehicles.

3. Relaxed In-Use Standards for Vehicles Produced During the Phase-in Period

The Tier 2 standards will be challenging for manufacturers to achieve, and some vehicles will pose more of a challenge than others. Not only will manufacturers be responsible for assuring that vehicles can meet the standards at the time of certification, they will also have to ensure that the vehicles comply when self-tested in-use under the provisions of the CAP2000 program, and when tested by EPA under its in-use (''Recall'') test program.

With any new technology, or even with new calibrations of existing technology, there are risks of in-use compliance problems that may not appear in the certification process. In-use compliance concerns may discourage manufacturers from applying new technologies or new calibrations. Thus, we proposed and are finalizing, relaxed in-use standards for those bins most likely to require the greatest applications of effort, to provide assurance to the manufacturers that they will not face recall if they exceed standards by a specified amount.

For the first two years after a test group meeting a new standard is introduced, that test group will be subject to more lenient in-use standards. These ''in-use standards'' will apply only to bin 5 and below, only for the pollutants indicated, and only for the first two model years that a test group is certified under that bin. The in-use standards will not be applicable to any test group first certified to a new standard after 2007 for LDV/LLDTs or after 2009 for HLDTs.

The temporary in-use standards are shown in Table V.A.–3 below.

TABLE V.A.–3.—IN-USE COMPLIANCE STANDARDS (G/MI)

[Certification standards shown for reference purposes]

Bin	Durability period (miles)	NO_X In-use	NO_X certification	NMOG in-use	NMOG certification
5 ..	50,000	0.05		n/a	0.075
5 ..	120,000	0.10	0.07	n/a	0.090
4 ..	120,000	0.06	0.04	n/a	0.070
3 ..	120,000	0.05	0.03	0.09	0.055
2 ..	120,000	0.03	0.02	0.02	0.010

Because we are concerned that diesel vehicles may require low sulfur fuel to comply with our interim requirements and that such fuel may not be widely available until the 2006–2007 timeframe, we are providing in-use standards specifically for diesel vehicles certified to bin 10 standards. These standards will be determined by multiplying the applicable NO_X and PM certification standards by factors of 1.2 and 1.35, respectively. These multipliers can be used only for years during which bin 10 is viable, only for diesels and only for the pollutants indicated.

We believe manufacturers should and will strive to meet certification standards for the full useful lives of the vehicles, but we recognize that the existence of such in-use standards poses some risk that a manufacturer might aim for the in-use standard in its design efforts rather than the certification standard, and thus market less durable designs. We do not believe that risk to be significant. We believe that such risks are more than balanced by the gains that can result from earlier application of new technology or new calibration techniques that might occur in a scenario where in-use liability is slightly reduced. Further, we believe that the in-use standards will be of short enough duration that any risks are minimal.

4. Enforcement of the Tier 2 and Interim Corporate Average NO_X Standards

We are finalizing, as proposed, that manufacturers can either report that they meet the relevant corporate average NO_X standard in their annual reports to the Agency or they can show via the use of NO_X credits that they have offset any exceedance of the corporate average NO_X standard. Manufacturers will also have to report their NO_X credit balances or deficits.

The averaging, banking and trading program will be enforced through the certificate of conformity that the manufacturer must obtain in order to introduce any regulated vehicles into commerce. The certificate for each test group will require all vehicles to meet the applicable Tier 2 emission standards from the applicable bin of the Tier 2 program, and will be conditioned upon the manufacturer meeting the corporate average NO_X standard within the required time frame. If a manufacturer fails to meet this condition, the vehicles causing the corporate average NO_X exceedance will be considered to be not covered by the certificate of conformity for that engine family. A manufacturer will be subject to penalties on an individual vehicle basis for sale of vehicles not covered by a certificate. These provisions will also apply to the interim corporate average standards.

As outlined in detail in the preamble to the final NLEV rule, EPA will review the manufacturer's sales to designate the vehicles that caused the exceedance of the corporate average NO_X standard. We will designate as nonconforming those vehicles in those test groups with the highest certification emission values first, continuing until a number of vehicles equal to the calculated number of noncomplying vehicles as determined above is reached. In a test group where only a portion of vehicles are deemed nonconforming, we will determine the actual nonconforming vehicles by counting backwards from the last vehicle produced in that test group. Manufacturers will be liable for penalties for each vehicle sold that is not covered by a certificate.

During phase in years, the certificates will also require manufacturers to meet the applicable phase-in requirements. Compliance with the phase-in requirements will be enforced in the same manner as for the corporate average NO_X standard. For the optional phase-in requirement for HLDTs for model year 2004, manufacturers must declare in their application for certification whether they intend to comply with the interim requirements for all of their HLDTs and initiate phase-in to the interim corporate average NO_X standard in 2004 and receive the benefits of that phase-in (less stringent NMOG standards for certain LDT2s and LDT4s). Compliance with this phase-in requirement and the fleet average NO_X standard will be enforced just like compliance with any other average NO_X standard and phase-in requirement of today's program.

We will also condition certificates to enforce the requirements that manufacturers not sell NO_X credits that they have not generated. A manufacturer that transfers NO_X credits it does not have will create an equivalent number of debits that it must offset by the reporting deadline for the same model year. Failure to cover these debits with NO_X credits by the reporting deadline will be a violation of the conditions under which EPA issued the certificate of conformity, and nonconforming vehicles will not be covered by the certificate. EPA will identify the nonconforming vehicles in the same manner described above.

In the case of a trade that results in a negative credit balance that a manufacturer could not cover by the reporting deadline for the model year in which the trade occurred, we proposed, and are finalizing, to hold both the buyer and the seller liable. This is consistent with other mobile source rules, except for the NLEV rule as discussed below. We believe that holding both parties liable will induce the buyer to exercise diligence in assuring that the seller has or will be able to generate appropriate credits and will help to ensure that inappropriate trades do not occur.

In the NLEV program we implemented a system in which only the seller of credits would be liable. In the preamble to the final NLEV rule (*See* 62 FR 31216), we explained that a multiple liability approach would be unnecessary in the context of the NLEV program given that the main benefit to a multiparty liability approach would be to ''protect against a situation where one party sells invalid credits and then goes bankrupt, leaving no one liable for either penalties or compensation for the environmental harm.'' Our preamble stated further that EPA would not necessarily take the same approach for ''other differently situated trading programs.''

The NLEV program was implemented to be a relatively short duration program, during which time we could expect relative stability in the industry. Also, given that NLEV is a voluntary program of lower than mandated standards, we did not expect that the smallest manufacturers would opt in. These are the companies whose stability is most in jeopardy in a dynamic and very competitive worldwide business.

We currently believe that the Tier 2 program and its framework will remain for many years. We note that the program is not scheduled for complete phase-in for almost nine years after the publication of today's rule. All manufacturers, large and small, will ultimately have to meet the Tier 2 standards. We cannot predict that in the Tier 2 timeframe there will not be companies that leave the market or are divided between other companies in mergers and acquisitions. Thus we believe it is prudent to implement a program to provide inducements to the seller to assure the validity of any credits that it purchases or contracts for.

J. Addressing Environmentally Beneficial Technologies Not Recognized by Test Procedures

Compliance with the current and proposed EPA motor vehicle emission standards is based on the emission performance of a vehicle over EPA's prescribed test procedure. While this test procedure addresses many of the aspects of a vehicle's impact on air quality, it does not address all such impacts. EPA is aware of two developing technologies which have potential to improve ozone-related air quality, but that would not do so over the current EPA test procedure.

The first example is a device that removes ozone from the air as the vehicle is driven. A major producer of automotive catalysts, Englehard, has developed a catalytic coating for vehicle radiators (called PremAir) that converts ambient ozone to oxygen. ARB has been working with Englehard for some time to develop a procedure which would grant PremAir and other direct ozone reducing technologies a NMOG credit under its LEV I and LEV II programs. ARB issued on December 20, 1999 a Manufacturers Advisory Circular outlining procedures for establishing such a NMOG credit.

Englehard submitted substantial comments to the Tier 2 NPRM, including ozone modeling results for five cities (Los Angeles, Houston, Atlanta, New York City, and Chicago). This ozone modeling compared the ozone reductions from reduced exhaust VOC and NO_X emissions to that from using PremAir. As a result of this modeling, Englehard requested that EPA grant a typical PremAir system a NMOG or NO_X emission credit of 0.015 g/mi. This credit would be adjusted based the exact design and performance of the system and vehicle being certified.

The second example is an insulated catalyst. The insulation retains heat for extended periods of time, increasing the catalyst temperature when the engine is started and reducing the time required for the catalyst to reach an operational temperature. This technology can reduce cold start emissions for engine off times (called soaks) of 24 hours or less. The vast majority of engine soaks in-use are less than 24 hours. However, EPA's test procedure only tests emissions at two fairly extreme soak times: 10 minutes and 12–36 hours. The 10 minute soak is so short that even an uninsulated catalyst is warm enough to quickly begin working upon restart. The 36 hour soak is beyond the practical limit of cost-effective insulating techniques. As a result of the Tier 2 NPRM, EPA received a number of inquiries from potential manufacturers of insulated catalysts, requesting further information about emission credits, test procedures and certification requirements.

EPA believes that both of these technologies, as well as other potential technologies, will reduce regulated emissions and/or ambient ozone levels, as long as they operate as designed in-use. EPA will work with the developers of such technologies to establish regulatory procedures to determine whether it is appropriate to grant emission credit for particular technologies. This process will involve the opportunity for public notice and comment.

With regard to Englehard's PremAir technology, EPA specifically requested comments on ARB's proposed approach to determining an NMOG credit and received no adverse comment on granting this type of technology a VOC emission credit. Thus, EPA is promulgating today procedures very similar to ARB's for certifying such technologies and determining the appropriate VOC emission credit. The only difference between EPA's and ARB's procedures involve assessing the effectiveness of VOC emission reductions and ozone reducing devices in areas outside of California.

In summary, the ozone reductions associated by both the ozone reducing technology, such as PremAir, and exhaust VOC emission reductions will be estimated using urban airshed modeling, using up-to-date chemical and meteorological simulation techniques. Four local areas shall be modeled: New York City, Chicago, Atlanta and Houston. The ozone episodes to be modeled shall be those selected by the states for use in their most recent ozone SIPs. Emissions shall be projected for calendar year 2007. Baseline emissions will include the benefits of the Tier 2 and sulfur standards being promulgated today, as well as all other emission controls assumed in EPA's ozone modeling of the benefits of the Tier 2 and sulfur standards described above. The ozone benefit of VOC emission reductions will be modeled by assuming that Tier 2 LDVs and LDTs meet a 0.055 g/mi exhaust NMOG standard instead of a 0.09 g/mi NMOG standard. The relationship between changes in exhaust NMOG emission standards and in-use VOC emissions shall be determined by modeling LDV+LDT emission in 2030 assuming that all Tier 2 vehicles meet a 0.055 g/mi exhaust NMOG standard instead of a 0.09 g/mi NMOG standard. All emission modeling shall utilize the updated Tier 2 emission model developed by EPA as part of this rule, or MOBILE6, once it is available. The measure of ozone to be used in calculating VOC emission equivalency will be the peak one-hour ozone level anywhere in the modeled region on the day when ozone is at its highest. The NMOG credit will be determined by averaging the NMOG credit determined in each of the four local areas.

Simulation of the benefits of the direct ozone reducing device will assume that ozone levels immediately around the roadway will be 40% less than that existing in the broader grid. The performance aspects of the direct ozone reducing device can be simulated by any reasonable values, since the appropriate NMOG credit for any specific application of this technology will be scaled to the performance of the specific application.

The manufacturer wishing to obtain an NMOG credit for use of this technology must demonstrate its effectiveness to EPA as part of the certification process. This will involve demonstrating the air flow through the device, its ozone destruction capability under conditions analogous to those photochemically modeled, the durability of this capability over the useful life of the vehicle and the method to be used to diagnose its effectiveness in-use.

Regarding the insulated catalyst technology, less information has been received to date on its performance. We are not promulgating regulations for determining the appropriate credit for such technology today. However, when we were developing our SFTP standards, EPA developed a methodology to assess the emission benefits of insulated catalysts or other techniques which reduced emissions after the vehicle soaks between 10 minutes and 12–36 hours. Thus, EPA expects to use this methodology as a starting point in assessing the benefit of insulated catalysts and will continue to assess development of options in this area. Because an insulated catalyst operates essentially like a typical catalyst, we do not expect that the test procedures for its certification would differ from those applicable to typical Tier 2 vehicles. The primary difference will be an assessment of its effectiveness relative to conventional catalyst technology over a range of vehicle soak times between 10 minutes and 36 hours. Then, it will be necessary to estimate the average effectiveness in-use relative to conventional technology using the in-use frequency of vehicle soak times.

K. Adverse Effects of System Leaks

The standards set forth in today's final rule are very stringent. They require extremely tight control of air/fuel ratios and also tight control of the inputs to the catalyst(s). A sealed exhaust system is crucial to the proper operation and emission control of current vehicles and even more so to the expected Tier 2 vehicles. Because a given point in the exhaust system intermittently sees negative pressure, exhaust leaks can permit air to enter the exhaust system. Even tiny amounts of air entering this way can have large impacts on the output of the oxygen sensor. If the output of the oxygen sensor is affected, then the exhaust output of the cylinders will be affected. Consequently, an exhaust leak can lead to both excess NO_X and NMOG emissions. Air entering through exhaust leaks can also impact the NO_X conversion efficiency of catalysts.

In the preamble to the NPRM, we expressed our concerns about the impact of small exhaust leaks and requested comment on design or on-board monitoring measures we could finalize to ensure that exhaust systems were manufactured and installed in such a way that leaks are prevented. We also asked for comment on whether we should implement a provision that would require manufacturers to demonstrate through engineering analysis or design that the possibilities of exhaust leaks have been addressed.

Manufacturers indicated in their comments that they believe addressing exhaust leaks is unnecessary. We believe otherwise. Data we have seen suggest that very large emission effects can occur due to very small leaks. Consequently, we are finalizing a provision in today's rule that will require, as part of the certification process, for manufacturers to indicate that they have conducted an engineering analysis of the exhaust system. This analysis must cover the entire exhaust system, including air injection systems, from the engine block exhaust manifold gasket surface to a point beyond the last catalyst or oxygen sensor. This analysis must determine whether the exhaust system has been designed to facilitate leak-free assembly, installation, repair and operation for the full useful life of the vehicle.

With regard to the concept of ''facilitating leak-free repair'', we intend that manufacturers should ascertain that the exhaust system can be removed in a dealership or repair shop for repairs to the exhaust system itself or to other components of the vehicle and be able to be reassembled and reinstalled in a leak free manner using commonly available tools. It is not our intention that the concept of ''facilitating leak-free repair'' apply to situations of gross misuse, tampering or serious vehicle damage.

L. The Future Development of Advanced Technology and the Role of Fuels

The EPA staff will continue to assess the emission control potential of vehicles powered by technologies such as lean-burn and/or fuel-efficient technologies, including diesel engines equipped with advanced aftertreatment systems, gasoline direct injection engines, and other technologies that show promise for significant advances in fuel economy and meeting the Tier 2 standards in the post-2004 time frame. In this assessment, we will maintain a ''systems'' perspective, considering the progress of advanced vehicle technologies in the context of the role that sulfur in fuels plays in enabling the introduction of these advanced technologies or maximizing their effectiveness.

M. Miscellaneous Provisions

We are finalizing, as proposed, to continue existing emission standards from Tier 1 and NLEV that apply to cold CO, certification short testing, refueling, running loss, and highway NO_X. We are discontinuing, as proposed, the 50 degree (F) standards and testing included in the NLEV program. The 50 degree standards are a part of the NLEV program because that national program adopted California requirements virtually in their entirety. These standards had not previously been part of any federal program. We are also discontinuing idle CO standards for LDTs, based upon comment. These standards are adequately covered by the certification short test standards.

VI. Gasoline Sulfur Program Compliance and Enforcement Provisions

A. Overview

The gasoline sulfur program promulgated today has many of the same features as the reformulated gasoline/conventional gasoline (RFG/CG) program, including refinery averaging, refinery and downstream level caps, and the generation and use of credits. These features raise similar compliance issues for both programs. As a result, the enforcement mechanisms of the gasoline sulfur rule generally track those of the RFG/CG rule, where applicable. Because low sulfur gasoline is necessary to avoid significant impairment of Tier 2 motor vehicle emissions technology, we believe measures are needed to assure that gasoline meets the standards promulgated in today's rule at the time the gasoline leaves the refinery gate or is imported, and to assure that the quality of the gasoline is maintained downstream of the refinery.

