

Chapter I: Introduction

We prepared this Regulatory Impact Analysis (RIA) for our final rulemaking (FRM) on Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. The purpose of this document is to present our estimates of the likely costs, benefits, and industry impacts associated with the implementation of the final heavy-duty engine and vehicle standards and the diesel sulfur requirements. Throughout this RIA we have referenced a number of technical documents published by the Society of Automotive Engineers (SAE). Information on how to obtain copies of these technical documents is available in the docket for this rulemaking.^a

This chapter provides an overview of the final rule. Subsequent chapters present the following information:

- **Chapter II** presents the health and welfare concerns associated with heavy-duty vehicle emissions, and the expected emissions reductions resulting from the new standards.
- **Chapter III** examines the engine and vehicle changes needed to meet the heavy-duty emission standards and the feasibility of these changes under the implementation schedule. It also presents the basis for the need for diesel fuel sulfur levels of 15 parts per million or less.
- **Chapter IV** examines the refinery and fuel distribution system changes needed to meet the low sulfur highway diesel fuel requirement and the feasibility of these changes under the implementation schedule.
- **Chapter V** estimates the economic impact of the engine/vehicle and fuels standards in per-vehicle and per-gallon terms, and in the aggregate.
- **Chapter VI** discusses the cost-effectiveness of the program in achieving emission reductions.
- **Chapter VII** discusses the cost-benefit analysis of the program.

^a EPA Memorandum “Obtaining Society of Automotive Engineers (SAE) Technical Papers”, William Charmley, copy available in EPA Air Docket A-99-06.

- **Chapter VIII** presents the Regulatory Flexibility Analysis (RFA) for this FRM. This analysis evaluates the impacts of the heavy-duty engine and vehicle standards and the diesel sulfur requirements on small businesses.
- **Chapter IX** analyzes the issues surrounding how the engine and fuel standards should be applied in Alaska and U.S. territories.
- **Appendix A** describes current regulatory requirements that affect diesel sulfur content and explains our bases for controlling diesel sulfur under Section 211(c) of the Clean Air Act.
- **Appendix B** contains a table of vehicle miles traveled by heavy-duty diesel engine class.

The final rule implements the second of two phases of a comprehensive nationwide program for controlling emissions from heavy-duty engines (HDEs) and vehicles. It builds upon the phase 1 program we recently finalized (65 FR 59896, October 6, 2000). That action reviewed and confirmed the 2004 model year emission standards set in 1997 (62 FR 54693, October 21, 1997), finalized stringent new emission standards for gasoline-fueled heavy-duty vehicles (HDVs), and finalized other changes to the heavy-duty program, including provisions to ensure in-use emissions control.

This second phase of the program looks beyond 2004, based on the use of high-efficiency exhaust emission control devices and the consideration of the vehicle and its fuel as a single system. In developing the final rule, we took into consideration comments received in response to a notice of proposed rulemaking (NPRM) published in June of this year (65 FR 35430, June 2, 2000), and comments we received in response to our discussion of future standards in the heavy-duty 2004 standards rulemaking.

There are two basic parts to the final rule: (1) new exhaust emission standards for heavy-duty highway engines and vehicles, and (2) new quality standards for highway diesel fuel. The systems approach of combining the engine and fuel standards into a single program is critical to the success of our overall efforts to reduce emissions, because the emission standards would not be feasible without the fuel change. This is because the emission standards are expected to result in the use of high-efficiency exhaust emission control devices that would be damaged by sulfur in the fuel. This final rule, by providing extremely low sulfur diesel fuel, will also enable cleaner diesel passenger vehicles and light-duty trucks. This is because the same pool of highway diesel fuel also services these light-duty diesel vehicles, and these vehicles can employ technologies similar to the high-efficiency heavy-duty exhaust emission control technologies that will be enabled by the fuel change. We believe these technologies are needed for diesel vehicles to comply with our recently adopted Tier 2 emissions standards for light-duty highway vehicles (65 FR 6698, February 10, 2000).