More specifically, today's rule includes the following provisions:

- Refiners and importers must test each batch of gasoline produced or imported for sulfur content and maintain testing records and retain test samples;
- Refiners and importers must submit reports regarding compliance with the average standards and credit provisions;
- Attest procedures [125] similar to those of the RFG/CG rule will be applied to the sulfur standards and credit provisions;
- Refiners and importers are prohibited from using, selling or purchasing invalid sulfur credits, and are required to adjust compliance calculations if invalid credits have been used, sold or purchased;
- Small foreign refiners subject to the small refiner standards described in section IV.C. above must comply with the rule's small refiner compliance requirements and other requirements to ensure the separation of such foreign gasoline from all other gasoline to the U.S. port of entry; any foreign refiners participating in the early credit generation program must also meet certain provisions concerning credit generation, including reporting and recordkeeping;
- All regulated parties in the gasoline distribution system who are downstream from the refiner or importer must comply with downstream sulfur cap standards;

[125] 40 CFR Part 80, subpart F.

- Regulated parties are subject to presumptive liability for violations at a party's own facility and for violations at other facilities that could have been caused by the regulated party; branded refiners are subject to liability for violations occurring at branded facilities.
- Refiners and distributors may implement downstream quality assurance testing to assure compliance and to establish an element of defense against presumptive liability.

As in other fuels programs, the sulfur standards apply to all motor vehicle fuel that meets the definition of gasoline, except for aviation fuel and racing gasoline, as was proposed in the NPRM. See 40 CFR 80.2(c). Gasoline sulfur standards apply, however, to gasoline that is ultimately used in nonroad equipment or marine engines.

As we noted in the NPRM, we are aware there are certain fuels, such as aviation fuel and racing fuel, that are generally segregated from gasoline throughout the distribution system. Where such fuels are segregated from motor vehicle gasoline and not made available for use in motor vehicles, the fuel is not subject to sulfur rule standards. However, if such fuels are not segregated throughout the distribution system, but are used as motor vehicle gasoline or are commingled with motor vehicle gasoline, then any person who introduces such fuels into the gasoline distribution system is a refiner, subject to all the refiner requirements of today's regulations, including registration, reporting, testing and meeting the national refiner average and cap standards for the volume of gasoline that person added to the distribution system. Today's rule adopts the provisions concerning fuel used for racing vehicles as proposed.

One commenter suggested that racing gasoline or aviation gas should be allowed to be used as motor vehicle gasoline by downstream parties so long as the racing gasoline or aviation gas does not exceed the applicable downstream cap standard. We disagree. Racing gas that meets the applicable downstream sulfur cap would nevertheless not be subject to the refinery gate cap or averaging standards, and may not meet such standards. Allowing such fuels to be distributed for motor vehicle use would thus circumvent the intent of the rule.

The rule promulgated today clarifies the definition of ''refinery'' at 40 CFR 80.2(h), as was proposed in the NPRM. We received no comments on this clarifying change. Specifically, section 80.2(h) now provides that ''refinery'' means any facility, including a plant, tanker truck or vessel where gasoline or diesel fuel is produced, including any facility at which blendstocks are combined to produce gasoline or diesel fuel, or at which blendstock is added to gasoline or diesel fuel. This is consistent with all current EPA fuels rules, interpretations, policies and question and answer documents.

Oxygenate Blenders

In the NPRM we proposed that oxygenate blenders [126] would not be subject to the refiner sulfur standard like other blenders, because we felt it unlikely that oxygenates will have sulfur levels that will raise the sulfur content of the gasoline. This approach also was proposed because gasoline is the denaturant normally used to produce denatured ethanol. However, we received comments that denatured ethanol may contain as much as 50 ppm sulfur, which could result in significant increases in sulfur content from ethanol blending alone.

While it is true that some of today's gasoline has a sulfur content as high as 1,000 ppm which if used as an ethanol denaturant results in ethanol having a sulfur content of 50 ppm, the average sulfur content of gasoline is about 300 ppm which if used as an ethanol denaturant results in ethanol with a sulfur content of 15 ppm. In addition, when the gasoline sulfur standards being promulgated today are in effect, the average sulfur levels of gasoline will be significantly reduced, which will further reduce the sulfur content of denatured ethanol to very low levels. For this reason, we are finalizing the regulation as proposed that oxygenate blenders are not subject to refiner sulfur standards.

However, if gasoline blendstock instead of finished gasoline is used as a denaturant for ethanol the oxygenate blender who adds the ethanol would become a ''refiner,'' who is required to demonstrate compliance with the sulfur standards for the denatured ethanol added to gasoline. This is because the oxygenate blender would be adding a blendstock along with the ethanol, which subjects the blendstock blender to refiner standards and requirements. Moreover, if the blendstock has a high sulfur content the denatured ethanol could have a sulfur content greater than 30 ppm, or even greater than 80 ppm, which could make compliance by such a ''refiner'' difficult or impossible. In addition, as discussed above, in certain cases ethanol is included in the refinery compliance calculations of the refiner who produced the gasoline or RBOB with which the ethanol is blended. Refiners assume this ethanol has no sulfur content, an assumption that could be incorrect if high sulfur blendstock is used as the denaturant.

For these reasons we believe it is important that ethanol blenders use denatured ethanol with a sulfur content of 30 ppm or less, which would occur if the current practice of using finished gasoline as ethanol denaturant continues. In order to ensure this result, the regulations include a provision that prohibits ethanol blenders from using denatured ethanol with a sulfur content greater than 30 ppm. We believe ethanol blenders can comply with this requirement through commercial arrangements with their ethanol suppliers, that specify the maximum sulfur content of denatured ethanol. In addition, ethanol blenders can assure compliance with this requirement by testing to determine the sulfur content of denatured ethanol received.

Gasoline Treated as Blendstock (GTAB)

One commenter suggested that the Agency policy under the RFG/CG rule that allows certain imported gasoline to be treated as a blendstock by importer-refiners should be applied to today's rule. The GTAB policy was originally issued in the RFG Question and Answer document, and was subsequently published as part of a proposed RFG rulemaking in 1997.[127] We intend to address GTAB issues in that RFG rulemaking, including issues regarding compliance with today's rule.

Transmix

We are aware that when gasoline meeting the requirements finalized in today's rule is transported through pipelines, there will be some situations where adjacent distillate product in the pipeline will mix with a portion of the gasoline to create an interface product, commonly referred to as transmix. This transmix may not be blended into the diesel fuel because the gasoline in the transmix may result in diesel fuel performance problems. Historically, this type of transmix product has either been blended into the gasoline, in limited concentrations, or the transmix has been separated into its gasoline and distillate components at a reprocessing plant. However, the practice of blending the transmix into gasoline may result in violations of the downstream standards for RFG, and such blending could violate the downstream sulfur caps finalized in today's rule, because many distillates have a very high sulfur content. Therefore, we believe regulatory provisions are needed to resolve these issues. We have not addressed transmix issues in today's rule because we have already proposed regulations regarding transmix blending and processing in another rulemaking.[128] We plan to address transmix issues, including issues regarding compliance with today's rule, in that rulemaking, which we plan to finalize in the near future.

Inability To Produce Conforming Gasoline in Extraordinary Circumstances

Several commenters suggested the rule should include a provision, similar to the RFG rule provision at 40 CFR 80.73, to address situations where, due to extraordinary circumstances, a refiner or importer cannot produce or distribute conforming gasoline. Section 80.73 applies to refiners, importers and oxygenate blenders. Today's rule has adopted the provisions of section 80.73 for RFG and CG, for importers and refiners, but not for oxygenate blenders. This is because the gasoline sulfur program does not include provisions that would be expected to require oxygenate blender relief.

In the remainder of this section we discuss enforcement issues regarding today's rule that are not covered in this Overview or in section IV.C., above.

B. Requirements for Foreign Refiners and Importers

In the NPRM we proposed that standards for gasoline produced by foreign refineries that are not subject to small refiner individual refinery standards would be met by the importer. Standards for gasoline produced by a foreign refinery subject to an individual sulfur rule standard would be met by the foreign refinery, with certain limited exceptions as provided in the foreign refinery provisions. The rule promulgated today adopts the provisions as proposed, except for several changes aimed at clarifying the proposed requirements, changes relating to the temporary relief provision, and changes relating to foreign refiners' participation in the early credit program. These provisions are very similar to the foreign refinery provisions of the RFG/CG rule.

[126] The term ''oxygenate blenders'' includes ''ethanol elnders.''

[127] Reformulated Gasoline and Anti-dumping Questions and Answers, (11/12/96); Proposed Rule for Modifications to Standards and Requirements for Reformulated and Conventional Gasoline; 62 FR 37337 et seq. (July 11, 1997).

[128] 62 FR 37337 et seq. (July 11, 1997) (proposed 40 CFR 80.84).

1. Requirements for Foreign Refiners With Individual Refinery Sulfur Standards or Credit Generation Baselines

Under the RFG/CG rule, EPA promulgated regulations [129] addressing the establishment and implementation of individual baselines for CG produced by certain foreign refiners. The purpose of these regulations is to ensure the compliance of gasoline supplied from foreign refineries with individual compliance baselines. It includes comprehensive controls, requirements and enforcement mechanisms to monitor the movement of gasoline from the foreign refinery to the U.S., to monitor gasoline quality and to provide for enforcement as necessary.

In the NPRM, we proposed similar requirements for compliance with the applicable sulfur standards that would apply to any foreign refiner who demonstrates that it meets the sulfur program's small refiner criteria. We proposed that foreign refinery baselines would be based on annual average sulfur levels and the volume of gasoline imported to the U.S. during the same baseline period as would be applicable to domestic small refiners. In today's final rule we have also adopted provisions for foreign refiners to establish baselines to participate in the early credit generation program, and to request temporary relief. Any foreign refiner who obtains a foreign refinery gasoline sulfur baseline would be subject to the same requirements as domestic refiners with individual refinery baselines under today's rule. Additionally, provisions similar to the provisions at 40 CFR 80.94 would apply, which include:

- Segregating gasoline produced at the small refinery until it reaches the U.S.;
- Refinery registration;
- Controls on product designation;
- Load port and port of entry testing;
- Attest requirements; and
- Requirements regarding bonds and sovereign immunity.

The rationale for these enforcement provisions is discussed more fully in the Agency's preamble to the final RFG/CG foreign refineries rule (62 FR 45533 (Aug. 28, 1997)).

Several commenters suggested that the rule should have even stronger enforcement provisions concerning foreign refiners, including criminal provisions against foreign individuals who violate the requirements of the rule. While we agree that the rule's enforcement provisions pertaining to foreign refiners must be effective, we believe the proposed enforcement provisions are sufficient, and that attempts to further strengthen them would not significantly increase their overall effectiveness. Today's rule imposes various requirements on foreign refiners not required of domestic refiners, as noted above, which we believe are more effective for ensuring environmental compliance than criminal provisions would be for foreign individuals, in light of the potential difficulties of enforcing sanctions against foreign individuals. EPA's experience to date with the similar RFG/CG requirements under section 80.94 of the RFG/CG rule does not indicate the provisions are inadequate.

Therefore, today's rule generally retains these provisions as proposed. The final rule makes several technical changes, including changes regarding baselines for foreign refiners, to be consistent with the requirements for domestic small refiners and refiners generating early credits finalized in today's rule. The rule's foreign refiner enforcement provisions now also apply to foreign refiners participating in the early credits program, and to the use of credits by foreign small refiners.

One commenter stated that the language of the proposed § 80.410(n) would be too broad in that prohibiting any ''person'' from combining certified small foreign refiner gasoline with non-certified small foreign refiner gasoline or with certified small foreign refinery gasoline produced at a different refinery would prohibit even retail level commingling of such products. This was not intended and today's rule clarifies that such commingling can occur subsequent to importation.

Under the proposal, when the small refiner standards sunset (and additionally under today's rule, when the temporary refiner relief provisions sunset),[130] all gasoline would be subject to a single national averaged standard and one national refinery level cap. Thereafter, standards for all imported gasoline would be met by U.S. importers. We have retained this provision as proposed. With a single national average standard and cap standard, gasoline sulfur content can most readily be monitored at the U.S. importer level, since there will no longer be a special class of gasoline with different standards that would need to be monitored.

2. Requirements for Truck Importers

Today's final rule adopts the proposed requirement for importers to sample and test each batch of gasoline imported. However, as noted in the preamble to the NPRM, for parties that import gasoline into the U.S. by truck, the every-batch testing requirement would include testing the gasoline in each truck compartment, or if the gasoline is homogeneous, testing the gasoline in the truck.

In the NPRM we recognized that this every-batch testing requirement may not be feasible for truckers hauling many small loads of gasoline, and we therefore proposed a limited alternative approach for truck importers in lieu of every-batch testing. The proposed alternative approach is based on the importer meeting the 30 ppm sulfur standard on a per-gallon basis. Under this alternative approach, the importer would be allowed to rely on the sulfur results based on sampling and testing conducted by the operator of the foreign truck loading terminal. Because, in most cases, the terminal operator will not be subject to United States laws, we also proposed safeguards intended to ensure that the gasoline in fact meets the applicable standard. This includes the requirement that the importer conduct a quality assurance sampling and testing program independent from the sampling and testing conducted by the terminal. Under this approach the reporting requirements would be minimized since no averaging would be required. The environmental consequences of this approach would be neutral, because by meeting the 30 ppm sulfur standard on an every-gallon basis the standard also would be met on average.

One commenter stated that the 30 ppm per-gallon standard would be difficult for truck importers to meet due to the fact that Canadian terminals may not always have gasoline with a sulfur content no greater than 30 ppm. The commenter suggested that truck importers be allowed to rely on testing conducted by the foreign gasoline terminal, as discussed above, to meet the average and cap standards like other importers.

We agree that truck importers may have difficulty obtaining gasoline that meets the 30 ppm sulfur standard on a per-gallon basis. Under Canadian regulations, Canadian refiners will be subject to a 150 ppm average standard and a 300 ppm cap in 2004, and in 2005 Canadian refiners will be subject to a 30 ppm average standard and an 80 ppm

[129] 40 CFR 80.94.

[130] Small refiner and temporary refiner hardship individual refinery standards sunset January 1, 2008, except for any small refineries that receive a hardship extension not to exceed two years.

cap.[131] This means that truck importers should be able to meet the standards applicable to other importers, including the ultimate average standard and cap standard under today's rule (30 ppm average and 80 ppm cap), without great difficulty. However, meeting a per-gallon cap of 30 ppm might be difficult since the sulfur content of gasoline in the storage tanks of Canadian terminals, like those of U.S. terminals, will likely exceed 30 ppm at times, even after the 30/80 standards are implemented. We have concluded that we can address this concern by providing additional flexibility to truck importers, and still assure compliance.

While today's rule retains the proposed alternative, with some modifications, it also provides a second alternative approach. Under this second approach, truckers are allowed to meet the national average and cap applicable to other importers, and rely on testing conducted by the foreign gasoline terminal so long as all the other requirements applicable to the proposed alternative approach are complied with. In addition, truckers using this second alternative approach will be subject to more extensive reporting than required for the proposed alternative, since the importer will have to demonstrate compliance with the annual average sulfur standard applicable to other importers.

One commenter urged that truckers should be subject only to the national downstream cap. We cannot agree to this approach as it is not environmentally neutral relative to the national standards in effect for other importers and refiners. If truck importers were required to meet only the downstream cap, sulfur levels for their imported gasoline could be substantially higher than for other importers, which could have a detrimental environmental consequence.

One commenter stated that the 30 ppm per-gallon standard for truck importers should not go into effect until the 30 ppm standard becomes the national average standard for refineries and other importers. We agree. Under today's rule, the per-gallon standards applicable to truck importers under the proposed alternative will be the same sulfur level as the sulfur average standard that applies to other importers (in 2004 there is no average standard; however, truck importers using this alternative compliance approach must meet the corporate pool standard on a per-gallon basis).[132] Under the second alternative approach, the truck importer will be subject to the same average standard and cap standard applicable to other importers.[133]

Similar provisions as provided above apply to truck importers for gasoline subject to the geographic phase-in area (GPA) standards (see section IV.C. of this preamble for a discussion of GPA standards). However, because of the small volumes of truck-imported gasoline, and the consequent difficulty in meeting corporate pool averages for a trucker who imports gasoline into both the GPA and areas outside the GPA, today's rule requires that for truck importers using the averaging option, the corporate pool average does not have to be met. The 150 ppm average standard and the 300 ppm cap standard apply to gasoline imported by truck into the GPA in 2004 through 2006. For truck importers meeting the per-gallon standard option for gasoline imported into the GPA, the per-gallon standards are 150 ppm for 2004 through 2006.

Truck Import of Foreign Small Refiner Gasoline

The NPRM addressed issues associated with gasoline produced by a foreign small refinery with an individual baseline and certified as subject to the refinery's individual interim standard (S–FRGAS), and imported by truck. The proposed requirements for S–FRGAS included segregating the gasoline from all other gasoline from the refinery gate to the U.S., so that compliance with standards can be tracked. For ordinary, non-truck importers, each batch of certified S–FRGAS must be tested at the load port and port of entry. Today's rule finalizes these proposed requirements for S–FRGAS.

However, in the case of gasoline imported by truck, the NPRM acknowledged that the testing and other procedures proposed for certified S–FRGAS may not be feasible. As a result, we proposed an alternative to the requirement for testing every truckload of imported certified S–FRGAS, and to other importer requirements. This alternative approach includes a requirement that small foreign refiners producing any S–FRGAS that will be imported by truck submit a petition to EPA that includes a plan which is designed to ensure that certified S–FRGAS remains segregated from all other gasoline from the refinery to the U.S. Rather than specifying the precise requirements of such a plan in the regulations, we proposed to allow the refiner to develop its own procedures for ensuring that S–FRGAS remains segregated. However, the plan must contain certain elements, such as product transfer documents which identify the origin of the gasoline and prohibit its commingling with any product other than certified S–FRGAS from that refinery.

This approach also requires the refiner of such truck-imported gasoline to receive and maintain all such product shipment documents, including U.S. import documents, for five years and review these to ensure that segregation is maintained until reaching the U.S. To ensure that refiners conduct this review, we proposed to require the refiner's plan to include attest audit procedures to be conducted annually by an independent third party.

We received no comments on this proposal for ensuring the integrity of S–FRGAS imported by truck. Today's final rule adopts the petitioning provision to permit alternative segregation procedures for S–FRGAS imported by truck as proposed since we continue to believe that it will provide flexibility to foreign refiners and to importers and will adequately assure enforceability.

C. What Standards and Requirements Apply Downstream?

We proposed per-gallon cap standards that would apply to all parties in the distribution system downstream of the refinery and importer level, including pipelines, terminals, oxygenate blenders, distributors, carriers, retailers and wholesale purchaser-consumers. We believe that downstream cap standards and compliance monitoring based on downstream standards are needed to ensure that the sulfur level of gasoline remains below the cap level when dispensed for use in motor vehicles, to avoid adverse emissions consequences that would be caused by the use of gasoline having a sulfur content above the cap level. The following discussion addresses downstream standards generally, downstream standards and requirements for gasoline produced by refineries subject to standards under § 80.240 and 80.270, and downstream standards and requirements for gasoline produced or imported for the geographic phase-in area (GPA).

[131] Vol. 133 23/6/99 C. Gaz. II, 23 June 99 (pp. 1469 *et seq.*)

[132] In 2004, a 120 ppm cap; In 2005 and beyond, a 30 ppm cap. See Table IV.C.–1.

[133] In 2004, a 120 ppm average standard and a 300 ppm cap; In 2005, a 30 ppm average standard, a corporate pool average no greater than 90 ppm, and a 300 ppm cap; In 2006 and beyond, a 30 ppm average standard and a 80 ppm cap. See Table IV.C.–1.

Determination of Downstream Cap Standards

We proposed that the downstream standards would be more lenient than the refinery-level cap standards so that refiners and importers can produce gasoline that equals the refinery-level cap standard. We did so because it has been EPA's experience that if a refiner produces gasoline that equals, or almost equals a standard, that gasoline may be shown to violate the standard when subsequently tested at a location downstream of the refinery due to testing variability. As a result, parties downstream of the refinery (primarily pipelines) set commercial specifications for the quality of the gasoline they will accept that are more stringent than the standard that applies to the downstream party. This, in effect, forces refiners to produce gasoline that is ''cleaner'' than the refinery-level standard.

In other fuels programs (for example, the benzene per-gallon standard for RFG) we resolved this concern by announcing enforcement tolerances for fuels standards that apply downstream of the refinery-level, thereby reducing the need for pipelines to set specifications more stringent than the refinery level standards. We believe that having more lenient downstream standards will have the same effect as enforcement tolerances.

In the NPRM we proposed that the values of the downstream cap standards would reflect the testing variability that could reasonably be expected when different laboratories test gasoline for sulfur content; that is, lab-to-lab variability, or reproducibility. Industry commenters supported this approach, and today's rule adopts this approach. For gasoline subject to the 80 ppm refinery-level sulfur cap, the downstream maximum standard is 95 ppm. This difference reflects the reproducibility established by the American Society for Testing and Materials (ASTM).[134] For gasoline subject to refinery-level sulfur caps higher than 80 ppm, which will be the case for gasoline produced before 2006 and for gasoline produced by certain small refineries through 2007, the downstream cap is similarly established by using ASTM reproducibility data. The national downstream cap is 378 in 2004, when the refinery level cap can be as high as 350 ppm. The national downstream cap in 326 in 2005, when the refinery level cap is 300.

Because these downstream caps are based on sulfur test reproducibility, we intend to amend the rule in the future if improvements in test precision are made for the designated method. We may also consider amending the rule to make some other method the designated method if a more precise method is available in the future.

The Proposed Downstream Standards Compliance Scheme

Under the proposal, if gasoline produced by a small refiner with a less stringent cap standard is mixed in the distribution system with gasoline subject to the national cap standard, the entire mixture would then be subject to the higher cap standard, even though most of the gasoline, at the refinery level, would be subject to the more stringent national cap standard. We proposed that during the period that small refinery individual standards are in effect, for gasoline that is comprised, in whole or in part, of small refiner gasoline with a higher sulfur cap standard than the national cap standard, product transfer documents (PTDs) would specify that the gasoline is small refiner gasoline and the level of the downstream cap applicable to the gasoline.

The purpose of the proposed provisions was to make it possible to determine the standard that applies to any gasoline downstream of the refinery. If the gasoline contains no small refiner gasoline, the downstream standard would be based on the national cap. If the gasoline is comprised, in whole or in part, of small refiner gasoline subject to a less stringent cap standard, the downstream standard would be based on this less stringent cap standard. As gasoline is mixed and remixed in the fungible distribution system, the percentage of gasoline that is small refinery gasoline will progressively diminish until the fungibly mixed gasoline meets the national downstream cap. Therefore, we proposed in the NPRM that a downstream party may no longer classify gasoline as containing small refiner gasoline if a test result shows the sulfur content of the gasoline is below the applicable national (i.e., not small refiner) downstream cap.

Several commenters suggested that this tracking scheme would be unworkable. Some of these comments were based on the belief that the proposal intended to require segregation of the small refiner gasoline through the distribution system. The proposal was not intended to require that small refiner gasoline must be segregated, and under today's final rule there is no requirement that small refiner gasoline must be segregated from gasoline produced by other refiners. Some commenters also believed that testing by downstream parties would be required under the proposed rule. These commenters were concerned that a downstream testing requirement could be costly and could delay distribution of gasoline. This latter point is addressed later in this discussion. Some commenters stated that the proposed PTD provisions of the downstream enforcement scheme were too complex and that some means other than changing PTD designations should be found to track small refiner gasoline.

Other commenters, including automobile manufacturer trade associations, stated they believed that EPA enforcement and testing downstream of the refinery is necessary to assure that gasoline complies with standards at the retail gasoline pump.

We have carefully considered the comments and we have concluded that the tracking scheme as proposed would not be effective because most pipeline shipments are expected to include some small refiner gasoline (although the amount of small refiner gasoline may comprise less than 1% of the shipment) and therefore, most of the gasoline in the nation might be classified as small refiner gasoline, even though only a small fraction of the supply will actually be small refiner gasoline. Therefore, a downstream cap much less stringent than the national downstream cap would attach to most gasoline produced to meet the national refinery standards, and the scheme would not be effective in monitoring whether the quality of most gasoline is maintained after it enters the gasoline distribution system.

The proposed scheme could lead to other unintended results. The gasolines contained in a fungible mixture in the distribution system may not be fully mixed and homogenous. As a result, a distinct, unmixed, portion of gasoline within a fungible mixture could be small refiner gasoline with a sulfur content above the national downstream cap, while other parts of the fungible mixture would meet the national downstream cap. This is especially true for fungible mixtures in pipelines and could also be true for gasoline in storage tanks. If a test result for a sample collected from part of such a fungible mixture in a pipeline shows compliance with the national downstream cap, under the proposed rule the entire mixture would become subject to the national downstream cap, and the pipeline PTDs could not classify the gasoline as small refiner gasoline. Thus,

[134] ASTM standard method D 2622–98, entitled 'Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry.''

under the proposal, parties downstream of the pipeline could be subject to liability because they might receive small refiner gasoline not meeting the national standard even where a pipeline PTD does not represent that the gasoline is small refiner gasoline. That was not intended by the proposal.

Because of these difficulties, we concluded that the proposed scheme must be modified to address these concerns, in order for there to be effective enforcement of the downstream standards. We are concerned that the quality of gasoline will be affected downstream of the refinery. Gasoline may be contaminated with high sulfur blendstocks or other high sulfur products such as distillates after it leaves the refinery gate. There is likely to be an economic incentive for some downstream parties to sell or use gasoline or blendstocks that have a higher sulfur content than the national downstream standard. The inability to monitor downstream compliance would result in environmental degradation that is not intended by the rule, and in an inability to assure a level playing field for all parties in the gasoline distribution industry.

Tracking Gasoline Downstream of the Refinery

We believe that an effective downstream compliance and enforcement scheme is necessary in order to achieve the full emissions reduction benefits of the rule. Today's rule modifies the proposed tracking scheme so that compliance with the program can be monitored.

Under today's rule, all gasoline downstream of the refiner or importer is subject to the national downstream standard unless a different downstream standard, based on the highest sulfur content of any small refiner/temporary refiner relief gasoline in the gasoline mixture (as determined by the small refiners' batch testing), is supported by PTDs and a test result confirming the presence of small refiner/temporary refiner relief gasoline. The test result must be for gasoline sampled from the downstream facility classifying the gasoline as small refiner gasoline, unless the facility is a trucker, retailer or wholesale purchaser-consumer. We have concluded that this requirement is necessary to monitor compliance with the downstream standards during the period that small refiner/temporary refiner relief standards are in effect, because the vast majority of the gasoline transported by pipelines will be gasoline produced to comply with the national cap,[135] even though most of those pipeline shipments will be classified as small refiner gasoline.[136]

We believe that the ability to track small refiner gasoline is made even more important due to the geographic phase-in area (GPA) gasoline provisions finalized today.[137] GPA gasoline is subject to less stringent refiner/importer standards than gasoline produced for use in other parts of the country. Therefore, its use is limited to the GPA states. However, it may be produced or imported at any location in the country before it is transported for use in the GPA. EPA would have little ability to assure GPA-designated gasoline is only being used in the GPA if it cannot determine if gasoline at a downstream location outside the GPA that exceeds the applicable downstream cap for non-small refiner gasoline, is in fact small refiner gasoline or if it may include gasoline that was designated for use in the GPA but has been diverted for use elsewhere. The tracking requirements for small refiner gasoline will help us to make that determination.

The only parties required to perform testing in order to demonstrate that a shipment, or tank, of gasoline contains small refiner gasoline are gasoline pipelines and terminals. Where a terminal properly classifies gasoline in its storage tank as small refiner gasoline, and subsequently receives a load of gasoline into that tank, it may not continue to classify the gasoline as small refiner gasoline unless the tank is sampled, and a test demonstrates that the tank still contains small refiner gasoline and the gasoline sulfur content exceeds the national refinery level cap. In 2004 the test result would have to exceed 350 ppm; in 2005, 300 ppm; and starting with 2006, 80 ppm. In the GPA, the test result would have to exceed 350 ppm in 2004, and 300 ppm in 2005 and 2006.

We have concluded that the pipeline and terminal testing provisions are necessary for effective enforcement. We believe that terminals and pipelines will be able to perform sampling and testing that will enable them to identify the presence of small refiner gasoline in a cost-effective manner. These parties have knowledge regarding the mixing of gasoline as it moves from the pipeline and into the terminal tank, and knowledge of the distribution system, that will enable them to make judgments regarding the extent of testing that may be needed to demonstrate whether gasoline meets the national downstream cap. Further, a terminal operator may take additional tests if it believes a tank may contain a stratified portion of small refiner gasoline, despite a test result showing the tank complies with the national downstream cap.

Many terminals may have sufficient reason to believe they are receiving only gasoline meeting the national cap such that they will not normally test each receipt of gasoline. Additionally, even for terminals who receive small refiner gasoline, we do not believe the sampling and testing will be burdensome. This is partly because many terminals already conduct periodic sampling, or even sampling after every delivery of gasoline into storage tanks, at least in the summer VOC or RVP season, to test gasoline for various parameters, which may already include sulfur testing in RFG areas. Field test instruments already exist that are adequate for this testing in 2004 and 2005 when the national downstream cap is 378 ppm and 326 ppm, respectively. Moreover, we believe that because of today's rule, better field test instruments for sulfur analysis at lower levels are likely to be developed in the next few years. Therefore, it will not be necessary for quality assurance samples to be sent to a laboratory for testing. Thus, we do not believe shipments will be held up while terminals await a test result. We also believe that it is likely that these instruments will be available for a cost that will be far less than most laboratory instruments available today.

Under today's rule, retailers are not required to conduct testing. The retailer can demonstrate that the gasoline is properly designated small refiner gasoline subject to a less stringent downstream standard by maintaining PTDs from its suppliers that demonstrate a terminal classified gasoline supplied to the retailer's storage tank as small refiner gasoline.

Downstream Standards and Requirements for GPA Gasoline

Consistent with the way today's rule sets downstream sulfur standards for other gasoline, the GPA program downstream standard is determined by adding the ASTM reproducibility applicable to the refinery level sulfur

[135] For example, most pipeline shipments are expected to contain small refiner gasoline in the two U.S. pipelines that carry the highest volume of gasoline. However, in most shipments the small refiner gasoline is expected to account for substantially less than 5% of the total volume of gasoline in the shipment.

[136] For purposes of this discussion, ''small refiner gasolne'' includes any gasoline from a refiner to whom EPA grants relief based on a showing of extreme hardship.

[137] See section IV.C. of this preamble for refiner/importer standards and the discussion below regarding downstream compliance and enforcement provisions.

cap to that refinery level cap, which for GPA gasoline is as high as 350 ppm in 2004, and 300 ppm in 2005 and 2006. This results in downstream standards for GPA gasoline of 378 ppm in 2004, and 326 ppm in 2005 and 2006.

Because GPA gasoline must be used only within the GPA states,[138] today's rule requires that refiners and importers producing or importing gasoline subject to the GPA standards must designate each such batch of gasoline as GPA gasoline and segregate such batches from all other gasoline. Product transfer documents must identify the gasoline as GPA gasoline so that all downstream parties will be aware that it must be sold or distributed for use only in the GPA.

Gasoline produced for use in all areas of the country outside the GPA may be sold for use in the GPA, including gasoline subject to small refiner standards under section 80.240 of today's rule.

Where GPA gasoline is commingled with other gasoline, the commingled gasoline must be classified as GPA gasoline and used only in the GPA states. Where GPA gasoline is commingled with S–RGAS, the applicable downstream sulfur standard for that gasoline is the greater of the GPA downstream standard or the applicable small refiner/temporary refiner relief standard as determined under section 80.210 of the rule.

Lead-Time for Downstream Compliance With New Standards

Some commenters stated that there should be a lead-time of several months between the implementation date of a new refinery level sulfur standard and the implementation date of the corresponding downstream standard. Based on our experience with other fuels programs, we believe that a one-month lead time will be adequate for gasoline at the terminal level to meet new standards. An additional one month for retailers will give them ample time to comply. Therefore, under today's rule, the 378 ppm downstream sulfur standard (or any applicable small refiner downstream cap standard) is effective February 1, 2004 at the terminal level and March 1, 2004 at the retail level. The 326 ppm downstream sulfur standard is effective February 1, 2005 at the terminal level and March 1, 2005 at the retail level. The 95 ppm downstream standard is effective February 1, 2006 at the terminal level and March 1, 2006 at the retail level (or February 1, 2007, and March 1, 2007, respectively, in the case of gasoline at facilities in the GPA).

Retail Gasoline Pump Labeling

EPA believes gasoline advertised as being ''low sulfur gasoline'' when sold at retail outlets should have a sulfur content of no more than 95 ppm because this is the maximum sulfur level of gasoline at retail outlets that would protect the emission controls of Tier 2 vehicles. We are stating this to inform refiners and other regulated parties, when making advertisement decisions regarding gasoline, that it is EPA's position that effective January 1, 2004, if any retailer represents that gasoline is low sulfur gasoline, or representations to the same effect, the gasoline sulfur content should be no greater than 95 ppm.

D. Testing and Sampling Methods and Requirements

1. Test Method for Sulfur in Gasoline

We proposed ASTM standard method D 2622–98, ''Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry,'' as the primary method for testing sulfur in gasoline by refiners and importers. This is the designated method under the RFG/CG rule.[139] We also requested comment on adopting other methods as the primary method, in particular, ASTM method D 5453–93, ''Standard Test Method for Determination of Total Sulfur in Light Hydrocarbons, Motor Fuels and Oils by Ultraviolet Fluorescence,'' and ASTM D 4045, ''Standard Test Method for Sulfur in Petroleum Products by Hydrogenolysis and Rateometric Colorimetry,'' which is used under the California fuels program for sulfur levels below 10 ppm. We also proposed ASTM D 5453 as an alternative method for determining the sulfur content of gasoline and we requested comment on this proposal.