We believe that this systems approach is a comprehensive way to enable promising new technologies for clean diesel affecting all sizes of highway diesel engines and, eventually, diesel engines used in nonroad applications too. The fuel change, in addition to enabling new technologies, will also produce emissions and maintenance benefits in the existing fleet of highway diesel vehicles. These benefits include reduced sulfate and sulfur oxides emissions, reduced engine wear and less frequent oil changes, and longer-lasting exhaust gas recirculation (EGR) components on engines equipped with EGR. Heavy-duty gasoline vehicles will also be expected to reach cleaner levels due to the transfer of recent technology developments for light-duty applications, and the recent action taken to reduce sulfur in gasoline as part of the Tier 2 rule.

The basic elements of the final rule are outlined below. We are finalizing a PM emissions standard for new heavy-duty engines of 0.01 grams per brake-horsepower-hour (g/bhp-hr), to take full effect for diesels in the 2007 model year. We are also finalizing standards for NO_x and NMHC of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. These NO_x and NMHC standards will be phased in together between 2007 and 2010, for diesel engines. The phase-in will be on a percent-of-sales basis: 50 percent from 2007 to 2009 and 100 percent in 2010. Gasoline engines will be subject to these standards based on a phase-in requiring 50 percent compliance in the 2008 model year and 100 percent compliance in the 2009 model year. In addition, we are finalizing our proposal to include turbocharged diesels in the existing crankcase emissions prohibition, effective in 2007, with some revisions that allow some level of crankcase emissions to be discharged as long as the sum total of crankcase and exhaust emissions remains below the applicable standard.

Standards for complete HDVs will be implemented on the same schedule as for gasoline engine standards. For certification of complete vehicles between 8500 and 10,000 pounds gross vehicle weight rating (GVWR), the standards are 0.2 grams per mile (g/mi) for NO_x, 0.02 g/mi for PM, 0.195 g/mi for NMHC, and 0.016 g/mi for formaldehyde.^b For vehicles between 10,000 and 14,000 pounds, the standards are 0.4 g/mi for NO_x, 0.02 g/mi for PM, and 0.230 g/mi for NMHC, and 0.021 g/mi for formaldehyde. These standards levels are roughly comparable to the engine-based standards in these size ranges. Note that these standards will not apply to vehicles above 8500 pounds that we classify as medium-duty passenger vehicles as part of our Tier 2 program.

We are adopting new evaporative emissions standards for heavy-duty engines and vehicles, effective on the same schedule as the gasoline engine and vehicle exhaust emission standards. The new standards for 8500 to 14,000 pound vehicles are 1.4 and 1.75 grams per test for the 3-day diurnal and supplemental 2-day diurnal tests, respectively. Standards levels of 1.9

^b Vehicle weight ratings in this rule refer to GVWR (the curb weight of the vehicle plus its maximum recommended load of passengers and cargo) unless noted otherwise.

and 2.3 grams per test will apply for vehicles over 14,000 pounds. These standards represent more than a 50 percent reduction in the numerical standards as they exist today.

Finally, this rule specifies that, beginning September 1, 2006, diesel fuel sold for use in model year 2007 and later highway vehicles must be limited in sulfur content to 15 parts per million (ppm). This sulfur standard is based on our assessment of the impact of sulfur on advanced exhaust emission control technologies, and a corresponding assessment of the feasibility of low sulfur fuel production and distribution.

The new program includes a combination of flexibilities available to refiners to ensure a smooth transition to low sulfur highway diesel fuel. First, refiners can take advantage of a temporary compliance option which includes a banking and trading component. Under this voluntary option, a restricted amount of highway diesel fuel may continue to be produced at the existing 500 ppm sulfur maximum standard. At the end of the transition period all highway diesel fuel must meet the 15 ppm sulfur standard. Second, we are providing additional flexibilities for small refiners to minimize their economic burden in complying with the 15 ppm sulfur standard. Third, we are including a provisions for refiners located in the Geographic Phase-in Area (GPA) as defined in the Tier 2 program which will allow them to stagger their gasoline and diesel investments. Finally, we are adopting a general hardship provision for which any refiner may apply on a case-by-case basis under certain conditions.

With minor exceptions, existing compliance provisions for ensuring diesel fuel quality that have been in effect since 1993 remain unchanged (55 FR 34120, August 21, 1990). Additional compliance provisions have been established primarily during the first four years of the program to verify refiners' compliance with the temporary compliance option and various hardship provisions, to ensure the two grades of highway diesel fuel remain segregated, and to prevent misfueling of model year 2007 and later diesel vehicles.