Most comments supported the continued use of ASTM D 2622 as the designated method for testing sulfur in gasoline under the various fuels rules, including today's rule. Commenters indicated that most refineries outside of California are currently using ASTM D 2622. Under the California fuels regulations, California refineries currently use ASTM D 5453, as well as ASTM D 2622 and ASTM D 4045. Comments were generally favorable to the proposed use of ASTM D 5453 as an alternate method. However, one California refinery, an automobile manufacturers association and a manufacturer of analytical equipment stated that ASTM D 5453 should be the primary method, primarily due to its greater precision at low sulfur levels. Favorable comments were received to the use of ASTM D 4045, especially for gasoline sulfur content of 10 ppm or less. One commenter suggested that ASTM D 5623–94 should be allowed; one commenter suggested that ASTM D 3120 should be allowed, and one commenter suggested that ASTM D 6428 should be allowed. Several commenters stated that we should utilize a performance based criteria system to determine what test methods can be used.

We have considered the comments carefully. We believe there are a number of test methods for determining the sulfur content of gasoline that may eventually be shown to be as good as, or better than, ASTM D 2622. We also considered that the Agency is likely to issue a proposed rulemaking for a performance-based test method approach that would apply to motor vehicle fuel parameters. This rule, once promulgated, would set forth criteria for determining whether an alternative analytical test method could be used instead of the designated analytical test method for a given fuel parameter and would set forth criteria for correlating alternative analytical test methods to the designated analytical test method.

We believe it is appropriate that alternate analytical methods should be qualified and correlated to the regulatory method according to standardized criteria. Today's rule therefore provides that ASTM D 2622, the recognized standard analytical method for determining sulfur in gasoline, is the sole regulatory method, anticipating that a performance-based testing rule may be issued before 2004, and that under its terms anyone will be able to qualify and correlate additional testing methods. We do not believe this will result in undue hardship for several reasons. First, our current fuels rules already provide that ASTM D 2622 is the sole regulatory method for determining the sulfur content of gasoline. Second, California refiners currently using ASTM D 5453 or ASTM D 4045 will not face any hardship because today's rule allows the use of approved California test methods by California refiners.[140] Third, today's rule allows continued use of composite samples for sulfur testing for CG during the period of early credit generation, and therefore refiners currently using outside labs to test composite samples,

[138] As stated in section IV.C. of this preamble, the GPA states are Alaska, Idaho, Montana, North Dakota, Wyoming, Utah, Colorado and New Mexico.

[139] See 40 CFR 80.46(a). Today's rule updates the former designated test method, ASTM D 2622–94.

[140] See preamble discussion in section VI.E., below.

but who may elect to conduct testing in-house when the every-batch sulfur testing requirement is implemented, will not need to determine whether a less expensive alternative to ASTM D 2622 is available for several years. Last, if a performance-based test method rule is not issued by the Agency in the near future, then we may reconsider this issue in a subsequent rulemaking.

We also believe that a standardized approach for determining the appropriateness of alternate test methods, correlation methodology and quality control criteria for alternate test methods would be the most fair approach to the test equipment manufacturers and to the purchasers of testing equipment. It should result in a level playing field for competition among manufacturers of test equipment. We already know that ASTM D 5453 can be purchased for about half the price of ASTM D 2622 equipment, and competition may result in even less expensive equipment.

Some commenters suggested that where a refiner or importer uses ASTM D 2622 to test gasoline, and where the test result is less than 10 ppm, the refiner or importer should be able to report a test result of zero or perhaps use a default value of 5 ppm. This sort of approach has been allowed under the RFG and Anti-dumping Question and Answer Document. However, we disagree with the commenters that this practice is appropriate under the sulfur rule. Under the sulfur rule, with a refiner average standard of 30 ppm, it is important whether a bias is consistently drawn in favor of zero ppm as opposed to 10 ppm. This could artificially increase the number of credits earned or could allow more batches to be produced by the refiner that are near the 80 ppm cap. We believe that any imprecision of sulfur values derived from analysis using ASTM D 2622, will, over the course of numerous batches, average out to near zero. Further, we believe that the precision of ASTM D 2622 is likely to be improved by 2004. Also, by 2004 there may be other methods that will be shown to be precise at low sulfur levels that may be made available for use under a performance-based test method rule. Under today's rule the refiner or importer must report the test result that the test method provides, so long as the result is not less than zero (in which case a result of zero would be reported).

If alternative methods are ultimately made available for use under a performance based rule, refiners and importers who are producing or importing gasoline with low levels of sulfur may desire to use an alternative test method for low sulfur levels, especially if ASTM D 2622 is less precise at such levels. Under today's rule, if any approved alternative method is used for this purpose, a party could not choose to use the test result from ASTM D 2622 when its result is lower, and the test result from the alternative method when its result is lower. For any alternative test method that is eventually approved, if the party uses it for a certain range of sulfur concentrations, and ASTM D 2622 for another range, it must be consistent in such use. For example, if the alternate method were used for test results below 10 ppm, its result would always have to be used for sulfur levels below 10 ppm and ASTM D 2622 would always have to be used for sulfur levels greater than 10 ppm.

2. Test Method for Sulfur in Butane

We proposed the use of ASTM standard test method D 5623–94 [141] as the designated method for testing the sulfur content of butane and requested comment on whether this method should be the designated method. Although some butane suppliers or refiners currently use this method, several commenters stated that many refiners do not have ready access to ASTM D 5623 and that it is not necessarily the most precise method for determination of low levels of sulfur in butane. Commenters suggested at least three other methods are equal to ASTM D 5623. These are ASTM D 2784, ASTM D 4468, and ASTM D 3246.[142] One commenter also suggested that ASTM D 3227–92,[143] should be allowed. Several commenters requested that EPA at least allow alternative test methods for quality assurance testing.

We have reviewed the suitability of ASTM D 5623 and agree that it is not the best method for testing for sulfur content in butane. ASTM D 5623 measures sulfur compounds rather than total elemental sulfur, and the current ASTM 5623 method is specified for liquid fuels, not gaseous fuels.

ASTM D 2784 does not seem to be a better method than ASTM D 5623. Commenters stated that ASTM D 2784 is not the most precise method and that it is not widely used. We believe there may be some difficulty in even obtaining the apparatus for ASTM D 2784. ASTM D 3227 is not appropriate since it is designed for measuring a single sulfur compound, and it is currently designated for testing liquid samples.

We believe that ASTM D 4468 appears to be a good method for testing butane for sulfur levels below 20 ppm. However, dilution would be necessary to test for sulfur levels above 20 ppm. This may be problematical, since it may be difficult to dilute a gaseous fuel. We expect that under today's rule, butane being tested will frequently have sulfur content in excess of 20 ppm. Several other methods exist that might work well for testing for sulfur content of gaseous fuels, but their current scope does not include determination of sulfur in gaseous fuels.

ASTM D 3246–96, which was suggested by API and NPRA as a suitable method, is an appropriate method for measuring gaseous compounds and provides test results for total elemental sulfur. Its range is 1.5 to 100 ppm, which is ideal for testing for the alternative 30 ppm butane sulfur standard applicable to butane blenders promulgated in today's rule.[144]

After considering the strengths and weaknesses of all the available options we believe ASTM D 3246 is the best currently-available method. Therefore, today's rule makes ASTM D 3246 the designated method for testing the sulfur content of butane or other gaseous blendstocks. As discussed above, we anticipate that a performance-based test method rule for motor vehicle fuel parameters may be promulgated before 2004, and that the efficacy of other methods would be demonstrable under that rule. However, if that is not the case, the Agency may reconsider the issue of appropriate alternate test methods in a future rulemaking.

3. Quality Assurance Testing

Several commenters urged that alternate test methods be allowed for quality assurance test purposes. Under today's rule, the use of alternate test methods for quality assurance testing for purposes of establishing a defense to liability, for butane quality assurance testing under section 80.340(b)(4), and for determination of whether gasoline is small refiner gasoline, is allowed, so long as the alternate test method is correlated to the regulatory test method, the method is ASTM approved, and the

[141] ASTM D 5623, entitled "Standard Test Method for Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection."

[142] ASTM D 2784, entitled "Standard Test Method for Sulfur in liquefied Petroleum Gases"; ASTM D 4468–85(1995), entitled "Standard Test Method for Total Sulfur in Gaseous Fuels by Hydrogenolysis and Rateometric Colorimetry"; and ASTM D 3246–96, entitled "Standard Test Method for Sulfur in Petroleum Gas by Oxidative Microcoulometry."

[143] ASTM D 3227, entitled "Mercaptan sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels". The commenter suggested it should be allowed with the use of the x-ray finish.

[144] Discussed in section VI.D.3.

protocols under the method are followed. However, the regulatory method is required for the truck importer quality assurance testing under section 80.350(c).

4. Requirement To Test Every Batch of Gasoline Produced or Imported

We proposed in the NPRM that refiners and importers[145] would be required to sample each batch of gasoline produced or imported and perform a test on each sample to determine the sulfur content prior to the gasoline leaving the refinery gate or importer facility. We received comments on several aspects of this proposed requirement.

Several commenters urged that we continue to allow composite sampling and testing for sulfur. Some refiners commented that the requirement to test each batch would raise testing costs. However, one refiner commented that every-batch testing for sulfur would not be a substantial burden so long as every-batch testing for other CG parameters is not required.[146] This commenter stated that testing for sulfur content is much less complex than testing for certain other CG parameters.

We believe that with a refinery gate sulfur cap combined with refinery averaged standards, there is no realistic alternative to every-batch testing. The Agency has no way to know whether a composite sample that is tested and found to meet the applicable refinery cap included a sample from an individual batch of gasoline that was introduced into commerce that exceeded the cap by a factor of 2 or 3. Further, we believe that with averaged standards for refiners and importers, and with multiple cap standards in effect during the phase-in period, monitoring compliance without every-batch testing would be impossible even if we could somehow be assured that no individual batch significantly exceeded the applicable refinery level cap.

We realize that there will be an additional cost associated with testing every batch of CG—for sulfur content (this is already required for RFG). However, we believe less expensive test methods for sulfur content already exist, and may continue to be developed, that will likely be acceptable as alternative methods in the future, as discussed above. Therefore, today's rule retains the requirement for every-batch testing. Under today's final rule, the test results for each batch of gasoline will be used to determine compliance with the applicable refiner/importer cap standard and to calculate the refiner's or importer's annual average sulfur level. Any batch of gasoline that exceeds the applicable sulfur cap cannot be distributed or sold in the U.S. (unless it is exempted from the standards under today's rule, as described in section VI.G., below).

Refiners who use computerized in-line blending methods objected to the proposed requirement for a batch test before the gasoline is released from the refinery. These commenters stated that refiners using the sophisticated in-line blending practice cannot produce a complete batch test until a portion of the batch is already past the refinery gate. These commenters did not urge that we eliminate the requirement for every-batch testing, but urged that the sulfur rule adopt the RFG rule provisions for in-line blending found at 40 CFR 80.65(f)(4), for both RFG and CG.

We believe that the importance of assuring compliance with the refinery level cap is such that the rule must generally require that gasoline must be tested for sulfur content before it leaves the refinery. Based on experience under the RFG rule, we do not believe that the requirement to test each batch before it is released will substantially increase the cost of testing or cause delays in shipments.

However, today's rule recognizes the unique circumstances involved in computerized in-line blending. We believe that with appropriate safeguards, compliance with sulfur standards for gasoline produced by refineries using in-line blending can be assured. Therefore, today's rule incorporates the RFG rule provisions for in-line blending at 40 CFR 80.65(f)(4). Such provisions will be applicable to RFG and CG. However, refineries presently having an in-line blending waiver will be asked to submit additional information under the auditing procedures included in approvals of in-line blending petitions already in place. We will contact individual holders of in-line blending approvals to request information on how sulfur is monitored and how streams of gasoline are distributed in the in-line blending process. If we cannot conclude that the monitoring procedures will assure compliance with sulfur standards, we will revoke the in-line blending approval for that purpose. We believe it is important to ensure that the in-line analyzer technology and the refiner's methodology and procedures are sufficient for the gasoline sulfur levels the refinery will have after this rule is implemented, for both RFG and CG.

Several commenters stated that the proposed rule's requirement to test every batch of CG for sulfur is unnecessary during the period of early credit generation because there is no cap standard in effect during this period, even for those refiners generating credits. We agree that every-batch testing is not essential for CG until the refinery gate per-gallon cap standards go into effect. Thus, today's final rule allows composite sample testing for CG to continue during the period of early credits generation, until January 1, 2004, when a cap standard for sulfur is first imposed on gasoline.

5. Exceptions to the Every-Batch Testing Requirement

Under the RFG rule, refiners who blend butane or other blendstocks to previously certified gasoline (PCG) must determine the volume and parameter values of the blendstock, including sulfur content, by testing the gasoline before and after blending, and calculating the properties of the blendstock by subtracting the volume and parameter values of the PCG. For CG only, under certain conditions, we have allowed butane blenders to use the parameter specifications of butane as tested by the butane producer. We have allowed this alternative to every-batch testing because of the costs of testing each load of butane. We proposed a similar alternative to every-batch testing for butane blenders in the NPRM, which allows butane blenders to use the sulfur test result of their suppliers, if the butane contains no more than 30 ppm sulfur and if the butane blender undertakes a quality assurance program of periodic sampling and testing to ensure that the supplier's sampling and testing is accurate.

We also proposed to allow refiners that blend other blendstocks into PCG to meet an alternative testing requirement in lieu of testing every batch of gasoline. Provided that the refiner's test result for the sulfur content of each of the blendstocks is less than the national refinery level per-gallon cap standard, a refiner can sample and test each blendstock when received at the refinery, and treat each blendstock receipt as a separate batch for purposes of compliance calculations for the annual average sulfur standard.

Today's rule adopts these provisions. Several commenters urged us to delay the 30 ppm per-gallon cap standard until other refiners must meet a 30 ppm average standard. The proposed 30 ppm per gallon standard was intended to be environmentally neutral in relation to

[145] Except for certain truck importers, as noted above.

[146] As noted above, we are not requiring every batch testing for CG parameters other than sulfur.

the standard applicable to other refiners. Therefore, today's final rule makes clear that for the alternative compliance approach for butane blenders, the 30 ppm per-gallon cap is not applicable until January 1, 2005. The per-gallon cap starting January 1, 2004 is 120 ppm.[147] For GPA gasoline the per-gallon cap under this alternative compliance option is 150 ppm in 2004 through 2006.

6. Sampling Methods

Sampling methods apply to all parties who conduct sampling and testing under the rule. We proposed to require the use of sampling methods that were proposed in the July 11, 1997 **Federal Register** notice for the RFG/CG rule (62 FR 37338, at 37341–37342, 37375–37376). These sampling methods include ASTM D 4057–95 (manual sampling), ASTM D 4177–95 (automatic sampling from pipelines/in-line blending), and ASTM D 5842 (this sampling method is primarily concerned with sampling where gasoline volatility is going to be tested, but it would also be an appropriate sampling method to use when testing for sulfur). There were no adverse comments to the proposed sampling provisions. Today's rule adopts the methods as proposed.

7. Gasoline Sample Retention Requirements

In the NPRM, we proposed a refiner and importer (collectively referred to in this section as ''refiner'') sampling and testing program to establish the sulfur compliance of each batch of gasoline produced or imported. We were aware that there were possible drawbacks to a self-testing scheme. For example, a party might sample or test gasoline in a manner that is inconsistent with the required procedures, or employees might inaccurately record the test results by mistake or otherwise. Parties might also attempt to conceal a discovered violation or to save money by not correcting a violation.

To address our concerns about self-testing, we considered an alternative option of requiring independent sampling and testing for all gasoline, including conventional gasoline. We did not propose this requirement for independent sampling and testing for all gasoline because of the costs of such a requirement,[148] and we are not adopting such a program in today's final rule. Instead, we proposed in the NPRM a different strategy to complement the self-testing program that would help ensure refinery sulfur compliance. This strategy would have required refiners to retain for thirty days a representative sample from each batch of gasoline produced, and to provide such samples to the Agency upon request. We believed that, by means of this option, EPA could verify the refiner test results. We believe that this would create an incentive for refiners to sample, test, and record their sulfur results in an accurate and truthful manner. We also proposed that refiners be required to certify annually that the samples have been collected in the manner required under the sulfur rule. In addition, we proposed that specific procedures be followed by refiners to properly collect, retain, and ship the samples in a manner consistent with requirements already imposed or proposed under the RFG program. Under the proposal, a minimum representative sample of 330 ml of each gasoline batch would need to be retained (and submitted to EPA upon request).[149]

Although there were few comments on this proposal, one commenter, the National Petrochemical & Refiners Association (''NPRA''), did comment extensively on it, and strongly urged the Agency not to finalize it. One of the points raised by the NPRA was that the RFG regulations have their own sample retention and submission requirements, (40 CFR 80.65), so that a sulfur rule provision for RFG batches was not necessary. The Agency continues to believe that sample and retention requirements are useful to ensure compliance with the sulfur standards, but we agree with NPRA that the sample retention and submission requirements found in the RFG rule will serve equally as well for the sulfur rule. Therefore, the final sulfur rule requires all refiners, including those producing RFG, to comply with the sulfur rule's retention requirements. However, any refiner of RFG using an independent laboratory pursuant to 40 CFR 80.65(f), either under the 100% Option or the 10% Option, will be considered to be in compliance with the sulfur rule's retain requirements provided the refiner ensures that the independent laboratory conducting the retain program for the refiner, is in compliance with these requirements. In particular, the refiner must ensure that its independent laboratory sends the appropriate certificate of analysis along with any sample forwarded to EPA. Under the RFG program's 100% Option, the refiner must ensure that its independent laboratory sends the independent lab's certificate of analysis; and under the 10% Option, the refiner must ensure that its independent laboratory sends the refiner's certificate of analysis.

In addition to urging EPA not to finalize the sample retention and submission requirements for RFG gasoline, NPRA urged us not to finalize these requirements for CG as well. NPRA argued that these requirements would not prove useful in deterring non-compliance with the sulfur requirements for this product, primarily because false samples could be forwarded to EPA. The Agency disagrees with NPRA's argument. First, the goal of these requirements is not only to deter cheating but also to reveal inadequacies that exist in refiners' sulfur testing procedures. We do not expect that most non-compliance with the sulfur standards will occur through cheating, but rather through operational problems. Agency enforcement experience under the RFG rule reveals that some refiners' testing procedures are not always accurate in measuring parameters and thus detecting noncompliance. EPA verification testing will expose such testing inaccuracy, enabling the refiner to improve its testing procedures and thus improve its ability to detect, and correct, its own compliance problems. To ensure the effectiveness of these sulfur sample retention and submission requirements, the final rule requires all refiners to provide EPA with the sulfur test result the refiner has obtained for the sample, along with each sample the refiner provides to the Agency under this rule.

EPA will use these retained samples in compliance determinations. Gasoline samples that are forwarded to EPA under the sample retention requirements that are found to be in violation of a refinery cap, will be considered by EPA to be evidence of violations of the cap standard, regardless of the refiner's own test result. In addition, EPA testing of these samples may establish that the refiners' test results are generally incorrect, *i.e.*, are biased. EPA will evaluate whether such a bias constitutes evidence of a violation of the sulfur average standards applicable to the refiner, including whether the bias extends to other sulfur tests conducted by the refiner during the current or previous averaging periods. Further, evidence of testing bias could constitute evidence a refiner has not met the requirement to conduct sulfur testing in accordance with specified

[147] See Table IV.C.–1.

[148] See the discussion on this subject in the preamble to the reformulated gasoline program's final rule, 59 FR 7765 (Feb. 16, 1994).

[149] See 40 CFR 80.65(f)(3)(F)(ii), and the Proposed Rule for Modifications to Standards and Requirements for Reformulated and Conventional Gasoline, 62 FR 37337 *et seq*, proposed 40 CFR 80.101(i)(1)(i)(C)(iii).

procedures, and any reports submitted to EPA that reflect the bias could be evidence a refiner has not met the requirement to properly report the sulfur content of gasoline produced.

While it is true that a party can submit false samples to EPA in order to prevent the Agency from discovering what in actuality is a non-compliant batch of gasoline, we do not believe that there will be many examples of such flagrant cheating. Our enforcement experience indicates that the great majority of parties regulated under the fuels programs work to comply with the regulatory requirements. We believe that the potential penalties for the submission of false samples to the government, and the potential criminal liability which such conduct would subject parties to under to section 113 of the Clean Air Act, will act as significant deterrents to this cheating. Last, to further decrease perceived incentives for such cheating, the regulation specifically requires that the refinery official signing and submitting the refinery's annual sulfur report must make inquiries to verify the correctness of the sampling collection and retention procedures and include with the annual sulfur report a personal certification of the correctness of the procedures used to collect the retained samples. If such certification cannot be made, then the report cannot be timely filed.

NPRA further commented that CG being counted to create early credits under the sulfur rule's ABT program should not be subject to the proposed sample retention and submission requirements. NPRA argues that the lack of a sulfur cap during the early credit timeframe makes such retention and submission unnecessary. The Agency disagrees. During the early credit generation timeframe, refiners participating in the credit program must comply with sulfur averaging requirements, even though sulfur caps are not required to be met. Accurate determination of compliance with the averaging requirements necessitates accurate sulfur testing in the early credit period, just as it does during implementation of the full sulfur program, even though sulfur testing of CG composite samples will be permitted. Hence, the sample retention and submission requirements, whose purpose is to ensure accurate testing and compliance determination, continue to be necessary for the early credit period. The final rule retains the sample retention requirements for CG during the early credit time frame.

NPRA also suggested that in place of the proposed 30 day sample retention requirement, EPA instead should require refiners to maintain samples only from the last three batches of gasoline produced. NPRA argued that this alternative requirement would prove more economical for the refiners, yet would still provide EPA with the ability to test some samples itself. Although the Agency believes that the proposed 30 day retention period would provide a valuable amount of samples to be retained and thus available for testing by EPA, the Agency agrees that a more limited sample retention requirement could provide an acceptable means of confirming refiner testing accuracy and sulfur compliance, while being less burdensome to refiners. We do not believe, however, that retention of samples from only three batches of gasoline would be effective in accomplishing the goal of producing greater testing accuracy. Three samples would not be a great enough number to realistically demonstrate if a pattern of testing irregularities exists or to demonstrate that a significant volume of the refiner's production is covered by the testing verification process. Consequently, instead of the three batch sample retention requirement proposed by this commenter, the Agency has instead required in the final rule that at least the last 20 samples be retained, and that each sample be retained for a minimum of 21 days. The Agency believes this amended requirement addresses NPRA's concern that the amount of days of sample retention be reduced from thirty days, while also providing the Agency with an effective means of assuring a reasonable number of samples, representing a significant period of refining activity, will be available for accuracy testing. We believe the retention requirement is not burdensome given the limited number of samples that must be retained. Further, many refineries already retain samples.

A final comment by NPRA about the sample retention and submission requirements is addressed in the final rule. NPRA raised a concern about the required retention and submission of samples of pressurized blendstock, particularly butane, which would require the use of specialized high-pressure containers. The Agency agrees that there is legitimate concern about the handling, storing and shipping of such samples. We also believe that the final rule's quality assurance testing requirements and the testing requirements for blendstock suppliers provides adequate assurance of the compliance of these blendstocks. Hence, the final sulfur rule does not contain a requirement that samples of pressurized blendstock must be retained.

E. Federal Enforcement Provisions for California Gasoline and for Use of California Test Methods To Determine Compliance

Requirements to Segregate Gasoline and to Use Product Transfer Documents for Certain California gasoline; Definition of California Gasoline

In the NPRM, the Agency proposed to generally exempt from the requirements of the federal sulfur rule certain gasoline sold or intended for sale in California. For the purpose of program consistency, the gasoline to be exempt in the sulfur rule would meet the same definition of California gasoline as found in the RFG rule (40 CFR 80.81(a)(2)). The exempt gasoline would include all gasoline sold, intended for sale, or made available for sale in California that was also either: produced within California; imported into California from outside the U.S.; or imported into California from another state, provided that the out-of-state refinery did not also produce federal RFG.

Although the NPRM proposed to exempt California gasoline from compliance with the proposed sulfur standards (for reasons discussed elsewhere in this preamble), we did propose two requirements that would apply to some exempt California gasoline. The first would require exempt gasoline produced outside of California but intended for use in California, to be segregated from non-exempt gasoline at all points in the distribution system. The second would require out-of-state producers of exempt gasoline intended for sale in California to create PTDs identifying the product as California gasoline, and would require such PTDs to be provided to all transferees of this gasoline in the distribution system. Requiring such documentation is intended to facilitate enforcement and compliance by identifying gasoline that is not federally regulated. The same PTD requirements currently apply under the RFG program.[150]

One commenter expressed a reservation about the sulfur rule's proposed segregation requirement. The commenter was concerned that the segregation requirement for exempt California gasoline might interfere with the ability of California importers to import into California, non-exempt, federal RFG gasoline that happened to comply with California Air Resources Board (ARB) sulfur requirements, but had not been kept segregated by its out-

[150] See 40 CFR 80.81(g).

of-state refiner from the refiner's federal RFG product. Out of a concern about potential gasoline supply problems in California, the commenter asked for assurances from the Agency that such gasoline would not be prohibited from sale in California because of the sulfur rule's segregation requirement.

The Agency agrees that it would not be beneficial to restrict the flow of complying gasoline into California. However, since the federal and the ARB sulfur control programs provide for differing calculations of standard compliance, and since the standards themselves are not always consistent between the two programs, EPA does not believe that the compliance of gasoline produced for federal purposes will necessarily assure its compliance with ARB program requirements, and vice-versa. Therefore, we believe it is necessary to require the physical segregation of the gasolines produced for the different programs in order to best ensure compliance with our uniquely determined federal sulfur standards. To ensure segregation, it is necessary that refiners and importers designate gasoline batches destined for California as California gasoline and that PTDs identify the gasoline as being for use only in California.

Further, one of the purposes of creating the California exemption in the federal sulfur rule is to ensure the exclusion of California gasoline from the refiner's compliance calculations under the federal rule. This exclusion is necessary to prevent gasoline that is produced to comply with the strict California standards from unfairly effecting the refiner's compliance with the federal requirements, thereby facilitating the production of higher sulfur gasoline for use in a federal market supplied by the refiner. EPA believes that segregation of the two gasolines is necessary because it facilitates accurate identification of the product to be included solely in the federal compliance calculations.

EPA does not believe that requiring the segregation of California gasoline from gasoline produced for the federal market should create a significant restriction in the flow of gasoline to California. The Agency believes that if a California marketer needs to acquire ARB-complying gasoline from out-of-state, the marketer should generally be able to satisfy that need by ordering a batch of California gasoline to be created for it by out-of-state producers. Under this circumstance of the creation of a unique batch of California gasoline, segregation of the gasoline will typically be assured.

In analyzing the above comment on segregation of California gasoline, the Agency realized that the sulfur rule's proposed definition of exempted California gasoline, which paralleled the definition existing in the RFG rule, was not as complete as it should be to properly address the unique needs of the sulfur program. Specifically, the exclusion from the sulfur rule's exemption of out-of-state gasoline sold or intended for sale in California solely because it happens to be produced at a refinery that produces federal RFG gasoline, is not appropriate. Basing an exemption on whether or not an out-of-state refinery produces federal RFG is relevant to the RFG program, but it has no relevance to the sulfur control program. To ensure effective determination of compliance with federal sulfur standards, the final sulfur rule deletes any reference to RFG production in the rule's definition of exempt California gasoline. Hence, the example presented in the comment, in which out-of-state gasoline for sale in California could be considered non-exempt gasoline, would not arise under the expanded definition of California gasoline.

Use of California Test Methods and Off-Site Sampling Procedures for 49 State Gasoline

Under the NPRM and the final rule, refineries and importers located in California would be required to meet the federal sulfur standards and other requirements with regard to their "federal" gasoline to be used outside of California. However, we proposed that gasoline produced in California for sale outside of California could be tested for compliance under the federal sulfur rule using the methodologies approved by the ARB, provided that the producer complies with the procedures for such testing as already required under 40 CFR 80.81(h), which permits California test methods not identical to federal test methods to be used for conventional gasoline. Today's rule adopts this provision, as well as the corollary proposed provision that gasoline produced by California refiners for use out-of-state may be tested at off-site testing as already permitted pursuant to 40 CFR 80.81(h) for CG purposes. Both provisions in today's rule should alleviate duplicate testing burdens on California refiners subject to both the federal and California programs, since the test methods acceptable under these alternative provisions in today's rule are also currently used to comply with California requirements. No comments were received on these provisions.

F. Recordkeeping and Reporting Requirements

1. Product Transfer Documents

Small Refiner Gasoline Transfers

The NPRM proposed that the business practice PTDs that accompany each transfer of custody or title of gasoline that includes gasoline produced by any small refiner subject to sulfur rule individual refinery standards would be required to identify the gasoline as such, including the applicable downstream cap, as an aid to enforcing the national downstream cap. Today's rule adopts the proposed PTD requirement, with modifications regarding how the PTD requirement relates to testing, as described in section VI.C. The requirement for printing information on PTDs has been simplified in the final rule. All parties may use brief codes to identify the small refiner status of the gasoline and to identify the small refiner downstream standard it is subject to. This small refiner gasoline PTD provision is also applied to gasoline subject to individual refinery standards under the temporary refiner relief provision of today's rule.

GPA Gasoline Transfers

Under the geographic phase-in program finalized today, gasoline produced or imported for use in the GPA may be used only in the GPA states. Therefore, it is necessary for PTDs for gasoline that is comprised in whole, or in part, of GPA gasoline, to identify the gasoline as such and state that the gasoline may not be distributed or sold for use outside the GPA. Product codes may be used to provide this information, except in the case of transfers to truck carriers, retailers and wholesale purchaser-consumers.

2. Recordkeeping Requirements

Under today's rule, refiners and importers will be required to keep and make available to EPA certain records that demonstrate compliance with the sulfur program standards and requirements. This includes records pertaining to the generation, use and transfer of credits and allotments. The RFG/CG regulations currently require refiners and importers to retain records that include much of the information required in the sulfur rule. Where this is the case, there is no requirement for duplication of records or information.

Under the final rule, all parties in the gasoline distribution system, including refiners, importers, oxygenate blenders, retailers, and all types of distributors will be required to retain PTDs and records of quality assurance programs (including, where applicable, sulfur test results) that parties conduct to establish a defense to downstream violations. All parties in the gasoline distribution system currently are required to keep PTDs for RFG. However, since there are no downstream CG standards under the anti-dumping regulations, only refiners and importers are required to retain PTDs for conventional gasoline under the current regulations. Because the sulfur rule, like the RFG rule, includes downstream standards, we believe that a requirement to retain PTDs for all parties in the gasoline distribution system is appropriate under the sulfur rule. The PTD information will help us identify the source of any gasoline found to be in violation of the sulfur standards, and will provide downstream parties with information regarding the applicable downstream standard.

Parties are required to keep records for a period of five years,[151] with additional requirements for records pertaining to credits and allotments. Records pertaining to credits or allotments that were banked and never transferred to another party are required to be retained for five years after the credits or allotments are used for compliance purposes. Records pertaining to credits or allotments that were transferred are required to be retained by the transferor for five years after the year the credits or allotments were transferred, and by the transferee for five years after use.

We received comment that the regulations should allow records to be maintained in non-hard copy formats, such as photographic or electronic means. We do not believe that the recordkeeping requirements, as proposed, disallow the retention of records in electronic or photographic form. However, parties that electronically generate and/or maintain records must make available to EPA the hardware and software necessary to review the records, or if requested by EPA, electronic records shall be converted to paper documents.

The sulfur rule, like the RFG/CG rule, requires regulated parties to keep the results of tests conducted on the gasoline. A number of parties previously have asked EPA to clarify whether, under the RFG/CG rule, this recordkeeping requirement requires parties to keep copies of all documents that contain test results. To clarify what the recordkeeping requirements require with regard to test data, we proposed for the RFG/CG rule to add language which specifies that the test result as originally printed by the testing apparatus is required to be kept, or, where no printed result is generated by the testing apparatus, the results as originally recorded by the person who performed the tests. Today's action incorporates this clarification in the sulfur rule. Under this provision, where the test data is initially recorded into a database system and there are no prior written recordings of the data, the information in the database system may serve as the original record of the test data. The final rule also specifies that any record that contains results for a test that are not identical to the results as originally printed by the testing apparatus or recorded by the person who performed the test must also be kept. Although this language was not included in the NPRM, we have concluded it is a logical outgrowth of the proposal regarding recordkeeping for test data, and that it will make the regulation clearer with regard to this requirement. As a result, it is appropriate to include this language in the final rule.

3. Reporting Requirements

Refiners and importers will be required to submit an annual report that demonstrates compliance with the applicable sulfur standards and data on individual batches of gasoline, including batch volume and sulfur content. The rule requires that refiners and importers report on the generation, use and transfer of credits and allotments. The RFG/CG programs contain similar reporting requirements. Based on our experience with these programs, we believe that requiring an annual sulfur report and batch information will provide an appropriate and effective means of monitoring compliance with the average standards under the sulfur program. The batch data also will serve to verify that each batch of gasoline met the applicable sulfur cap standard when it left the refinery or import facility. The batch data must also show which batches were designated as GPA gasoline, as appropriate.

For the 2004 and 2005 annual averaging periods, refiners will be required to submit a report for the refiner's gasoline production (RFG and conventional gasoline) for all refineries during the averaging period, which demonstrates compliance with the applicable corporate average and per-gallon cap standards. For the 2005 annual averaging period, refiners will also be required to submit a separate report for each refinery, which demonstrates compliance with the refinery average standard. For the 2004 and 2005 annual averaging periods, importers will be required to submit a report for all of the gasoline they import during the averaging period, which demonstrates compliance with the applicable corporate average and per-gallon cap standards. The importer's report for 2005 must also demonstrate compliance with the refinery average (30 ppm) standard. Any refiner who is also an importer must aggregate the refining and importing activities for the purpose of demonstrating compliance with the applicable corporate average standards. Importers of gasoline produced by foreign refiners with individual baselines have additional reporting requirements. For the 2006 averaging period and beyond, corporate average reports are no longer required for either refiners or importers. Refiners will be required to submit an annual report for each refinery (importers for the gasoline they import), which demonstrates compliance with the refinery average and per-gallon cap standards. Refiners or importers producing both GPA gasoline and gasoline for the remainder of the country, must separately report compliance with the different standards. Annual reports, on forms provided by the Agency, must be received by EPA by the last day of February for the prior calendar year.

The annual reports will also provide a vehicle for accounting for any sulfur allotments or credits created, sold or used to achieve compliance during the averaging period. (See Section IV.C. for a discussion of the sulfur allotment and ABT credit programs.) Each refiner or importer choosing to participate in the ABT program will be required to report to the Agency on an annual basis (refiners for each refinery, and importers for the gasoline they import) the applicable sulfur baseline and the annual average gasoline sulfur level produced at that refinery or by that importer (in ppm sulfur) during the averaging period. Credit calculations will be reported, along with an accounting of credits banked, used, traded, acquired or terminated. The credits will be in units of ppm-gallons. The identity of the refiners/refineries and importers involved in these transactions will be reported, along with the registration numbers assigned to them by the Agency under the RFG/CG program (40 CFR 80, subparts D, E, and F).

For years 2000 through 2003, parties who generate early ABT credits will be required to report information relating to the generation of these credits. These early credit reports will only cover credits banked and traded. Beginning in 2004 and beyond, refiners and importers

[151] Five years is the applicable statute of limitations for the RFG and other fuels programs. See 28 U.S.C. 2462.

who generate and/or use ABT credits will be required to submit information relating to the generation and use of the credits as part of their annual compliance reports, including any credit debit that is carried over to the subsequent year. For each purchase of ABT credits, as reported on the buyer's annual report, there must be a corresponding entry on the seller's annual report. The annual report must also indicate any credits that are used to achieve compliance with the refinery average standard.

As discussed above, during the 2004 and 2005 annual averaging periods, refiners for the combined production from all their refineries, and importers for the gasoline they import, will also be required to demonstrate compliance with the applicable corporate average standard. In addition, refiners and importers must demonstrate compliance with the requirements for the generation, use, transfer and termination of allotments. Refiners and importers who trade sulfur allotments to meet the corporate average standard will be required to submit information relating to these transactions. All sulfur allotment transactions must be concluded by the last day of February of the calendar year following the year the allotments were used to meet the corporate average. Information relating to such transactions, including the identity of the refiners and importers involved in the transactions and their EPA registration numbers, must be reported by both parties to the transaction as part of their annual compliance reports.

As discussed in Section IV.C., above, parties that only blend oxygenates into gasoline are not treated as refiners under the sulfur rule, and, as a result, are not subject to the reporting requirements under § 80.370.

Refiners and importers are also required to arrange for a certified public accountant or certified internal auditor to conduct an annual review of the company's records that form the basis of the annual sulfur compliance report (called an ''attest engagement''). The purpose of the attest engagement is to determine whether representations by the company are supported by the company's internal records. Attest engagements are already required under the RFG/CG regulations. The refiner's attest engagement under the RFG/CG rule partially encompasses sulfur rule compliance since the attest auditors are already required to verify sulfur results for both CG and RFG. However, the RFG/CG attest engagements do not require the attest auditor to review sulfur credit generation, credit purchases, credit trading or small refiner issues. Because of the complexity of the sulfur credit program and small refiner program, sulfur attest engagement provisions have been adopted by today's rule that require the attest auditor to review sulfur credit generation, credit trading, credit purchasing, credit selling, corporate pool averaging, and small refiner issues. Consistent with the RFG regulations, the attest reports for sulfur are to be included in the presently required attest engagement submitted by May 31 of each year.

G. Exemptions for Research, Development, and Testing

The final rule provides for an exemption from the sulfur requirements for gasoline used for research, development and testing purposes. We recognize that there may be legitimate research programs that require the use of gasoline with higher sulfur levels than those allowed under the sulfur rule. As a result, the final rule includes provisions for obtaining an exemption from the prohibitions for persons distributing, transporting, storing, selling or dispensing gasoline that exceeds the standards, where such gasoline is necessary to conduct a research, development or testing program. Parties are required to submit to EPA an application for exemption that describes the purpose and scope of the program and the reasons why use of the higher sulfur gasoline is necessary. In approving any application, EPA will impose reasonable conditions such as recordkeeping, reporting, volume limitations and possible requirements to repair vehicles.

We received comment that the regulations should clarify that suppliers of gasoline used for R&D purposes are exempt from the prohibitions and penalties under the sulfur rule. To clarify this point, we have added a provision which explicitly states that gasoline subject to an R&D exemption is exempt from the provisions of subpart H, so long as the gasoline is used in a way that complies with the terms of the memorandum of exemption. If the R&D exemption is shown to be based on false information or is not properly maintained, parties will be liable for violations of the provisions under subpart H regarding any gasoline covered under the exemption.

We also received comment that the regulations should ensure that vehicles which have been used for testing with high sulfur test fuels are not later returned to the general fleet, or if they are, the vehicles should be required to be restored to their original condition. EPA agrees that it would be improper to permit such vehicles to be used in general use if their emission controls have been rendered inoperative through fueling with high sulfur gasoline. This issue may be effectively addressed through the anti-tampering requirements of section 203(a)(3) of the Clean Air Act, 42 U.S.C. § 7522(a)(3), and is also addressed in today's rule, which provides the Administrator with the power to include appropriate conditions when granting R&D exemptions.

H. Liability and Penalty Provisions for Noncompliance

The liability and penalty provisions under the sulfur rule are similar to the liability and penalty provisions of the RFG and other fuels regulations.[152] Regulated parties will be liable for committing certain prohibited acts, such as selling or distributing gasoline that does not meet the sulfur standards, or causing others to commit prohibited acts. In addition, parties will be liable for a failure to meet certain affirmative requirements, such as the recordkeeping or PTD requirements, or causing others to fail to meet such requirements.

The sulfur rule, like other EPA fuels regulations, includes a presumptive liability scheme for violations of prohibited acts. Under this approach, the party in the gasoline distribution system that controls the facility where the violation occurred, and other parties in that gasoline's distribution system (such as the refiner, reseller, and distributor), are presumed liable for the violation.[153] The sulfur rule explicitly includes causing another person to commit a prohibited act and causing the presence of non-conforming gasoline to be in the distribution system as prohibitions. The final rule clarifies that causing the presence of non-conforming gasoline to be in the distribution system includes gasoline that does not conform to the applicable average standard, as well as gasoline that does not conform to the cap standard. Affirmative defenses are provided for each party that is deemed presumptively liable for a violation, and all presumptions of liability are refutable. The defenses under the sulfur rule are similar to those

[152] See section 80.5 (penalties for fuels violations); section 80.23 (liability for lead violations); section 80.28 (liability for volatility violations); section 80.30 (liability for diesel violations); section 80.79 (liability for violation of RFG prohibited acts); section 80.80 (penalties for RFG/CG violations).

[153] An additional type of liability, vicarious liability, is also imposed on branded refiners under these fuels programs.

available to parties for violations of the RFG regulations.

The final sulfur rule, like the proposal, applies the provisions of section 211(d)(1) of the Clean Air Act (Act) for the collection of penalties. The penalty provisions subject any person who violates any requirement or prohibition of the sulfur rule to a civil penalty of up to $27,500 for every day of each such violation and the amount of economic benefit or savings resulting from the violation. A violation of the applicable average sulfur standard constitutes a separate day of violation for each day in the averaging period. A violation of a sulfur cap standard constitutes a separate day of violation for each day the gasoline giving rise to the violation remained in the gasoline distribution system. The length of time the gasoline in question remained in the distribution system is deemed to be twenty-five days unless there is evidence that the gasoline remained in the gasoline distribution system for fewer than or more than twenty-five days. The penalty provisions are similar to the penalty provisions for violations of the RFG regulations.

After consideration of the comments received, the Agency is adopting regulations that specify the regulated parties who may be subject to liability for causing a violation of the sulfur rule. As proposed, the regulation would have applied to any person, not limited to the parties in the gasoline distribution system whose actions could logically have caused the nonconformity. This provision would have potentially broadened the range of liable parties under the sulfur rule beyond the range established under other fuel programs. EPA believes that the presumptive liability schemes of current fuels regulations have generally been effective and finds no compelling reason to apply the regulatory provision at issue to ''any person'' rather than to specific parties. Therefore, in the final sulfur rule, the liability sections for the causation violations will specify the regulated parties subject to the liability, and will not encompass unspecified parties. The final rule clarifies that oxygenate blenders are among the specified parties potentially subject to liability. Today's final rule also clarifies that parent corporations are liable for violations of subsidiaries. This is consistent with our interpretation of the RFG rule, as stated in the RFG and Anti-dumping Question and Answer document. Finally, the final rule clarifies that each partner to a joint venture will be jointly and severally liable for the violations at a joint venture facility or by a joint venture operation.

We received several comments on the proposal. Some commenters believe that the Act does not authorize EPA to establish prohibitions against causing another person to commit a prohibited act or causing the presence of non-conforming gasoline to be in the distribution system. These commenters believe that these prohibitions are a departure from the liability scheme under the existing fuels regulations and that they constitute double jeopardy by imposing liability for multiple violations for a single act. The commenters also believe that imposing liability for causing another person to commit a prohibited act extends the limits that Congress placed on liability under section 211 of the Act, since sections 211(d) and 211(k)(5) do not expressly mention imposing liability for causing another person to violate regulations. The commenter also noted that, had Congress intended for such actions to be prohibited, it could have expressly included such a prohibition in section 211. This commenter cites section 211(g) as an example of a statutory provision with such a prohibition. One commenter said that, rather than clarify the presumptive liability scheme, the rule provides no guidance regarding what it means to cause someone to violate a prohibition or cause non-conforming gasoline to be in the distribution system. A commenter also stated that these proposed prohibitions are unnecessary, since EPA has issued violations to multiple parties under current fuels regulations.

EPA disagrees with the comment that the sulfur rule's proposed liability scheme is a marked departure from the liability schemes typically found in the other fuels programs promulgated pursuant to section 211 of the Act and with the comment that the regulations constitute double jeopardy (the double jeopardy issue is addressed in the Response to Comment document). The majority of these programs, including the proposed sulfur rule, contain presumptive liability enforcement structures which impose liability on parties who, through their actions, could logically have caused the fuel nonconformity. The sulfur rule's presumptive liability scheme is thus consistent with the liability schemes of typical prior fuels programs. While EPA has issued notices of violations to multiple parties for violations under current fuels regulations, the Agency believes it is appropriate to clarify that the act of causing another party to violate the regulations is a prohibited act. Therefore, the regulatory language in the sulfur regulations explicitly addresses this issue.

EPA also disagrees with the comment that this provision is inconsistent with Section 211(d) of the Act because Section 211(d) does not mention imposing liability for causing another person to violate the regulations promulgated under Section 211(c). For the reasons described above, EPA is adopting a provision in today's regulations that prohibits causing another entity to violate the standards. This prohibition is a reasonable exercise of EPA's discretion under Section 211(c), and the penalty provision of Section 211(d) apply to violations of the prohibition. The fact that Section 211(d) does not specifically mention causing another person to violate the regulations is therefore irrelevant, such action is itself a violation of the regulations. Moreover, Section 211(d) does not mention any specific violations for which penalties may be assessed, but rather states generally that violations shall result in penalties. Thus, the absence of specific mention of causing another entity to violate the regulations is irrelevant, since all other specific prohibitions in regulations subject to Section 211(d) penalties are similarly not mentioned.

The Agency also disagrees with the comment that the Clean Air Act does not give EPA the authority to establish causation violations under the sulfur rule. We believe that the Act gives us ample authority to categorize the sulfur rule's causative acts, *i.e.,* the causing of another party to commit a violation, and the causing of nonconforming gasoline to be present in the distribution system, as prohibited acts. Section 211(c) of the Act authorizes the Agency to promulgate regulations for the purpose of prohibiting or controlling the manufacture, introduction into commerce, sale, or offering for sale of fuels or fuel additives where the fuel or additive causes or contributes to air pollution which may reasonably be anticipated to endanger public health or welfare, or where the fuel or additive will impair to a significant degree the performance of emission control devices that are or will be in general use. Today's gasoline sulfur rule is promulgated pursuant to this authority.

Section 211(c) gives EPA broad discretion to fashion regulations to control or prohibit the manufacture, introduction into commerce, sale, or offering for sale of fuels once the Agency has made the requisite findings regarding contribution to harmful air pollution or impairment of vehicle emissions control system performance. This includes the discretion to adopt reasonable regulatory provisions that are necessary and appropriate to ensure that the controls or prohibitions are effective. To effectively regulate sulfur in gasoline under section 211, it is necessary for the Agency to regulate the actions of those parties who do the manufacturing, introducing into commerce, and selling of gasoline subject to the sulfur requirements.

When one or several of these regulated parties causes another regulated party to violate the rule (or causes nonconforming gasoline to be present in the system), such an act could logically result in the high sulfur gasoline contributing to harmful air pollution or to the impairment of vehicle emission control device performance, which are the adverse impacts that legislative authority under section 211(c) was created to control. Examples of such upstream causative acts include the scenario where a refiner produces high sulfur gasoline which it sells to a distributor. That distributor then resells the nonconforming product to a variety of retail outlets which, in their turn, also violate the rule by selling the high sulfur gasoline to owners of motor vehicles. Another example occurs where a distributor has created high sulfur gasoline by blending high sulfur blendstock into his gasoline. This distributor then makes several different sales of this noncomplying product to a variety of retail outlets, which, in their turn, also violate the rule by selling the product to numerous motor vehicle owners. A third upstream causation scenario could occur if several refiners happen to make nonconforming gasoline. Each then sells its nonconforming product to a different distributor, and a retail outlet which is a customer of both distributors, purchases some of the noncomplying gasoline from both distributors. The retailer then commits a violation by offering this product for sale to its customers.

In some cases, an upstream action has more severe environmental impacts through causing a downstream violation than would occur if the violation was corrected upstream. For example, a refiner may violate the sulfur regulations by shipping gasoline that exceeds the applicable standards when it leaves the refinery. If that violation is corrected before the gasoline reaches the retail outlets, the adverse environmental impacts could be mitigated or avoided. However, if the refiner's violation is not corrected and ultimately causes a number of violations of the standards at retail outlets, the environmental impact would be more severe, since high sulfur gasoline would be introduced into vehicles and impair catalyst performance. Therefore, it is reasonable to consider causing a downstream violation by another party to be a separate violation, since an upstream party's actions can have more severe environmental consequences if they cause downstream parties to violate applicable requirements. For these reasons, it is reasonable to conclude that section 211(c) authorizes the Agency to prohibit and control such causative acts in order to ensure that gasoline ultimately introduced into vehicles meets the low sulfur standards.

Our approach is also reasonable under section 211(c) even though section 211(c) does not expressly prohibit causing another party to violate standards adopted under this subsection. In fact, section 211(c) itself does not contain any express prohibitions, but rather provides EPA authority to regulate fuels and fuel additives, based on certain findings. In contrast, other provisions of section 211, such as section 211(g), do include express prohibitions against certain actions. Thus, under section 211(g), the specified actions are prohibited even in the absence of EPA adopting regulations to codify the prohibitions. In section 211(g), Congress indicated a clear intent to prohibit a specific action (misfueling), without requiring EPA to adopt regulations to implement that prohibition. However, section 211(c) authorizes EPA to establish regulations with certain controls and prohibitions, and, as described above, EPA has the discretion to adopt reasonable measures to ensure that the requirements of such regulations are met.

Moreover, the commenters' assertion that this provision is inconsistent with other subsections of section 211 of the Act is misplaced. First, while the sulfur standards do apply to all gasoline, including gasoline subject to the reformulated gasoline requirements, the sulfur standards are being adopted pursuant to EPA's authority under section 211(c)(1), not under section 211(k). Therefore, section 211(k)(5)'s prohibitions, which describe actions that are violations of section 211(k), are not relevant to the sulfur standards. In addition, the enumeration of specific prohibitions in section 211(k) does not mean that EPA may establish no other prohibited acts with respect to reformulated gasoline; rather, it simply identifies certain actions that ''shall be'' violations of section 211(k), but does not preclude establishment of other appropriate prohibited acts pursuant to EPA's authority under the Act.

The Agency also disagrees with the argument that the proposed causation violations under the sulfur rule would impose unjustifiable, multiple liability for the commission of a single prohibited act. The Agency is generally not in the best position to know the exact cause of a gasoline nonconformity since so many parties and actions are involved with the sale and transfer of the gasoline. Therefore, for effective enforcement, we must have the ability to assert the liability of all the parties in the system who were connected with the nonconforming gasoline because they each could have caused the violation. Similarly, we must also have the ability to assert upstream liability for the full number of downstream violations a party may be responsible for causing, even if the multiple downstream violations may all ultimately be found to stem from one gasoline sale or transfer on the part of the upstream party. The enforcement possibility exists that the separate downstream violations may each have stemmed from separate actions by that party.

Any party may rebut the presumption of liability for each asserted violation by establishing through affirmative defenses that it did not cause the violation. Moreover, any party against whom EPA institutes an enforcement action may raise equitable factors about its own conduct as part of settlement of the violation enforcement action. In settling fuels matters, the Agency typically takes into account such matters as the volume of nonconforming product that a party was connected with, and the severity and the amount of proscribed activity that the party was actually involved with in causing the violation. We do not believe that either the sulfur rule's liability scheme or its future implementation will be arbitrary or unjustified.

To further alleviate commenters' concern about potential liability for multiple violations under the sulfur rule, we want to clarify that the Agency does not ordinarily attempt to collect separate penalties from an entity for the array of possible standard violations (*e.g.,* both for the manufacturing and the selling of noncomplying product), that a party might be liable for in respect to the same gasoline. In addition, we do not intend to seek penalties from a single party for violating regulatory standard requirements while also seeking penalties for that party's causing of other entities to violate regulatory standard requirements, where both violations involve the same gasoline, unless very unusual circumstances exist which would warrant such action, such as egregious conduct on the part of the party.

In a similar fashion, we do not expect to collect penalties from one party for both types of causation violations for the same amount of gasoline under normal circumstances. A primary Agency purpose in defining the causation violations as two separate prohibited acts (*i.e.,* causing another to commit a violation, and causing the presence of nonconforming product in the distribution system), was not to collect a double penalty, but to address different scenarios of evidence collection. For example, if the Agency finds a sulfur rule standard violation in a sample from a retail outlet supplied by a certain distributor, but we do not have a nonconforming sample from the distributor, the evidence would most easily permit us to assert that the distributor was responsible for causing the retailer violation that we do have evidence for. It is reasonable for us to assert the causation violation against the distributor in spite of our lack of a sample from the distributor, because any distributor who transfers gasoline to a retailer, which gasoline is found to be noncompliant, could logically have caused the noncompliance of the gasoline when it was under the distributor's control, such as by blending high sulfur blendstock into the gasoline.

On the other hand, if we have a violation sample from a distributor, but no samples from its downstream customers, we may assert that the distributor caused the presence of nonconforming gasoline in the distribution system, rather than assert that the distributor caused another party to sell nonconforming product, since we don't have a nonconforming sample from another party's facility. It would be reasonable for us to assert that the distributor caused the presence of nonconforming gasoline in the distribution system since we do have a sample of nonconforming gasoline from the distributor, and provided also that there is evidence that the distributor had sold, transferred, etc. this product to downstream customers.

In summary, the Agency intends to enforce the liability scheme of the sulfur rule in the same reasonable manner that we have enforced the similar liability schemes in our prior fuels regulations. This does not include attempting to penalize a party for multiple variations of noncompliance in regard to the same gasoline unless unusual circumstances make such action appropriate.

I. How Will Compliance With the Sulfur Standards Be Determined?

We have often used a variety of evidence to establish non-compliance with the requirements imposed under our current fuels regulations. Test results of the content of gasoline have been used to establish violations, both in situations where the sample has been taken from the facility at which the violation occurred, and where the sample has been obtained from other parties' facilities when such test results have had probative value of the gasoline's characteristics at points upstream or downstream. The Agency has also commonly used documentary evidence to establish non-compliance or a party's liability for non-compliance. Typical documentary evidence has included PTDs identifying the gasoline as inappropriate for the facility it is being delivered to, or identifying parties having connection with the non-complying gasoline.

EPA proposed that compliance with the sulfur standards would be determined based on the sulfur level of the gasoline, as measured using the regulatory testing methodologies. We further proposed that any evidence from any source or location could be used to establish the gasoline sulfur level, provided that such evidence is relevant to whether the level would have been in compliance if the regulatory sampling and testing methodology had been correctly performed. In today's action, EPA is adopting the proposed regulatory provision.

Several commenters interpreted this proposed language as evidencing the Agency's intent to make all evidence, including evidence not derived from regulatory test methods, equal in probative value to that from the regulatory test methods. One commenter also stated that the proposed provision is inconsistent with other parts of the proposal because it undercuts the benefits of having clearly defined regulatory test methodologies. EPA disagrees that the regulatory language indicates such an intent, or has such an effect. The regulations provide that compliance with the standards is to be determined using specified test methodologies. While other information may be used, including test results using different test methods, such other information may only be used if it is relevant to determining whether the sulfur level would meet applicable standards had compliance been properly measured using the specified test methodologies. Thus, the regulation adopted today does not result in a situation where any and all evidence carries equal weight in an enforcement action. In fact, the regulation establishes the regulatory test method as the standard against which other evidence is measured. Moreover, since any evidence other than regulatory test results must be relevant to compliance using the test method, EPA disagrees with the commenter who stated that the validity of the sulfur standards can be challenged in any enforcement action because neither EPA nor regulated entities will be able to rely on measurements taken using the regulatory test methods. Rather than causing more confusion regarding compliance with the standard, this provision clarifies that the regulatory test method defines compliance, since other evidence can only be used if it relates to compliance using that test method.

The following is an example of how the Agency believes evidence of standard non-compliance not based on regulatory test results might be used for compliance purposes under today's rule provisions. Under a first scenario, the Agency might not have sulfur results derived from regulatory test methods for a certain amount of gasoline sold by a terminal, yet the terminal's own test results, based on testing using methods other than those specified in the regulations, show an exceedance of the sulfur standard. Under the requirements of today's rule, the evidence from the non-regulatory test method could only be used to establish noncompliance if the terminal's test results are relevant to the determination of the gasoline's sulfur level that would have resulted if the regulatory test method had been used. Thus, the Agency would have to present evidence to link the results of the alternative test method to sulfur levels as measured using the regulatory test method.

Another commenter has suggested that, if the Agency decides to finalize a ''credible evidence'' provision, it use the language in the current RFG regulations which establishes a presumption that the regulatory testing methods prevail, except in exceptional circumstances. Other commenters also opposed the proposed provision in part because it differs from that in EPA's current fuels regulations. As described above, EPA believes that the provision adopted today does not undercut the importance of the regulatory testing methodologies, since other evidence may be used only as relevant to compliance as measured using the regulatory methods. In addition, as is consistent with the RFG scheme, EPA believes it is appropriate to use such other evidence even in some circumstances where test results using the regulatory test methods do exist, and the provision adopted today clarifies this. EPA also notes that it intends to undertake rulemaking in the near future to revise the current fuels regulations to include the same language for use of other evidence as adopted today in the final sulfur rule.

The provision adopted today also clarifies that any probative evidence obtained from any source or location may be used to establish non-compliance with requirements other than the sulfur standards, such as recordkeeping requirements and requirements to properly calculate sulfur credits and averages, as well as to establish which parties have facility control or some other basis for liability for sulfur rule non-compliance. Since proof of these elements is not predicated on establishing sulfur levels, whether or not regulatory test methods are used is not significant. Therefore commenters' concern about the use of other evidence undercutting the primacy of the regulatory test methods is not germane to this part of the regulation which is not directed toward standards. This provision is being included in the final sulfur rule to clarify that this rule, as is consistent with our interpretation of our other fuels rules, contemplates the full use of all relevant evidence to establish non-standard violations and rule liability.

EPA disagrees with the commenters who stated that EPA lacks authority under the Clean Air Act to permit the use of any evidence of non-compliance of the sulfur standards other than test results using the regulatory test methods. One commenter notes that the only explicit reference in the Act to the use of ''credible evidence'' is in section 113(e), which applies only to stationary sources, and that neither section 211 nor section 205 mention ''credible evidence.'' Finally, the commenter states that the proposed provision is inconsistent with the directive of section 211(k) that EPA determine appropriate measures of and methods for ascertaining the emissions of air pollutants.

EPA disagrees with the comments asserting that the Agency lacks authority to promulgate this provision. While section 113(e) does refer to ''credible evidence,'' that provision is not relevant to EPA's action today. Moreover, the absence of the explicit use of the term ''credible evidence'' in sections 205 and 211 does not compel a conclusion that EPA lacks authority to allow the consideration of relevant evidence in determining compliance with the sulfur standards. EPA believes that section 211(c) provides sufficient authority to adopt such a provision. Section 211(c) authorizes the Agency to promulgate regulations for the purpose of prohibiting or controlling the manufacture, introduction into commerce, sale, or offering for sale of fuels or fuel additives where the fuel or additive causes or contributes to air pollution which may reasonably be anticipated to endanger public health or welfare, or where the fuel or additive will impair to a significant degree the performance of emission control devices that are or will be in general use. As described in other sections of this preamble and in the RIA, today's regulation is promulgated pursuant to this authority. Section 211(c) gives EPA broad discretion to fashion regulations to control or prohibit the manufacture, introduction into commerce, sale, or offering for sale of fuels once the Agency has made the requisite findings regarding contribution to harmful air pollution or impairment of vehicle emissions control system performance. This includes the discretion to adopt reasonable regulatory provisions that are necessary and appropriate to ensure that the controls or prohibitions are effective and can be enforced.

To ensure the effectiveness and the ability to adequately enforce the sulfur standards, it is reasonable for EPA to consider evidence other than actual test results using the regulatory test method, where such evidence can be related to the test results. As described above, test results using the regulatory test method are often not available. In such circumstances, it is reasonable to consider other evidence of compliance, such as test results using other methods or commercial documents, if such evidence can be shown to be relevant to determining whether the gasoline would meet the standard if tested using the regulatory methods. This provision would not permit the use of other evidence that is not relevant to such a determination, and is therefore reasonably limited to allow for effective enforcement, without creating uncertainty about compliance.

Finally, EPA disagrees with the commenter's assertion that this provision is inconsistent with section 211(k). First, while the sulfur standards do apply to all gasoline, including gasoline subject to the reformulated gasoline requirements, the sulfur standards are being adopted pursuant to EPA's authority under section 211(c)(1), not under section 211(k). In any case, the directive of section 211(k)(4) that EPA determine through regulation appropriate measures of and methods for ascertaining the emissions of air pollutants explicitly applies only for purposes of section 211(k), and applies for determining the emissions levels of VOCs and toxic air pollutants from baseline vehicles when operating on baseline gasoline, as defined by section 211(k). Thus, the commenter's reference to section 211(k)(4) as inconsistent with the provision adopted today is misplaced, particularly in light of the limited applicability of the language in section 211(k)(4).[154]

As described in the NPRM, the Agency frequently uses a variety of evidence to establish compliance with fuel programs' regulatory requirements and liability for non-compliance. Such evidence has included test results obtained from a variety of sources, including bills of lading, delivery records, manifests, and other commercial documents. The compliance determination provisions included in today's final rule are created to provide the most effective Agency capability to enforce the rule's requirements.

VII. Public Participation

A wide variety of interested parties participated in the rulemaking process that culminates with this final rule. The formal comment period and four public hearings associated with the NPRM provided additional opportunities for public input. EPA also met with a variety of stakeholders, including environmental and public health organizations, oil company representatives, auto 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 on the Office of Mobile Sources internet home page. Comments and our responses are also included throughout this preamble for several key issues.

VIII. Administrative Requirements

A. Administrative Designation and Regulatory Analysis

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:

[154] The commenter references section 211(k)(5) as support for its assertion, but quotes language from section 211(k)(4). EPA assumes that the commenter intended to cite section 211(k)(4) rather than section 211(k)(5).

• 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 vehicle standards, gasoline sulfur standards, and other regulatory provisions, if implemented, would have an annual effect on the economy in excess of $100 million. Accordingly, we have prepared a Final Regulatory Impact Analysis (RIA) which 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. Regulatory Flexibility

The Regulatory Flexibility Act, 5 U.S.C. 601–612, was amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Public Law 104–121, to ensure that concerns regarding small entities are adequately considered during the development of new regulations that affect them. EPA has identified industries subject to this rule and has provided information to, and received comment from, small entities and representatives of small entities in these industries. We have prepared a Final Regulatory Flexibility Analysis (RFA) to evaluate the economic impacts of today's proposal on small entities.[155] The key elements of the RFA include:

• The number of affected small entities;

• The projected reporting, record keeping, and other compliance requirements of the proposed rule, including the classes of small entities that would be affected and the type of professional skills necessary for preparation of the report or record;

• Other federal rules that may duplicate, overlap, or conflict with the proposed rule; and

• Any significant alternatives to the proposed rule that accomplish the stated objectives of applicable statutes and that minimize significant economic impacts of the proposed rule on small entities.

The Agency convened a Small Business Advocacy Review Panel (the Panel) under section 609(b) of the Regulatory Flexibility Act as added by SBREFA. The purpose of the Panel was to collect the advice and recommendations of representatives of small entities that could be affected by today's proposed rule and to report on those comments and the Panel's findings as to issues related to the key elements of the Regulatory Flexibility Analysis under section 603 of the Regulatory Flexibility Act. The report of the Panel has been placed in the docket for this rulemaking.[156]

The contents of today's final rule and the Final Regulatory Flexibility Analysis reflect the recommendations in the Panel's report. We summarize our outreach to small entities and our responses to the recommendations of the Panel below.

1. Potentially Affected Small Businesses

The Regulatory Flexibility Analysis identifies small businesses from the industries in the following table as subject to the provisions of today's rule:

TABLE VIII.1.—INDUSTRIES CONTAINING SMALL BUSINESSES POTENTIALLY AFFECTED BY TODAY'S RULE

Industry	NAICS [a] codes	SIC [b] codes	Defined by SBA as a small business if: [c]
Motor Vehicle Manufacturers	336111	3711	< 1000 employees.
	336112		
	336120		
Alternative Fuel Vehicle Converters	336311	3592	< 500 employees.
	541690	8931	
	336312	3714	< 750 employees.
	422720	5172	< 100 employees.
	454312	5984 7549	< $5 million annual sales.
	811198	8742	
	541514		
Independent Commercial Importers of Vehicles and Vehicle Components.	811112	7533	< $5 million annual sales.
		7549	
	811198	8742	
	541514		
Petroleum Refiners	324110	2911	< 1500 employees.
Petroleum Marketers and Distributors	422710	5171 5172	< 100 employees.
	422720		

[a] North American Industry Classification System.
[b] Standard Industrial Classification system.
[c] According to SBA's regulations (13 CFR 121), businesses with no more than the listed number of employees or dollars in annual receipts are considered ''small entities'' for purposes of a regulatory flexibility analysis.

The Final RFA identifies about 15 small petroleum refiners, several hundred small petroleum marketers, and about 15 small certifiers of covered vehicles (belonging to the other categories in the above table) that would be subject to the rule.

[155] The Final RFA is contained in Chapter 8 of the Regulatory Impact Analysis.

[156] Report of the Small Business Advocacy Panel on Tier 2 Light-Duty Vehicle and Light-Duty Truck Emission Standards, Heavy-Duty Gasoline Engine Standards, and Gasoline Sulfur Standards, October 1998.

2. Small Business Advocacy Review Panel and the Evaluation of Regulatory Alternatives

The Small Business Advocacy Review Panel was convened by EPA on August 27, 1998. The Panel consisted of representatives of the Small Business Administration (SBA), the Office of Management and Budget (OMB), and EPA. During the development of the proposal, EPA and the Panel were in contact with representatives from the small businesses that would be subject to the provisions of the rule. In addition to verbal comments from industry noted by the Panel at meetings and teleconferences, we received written comments from each of the affected industry segments or their representatives. These comments, alternatives suggested by the Panel to mitigate adverse impacts on small businesses, and issues the Panel requested EPA take additional comment on are contained in the report of the Panel and are summarized below. Today's final rule incorporates the major recommendations of the Panel.

Fuel-Related Small Business Issues

Most of the small refiners stated that if they were required to achieve 30 ppm sulfur levels on average with an 80 ppm per-gallon cap without some regulatory relief, they would be forced out of business. Thus, the Panel devoted much attention to regulatory alternatives to address this concern. Most small refiners strongly supported delaying mandatory compliance for their facilities. On the other hand, most small refiners stated that a phase-in of gasoline sulfur standards would not be helpful because it would be more cost-effective for them to install the maximum technology required for the most stringent sulfur levels that would ultimately be imposed.

The Society of Independent Gasoline Marketers of America (SIGMA) commented that EPA should consider giving relief not only to refiners that meet the SBA definition of small refiner but also to refineries with relatively small production capacity that are owned by large refining companies. This was because a refinery with a small production capacity would operate essentially as an SBA-defined small refiner would. SIGMA also noted that small gasoline marketers would be affected by the closure of any refinery with small production capacity, whether it was owned by a large company or an SBA-defined small refining company.

The Panel recommended that small refiners be given a four to six year period of relief during which less stringent gasoline sulfur requirements would apply. The Panel also advised that EPA specifically request comment on an alternative duration of ten years for the relief period. Small refiners would be assigned interim sulfur standards during this relief period based on their current individual refinery sulfur levels. Following this relief period, small refiners would be required to meet the industry-wide standard, although temporary hardship relief would be available on a case-by-case basis. The Panel concluded that additional time provided to small refiners before compliance with the industry-wide standard was required would allow (1) new sulfur-reduction technologies to be proven-out by larger refiners, (2) the costs of advanced technology units to drop as the volume of their sales increases, (3) industry engineering and construction resources to be freed-up, and (4) the acquisition of the necessary capital by small refiners.

The Panel also concluded that adding gasoline sulfur to the fuel parameters already being sampled and tested by gasoline marketers would likely result in little, if any, additional burden. Therefore, the Panel did not recommend any special provision for gasoline marketers.

EPA's final action on this issue closely follows the Panel's recommendations. You can find a description of the small refiner provisions of today's final rule in Section IV.C.2. above. Comments and our responses on related issues are collected in the Response to Comments document.

Vehicle-Related Small Business Issues

Independent commercial importers of vehicles (ICIs) suggested that the new emissions standards be phased-in with the phase-in schedule based on the small vehicle manufacturer's annual production volume. Secondly, the ICIs requested that small testing laboratories be permitted to use older technology dynamometers than proposed for use by the Agency. Finally, the ICIs commented that the certification process should be waived for certain foreign vehicles. Small-volume vehicle manufacturers (SVMs) stated that a phase-in of Tier-2 emissions standards is essential. They further stated that SVMs should not be required to comply until the end of the phase-in period, which should not be before model year 2007. The SVMs also stated that a case-by-case hardship relief provision should be provided for their members. SVMs requested that a credit program be established with incentives for larger manufacturers to make credits available to SVMs in meeting their compliance goals.

Based on the above comments, the Panel advised that EPA consider several alternatives, individually or in combination, for the potential relief that they might provide to small certifiers of vehicles.

The Final Regulatory Flexibility Analysis evaluates the financial impacts of the proposed vehicle standards and fuel controls on small entities. EPA believes that the regulatory alternatives incorporated in today's final rule will provide substantial relief to small business from the potential adverse economic impacts of complying with today's proposed rule.

C. Paperwork Reduction Act

The information collection requirements (ICRs) associated with today's rule belong to two distinct categories: (1) those that pertain to amendments to the vehicle certification requirements, and (2) those that pertain to requirements for the control of gasoline sulfur content. These information collection requirements are contained in two separate ICR documents according to the category to which they belong.

The ICR in this final rule that pertains to the amendments to the vehicle certification requirements has been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* Copies of this ICR [157] can be obtained from Sandy Farmer, Office of Environmental Information, Collections Strategy Division, U.S. Environmental Protection Agency (Mail Code 2822), 401 M Street, SW, Washington, D.C. 20460, or by calling (202) 260–2740. Please refer to ICR #783.40 in any correspondence. Copies may also be downloaded from the internet at *http://www.epa.gov/icr.*

The ICR in this final rule that pertains to the requirements for the control of gasoline sulfur will be submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq.* The submission to OMB of the ICR document that contains this ICR and its availability to the public will be announced in a subsequent **Federal Register** notice.

[157] The information collection requirements associated with the amendments to the requirements for vehicle certification are contained in the Information Collection Request entitled ''Amendments to the Reporting and Recordkeeping Requirements for Motor Vehicle Certification Under the Tier 2 Rule'', OMB No. 2060–0114, EPA ICR # 783.40.

The Agency may not conduct or sponsor an information collection, and a person is not required to respond to a request for information unless the information collection request 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. The OMB control numbers for the information collection requirements in this rule will be listed in an amendment to 40 CFR part 9 in a subsequent **Federal Register** notice after OMB approves the ICRs.

The Paperwork Reduction Act stipulates that ICR documents estimate the burden of activities required of regulated parties within a three year time period. Consequently, the ICR documents associated with today's final rule contain burden estimates for the activities that will be required under the first three years of the program.

ICRs Pertaining to the Amendments to Vehicle Certification Requirements: The information collection burden to vehicle certifiers associated with the amendments to the vehicle certification requirements in today's notice pertain to the fleet-average NO_X standard and emission credits provisions. These requirements are very similar to those under the voluntary National Low Emission Vehicle (NLEV) program, which includes a fleet-average standard for nonmethane hydrocarbon organic gases (NMOG) and associated emission credits provisions. The hours spent annually by a given vehicle certifier on the information collection activities associated with the these recordkeeping and reporting requirements depends upon certifier-specific variables, including: the scope/variety of their product line as reflected in the number of test groups and strategy used to comply with the fleet-average NO_X standard, the extent they utilize emissions credits provisions, and whether they opted into the NLEV program. Vehicle certifiers that use the provisions for early banking of emission credits will be subject to the associated information collection requirements as early as September 1, 2000.[158] All vehicle certifiers will be required to comply with the information collection requirements associated with the amendments to the vehicle certification program beginning September 1, 2003.[159] The ICR document for the amendments to the vehicle certification program in this final rule provides burden estimates for all of the associated information collection requirements. The total information collection burden associated with the amendments to the vehicle certification requirements is estimated at 8,406 hours and $567,217 annually for the certifiers of light-duty vehicles, medium-duty passenger vehicles, and light-duty trucks.

ICRs Pertaining to the Requirements for Gasoline Sulfur Control: The information collection burden to gasoline refiners, importers, marketers, distributors, retailers and wholesale purchaser-consumers (WPCs), and users of research and development (R&D) gasoline pertain to the gasoline sulfur control program in today's rule. The scope of the recordkeeping and reporting requirements for each regulated party, and therefore the cost to that party, reflects the party's opportunity to create, control, or alter the sulfur content of gasoline. As a result, refiners and importers have significant requirements, which are necessary both for their own tracking, and that of downstream parties, and for EPA enforcement. Parties downstream from the gasoline production or import point, such as retailers, have minimal burdens that are primarily associated with the transfer and retention of product transfer documents. Many of the reporting and recordkeeping requirements for refiners and importers regarding the sulfur content of gasoline currently exist under EPA's Reformulated Gasoline (RFG) and Anti-Dumping programs. The ICR for the RFG program covered start up costs associated with reporting gasoline sulfur content under the RFG program. Consequently, much of the cost of the information collection requirements under the gasoline sulfur control program has already been accounted for under the RFG program ICR. In addition, many of the information collection burdens associated with the sulfur program are the result of provisions designed to provide refiners with flexibility in demonstrating compliance with the sulfur standards in the early years of the program, such as the credit trading and small refiner programs.

The information collection requirements under the sulfur control program evolve over time as the program is phased-in. Beginning July 1, 2000, certain requirements apply to parties that voluntarily opt to generate credits for early sulfur reduction under the average banking and trading (ABT) provisions. Many of the requirements do not become applicable until the beginning of the sulfur control program on October 1, 2003, when all refiners are required to meet the sulfur standards. The information collection requirements under the sulfur control program become stable after January 1, 2008, when the optional small refiner provisions expire.[160]

The ICR document for the sulfur control program in this final rule will provide burden estimates for the activities required under the first three years of the program, from July 1, 2000, through June 30, 2003. The burden associated with activities required after June 30, 2003, will be estimated in later ICRs. The initial ICR for the gasoline sulfur control program, however, will provide a qualitative characterization of all of the required activities and associated burdens for the various regulated parties as they develop, and until they become stable after January 1, 2008.

In the ICR associated with the NPRM for this final rule, we estimated that the total burden of the information collection requirements that would be applicable during the first three years of the proposed gasoline sulfur control program would be 42,479 hours and $2,149,865 annually.[161] Annual burden estimates for the various regulated entities under the initial three year period of the gasoline sulfur control program were also provided in the NPRM ICR as follows:

- Refiners: 31,231 hours; $1,879,822.
- Importers: 40 hours; $2,067.
- Pipelines: 85 hours; $2,785.
- Terminals: 1,700 hours; $55,700.
- Truckers: 3,333 hours; $118,000.
- Retailers/WPCs: 6,087 hours; $91,298.
- R&D Gasoline Users: 3 hours; $193.

We received few comments on the ICR burden estimates in the proposed sulfur rule. Most regulated parties have been fulfilling reporting, recordkeeping and testing requirements under the reformulated and conventional gasoline regulations. The only negative comments we received related to the batch testing for sulfur content and sample retention for conventional gasoline. We believe the estimated cost of complying with these requirements is somewhat higher than the actual

[158] These ICRs will become effective on the date that model year 2001 vehicles are introduced into commerce. EPA assumes that September 1, 2000 is the earliest date that model year 2001 vehicles will be marketed.

[159] Assuming model year 2004 vehicles are introduced into commerce on this date.

[160] A refiner can petition EPA for an extension of the small refiner provisions beyond January 1, 2008, based on hardship.

[161] The information collection requirements associated with the proposed gasoline sulfur control program are contained in the Information Collection Request that accompanied the Tier 2 NPRM which is entitled ''Recordkeeping and Reporting Requirements Regarding the Sulfur Content of Motor Vehicle Gasoline Under the Tier 2 Proposed Rule'', ICR #1907.01. Copies of this ICR can be obtained as discussed earlier in this section.

burdens industry will realize. The ICR for this final rule will be adjusted accordingly.

We estimate that there will be some additional costs and hourly burdens over those estimated in the NPRM associated with certain changes made to the sulfur program from the NPRM to this final rule. In particular, this final rule includes a program which provides for relaxed standards in the early years of the program for refiners and importers who produce or import gasoline for use in certain states in the western U.S. This program requires some additional reporting and recordkeeping burdens for those refiners and importers who participate in the program, since they will be required to submit an application for the program, including a baseline for purposes of establishing their sulfur standard. This program requires gasoline intended for use in the geographic area to be identified on product transfer documents and segregated from other gasoline in the distribution system. This final rule also includes provisions for trading sulfur allotments to provide refiners and importers additional flexibility in meeting the corporate pool average standards. This program requires additional reporting and recordkeeping to track allotment trading activity. In addition, the final rule requires small refiners to submit information regarding their crude oil capacity in order to qualify for the small refiner standards under the rule. Small refiners are also required to submit reports of their progress toward compliance with the sulfur standards. The additional total annual cost and hourly burden over the first three years of the program, as a result of changes made to the program in the final rule, are estimated to add less than one percent to the overall burden estimates contained in the NPRM ICR for the sulfur control program.

Total Burden of the ICRs: In the NPRM, we estimated that the total burden of the recordkeeping and reporting requirements associated with the proposed vehicle certification and gasoline sulfur control requirements would be 50,840 hours and $2,714,037 annually over the first three years that these requirements would be in effect. In the ICR document for this final rule which covers the ICRs for the vehicle certification program, the burden estimates were increased by 45 hours and $3,045 over the burden estimates in the NPRM ICR. This increase reflects changes from the NPRM in the final rule associated the inclusion of the medium-duty passenger vehicles (MDPVs) under the program. As discussed above, we anticipate that changes to the ICR document for this final rule which covers the ICRs for the sulfur control program will have burden estimates less than one percent higher than the estimates contained in the NPRM. Adding these increased costs to the burden estimates presented in the NPRM, we arrive at an estimate of the total burden of the recordkeeping and reporting requirements associated with the vehicle certification and gasoline sulfur control requirements in this final rule of less than 51,350 hours and $2,742,000 annually over the first three years that these requirements will be in effect. These burden estimates will be more precisely stated in the forthcoming **Federal Register** notice which announces the submission to OMB of the ICR document for this final rule that covers the ICRs for the sulfur control program and the availability of this ICR document to the public.

D. Intergovernmental Relations

1. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), P.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 ''Administrative Designation'' and Regulatory Analysis' section in today's preamble (VIII.A.) for further information regarding these analyses.

2. 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 motor vehicle emissions, motor vehicle fuel, 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.

3. 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 and national standards to control gasoline sulfur. 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.

This final rule preempts State and local controls or prohibitions respecting gasoline sulfur content, pursuant to Section 211(c)(4) of the Clean Air Act. The basis and scope of preemption is described in Section IV.C.1.d of this notice. 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.

E. 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 proposal 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

F. 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 Executive Order 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, section 5–501 of the Order directs the Agency to 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.

This rule is subject to the Executive Order because it is an economically significant regulatory action as defined by Executive Order 12866 and it concerns in part an environmental health or safety risk that we have reason to believe may have a disproportionate effect on children.

This rulemaking will achieve significant reductions of various emissions from passenger cars and light trucks, primarily NO_X, but also NMOG and PM. These pollutants raise concerns regarding environmental health or safety risks that EPA has reason to believe may have a disproportionate effect on children, such as impacts from ozone, PM and certain toxic air pollutants. See Section III of this preamble and the RIA for a further discussion of these issues.

The effects of ozone and PM on children's health were addressed in detail in EPA's rulemaking to establish the NAAQS for these pollutants, and we are not revisiting those issues here. We believe, however, that the emission reductions from the strategies established in this rulemaking will further reduce air toxics and the related adverse impacts on children's health. We will be addressing the issues raised by air toxics from motor vehicles and their fuels in a separate rulemaking that we will initiate in the near future under section 202(l) of the Act. That rulemaking will address the emissions of hazardous air pollutants from vehicles and fuels, and the appropriate level of control of HAPs from these sources.

In this final rule, we have evaluated several regulatory strategies for reductions in emissions from passenger cars and light trucks. (See sections IV, V, and VI of this preamble as well as the RIA.) For the reasons described there, we believe that these strategies are preferable under the Clean Air Act to other potentially effective and reasonably feasible alternatives that we considered for purposes of reducing emissions from these sources (as a way of helping areas achieve and maintain the NAAQS for ozone and PM). Moreover, we believe that we have selected for proposal the most stringent and effective control reasonably feasible at this time, in light of the technology and cost requirements of the Act.

G. 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).

IX. Statutory Provisions and Legal Authority

Statutory authority for the vehicle controls set in today's final rule can be found in sections 202, 206, 207, 208, and 301 of the Clean Air Act (CAA), as amended, 42 U.S.C. sections 7521, 7525, 7541, 7542 and 7601.

Statutory authority for the fuel controls set in today's final rule comes from section 211(c) of the CAA (42 U.S.C., section 7545(c)), which allows EPA to regulate fuels that either contribute to air pollution which endangers public health or welfare or which impair emission control equipment. Both criteria are satisfied for the gasoline sulfur controls we are establishing today. Additional support for the procedural and enforcement-related aspects of the fuel's controls in today's final rule, including the record keeping requirements, comes from sections 114(a) and 301(a) of the CAA.

List of Subjects

40 CFR Part 80

Environmental protection, Air pollution control, Fuel additives, Gasoline, Imports, Incorporation by reference, Labeling, Motor vehicle pollution, Penalties, Reporting and recordkeeping requirements.

40 CFR Part 85

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

40 CFR Part 86

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

Dated: December 21, 1999.

Carol M. Browner,

Administrator.

For the reasons set forth in the preamble, parts 80, 85 and 86 of title 40, of the Code of Federal Regulations are amended as follows:

PART 80—REGULATION OF FUELS AND FUEL ADDITIVES

1. The authority citation for part 80 continues to read as follows:

Authority: Secs. 114, 211, and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7414, 7545 and 7601(a)).

2. Section 80.2 is amended by removing and reserving paragraph (aa), adding paragraph (d), and revising paragraphs (h), (s) and (gg) to read as follows:

§ 80.2 Definitions.

* * * * *

(d) *Previously certified gasoline* means gasoline or RBOB that previously has been included in a batch for purposes of complying with the standards for reformulated gasoline, conventional gasoline or gasoline sulfur, as appropriate.

* * * * *

(h) *Refinery* means any facility, including but not limited to, a plant, tanker truck, or vessel where gasoline or diesel fuel is produced, including any facility at which blendstocks are combined to produce gasoline or diesel fuel, or at which blendstock is added to gasoline or diesel fuel.

* * * * *

(s) *Gasoline blending stock, blendstock, or component* means any liquid compound which is blended with other liquid compounds to produce gasoline.

* * * * *

(gg) *Batch of gasoline* means a quantity of gasoline that is homogeneous with regard to those properties that are specified for conventional or reformulated gasoline.

* * * * *

3. Section 80.46 is amended by revising paragraphs (a) and (h) to read as follows:

§ 80.46 Measurement of reformulated gasoline fuel parameters.

(a) *Sulfur.* Sulfur content of gasoline and butane must be determined by use of the following methods:

(1) The sulfur content of gasoline must be determined by use of American Society for Testing and Materials (ASTM) standard method D 2622–98, entitled ''Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry.''

(2) The sulfur content of butane must be determined by the use of ASTM standard method D 3246–96, entitled ''Standard Test Method for Sulfur in Petroleum Gas by Oxidative Microcoulometry.''

* * * * *

(h) *Incorporations by reference.* ASTM standard methods D 2622–98, D 3246–96, D 3606–92, D 1319–93, D 4815–93, and D 86–90 with the exception of the degrees Fahrenheit figures in Table 9 of D 86–90, are incorporated by reference. These