CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

AIR RESOURCES BOARD

INITIAL STATEMENT OF REASONS

PROPOSED CLEAN ON-ROAD SCHOOL BUS REGULATION FOR SCHOOL BUSES OPERATING IN THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Date of Release: July 29, 2005
Scheduled for Consideration: September 15 - 16, 2005

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED CLEAN ON-ROAD SCHOOL BUS REGULATION FOR SCHOOL BUSES OPERATING IN THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Staff Report

July 29, 2005

Table of Contents

List of Figures

List of Tables

EXECUTIVE SUMMARY

The Air Resources Board (ARB or "the Board") is the state agency responsible for protecting public health and the environment from the harmful effects of air pollution. ARB oversees all air pollution control efforts in California, including the activities of 35 independent local air districts, and works in cooperation with the districts and the U.S. Environmental Protection Agency (U.S. EPA) on strategies to attain state and federal ambient air quality standards and to reduce air toxic emissions.

The South Coast Air Quality Management District (SCAQMD) is the local government agency primarily responsible for air quality assessment and improvement in the South Coast Air Basin and the desert portion of Riverside County in the Salton Sea Air Basin. The South Coast Air Basin is federally designated as a serious nonattainment area for particulate matter (PM_{10}) and a severe nonattainment area for the eight-hour ozone standard.

Under its Clean Fleets program, the SCAQMD adopted seven fleet rules during 2000 and 2001. The SCAQMD adopted the fleet rules based on its authority granted by the State Legislature through Health and Safety Code Section 40447.5. These rules were developed to gradually shift public agencies and certain private entities to lower emissions by requiring them to acquire alternative-fueled vehicles whenever an operator with 15 or more vehicles purchased or leased vehicles for replacement or addition to its fleet. One of these seven rules is Rule 1195 concerning school buses.

The District's fleet rules, including Rule 1195, were challenged in federal court based on authority issues. In April 2004, the United States Supreme Court (U.S. Supreme Court) ruled that certain aspects of the fleet rules were preempted by federal law. The U.S. Supreme Court then remanded the case back to a lower court to determine whether the fleet rules could be characterized as state purchase decisions and, if so, whether a different standard of preemption applies.

In response to the U.S. Supreme Court's decision, the SCAQMD requested that ARB submit the SCAQMD's rules to the U.S. EPA for a waiver of preemption pursuant to Section 209(b) of the Clean Air Act. The ARB staff concluded, in consultation with the U.S. EPA, that the local fleet rules would not receive a Section 209 waiver because they have not been adopted by the ARB as state regulations. As a result, ARB staff initiated this public rulemaking process to develop an enforceable state school bus regulation applicable to the South Coast region for which a federal waiver could be obtained.

The federal District Court recently affirmed the SCAQMD's authority to regulate public fleets (approximately 43 percent of the affected school buses within the SCAQMD). The federal District Court did not explicitly rule on the District's authority to regulate private fleets operating under contract to public agencies,

leaving some ambiguity about the scope of the District's power. About 56 percent of affected school buses within the SCAQMD are under such contracts. The SCAQMD has no authority to regulate private schools that own or operate their own school bus fleets. There is only one private school with a fleet that exceeds 15 buses (the District's threshold for inclusion).

Adoption of this regulation would enable the SCAQMD to regulate the 21 school buses owned by the one private school with more than 15 buses. Adoption of this regulation would also help protect the SCAQMD in the event of further legal challenge to its authority to regulate private contractors to public agencies. Therefore, the ARB staff is presenting this proposal for Board consideration.

This proposal requires public and private school bus fleet operators with 15 or more school buses to purchase, lease, or contract for new school buses equipped with the cleanest engines available (referred to as Best Engine Selection Technology or BEST), and to annually retrofit 25 percent of eligible in-use diesel school buses with ARB-verified diesel emission control systems.

For new heavy-duty school buses, the proposal specifically requires fleet operators to:

- Acquire only buses equipped with engines that meet a 1.8 gram per brake horsepower-hour (g/bhp-hr) oxides of nitrogen (NOx) plus non-methane hydrocarbon standard and a 0.03 g/bhp-hr PM standard during the 2005-2006 model years;
- Acquire only buses equipped with engines that meet a 0.2 g/bhp-hr NOx family emission limit (FEL) and a 0.01 g/bhp-hr PM standard during the 2007-2009 model years. At this time, the staff expects that only alternative-fueled engines will meet this NOx family emission limit.

For new medium-duty school buses, the proposal specifically requires fleet operators to:

- Acquire non-diesel buses that are certified to the ultra low emission vehicle (ULEV) emission standard category or are equipped with non-diesel engines certified as ULEV.

No state agency can place an unfunded mandate on schools. Accordingly, compliance with the regulatory proposal is wholly contingent upon the availability of grant funding or external funding sources. Funding must be available for the incremental purchase cost of a reduced-emission school bus meeting the proposal's requirements or for the installation of exhaust emission control equipment to reduce pollutants from in-use diesel school buses. Funding must also be available to cover the other costs of regulatory compliance associated with compressed natural gas school buses, such as infrastructure costs, maintenance facility upgrade costs, and reasonable incremental operating and maintenance

costs. If external funding is not available for the incremental purchase cost of a reduced-emission school bus plus the associated additional costs, fleet operators may take advantage of the proposal's exemption process to purchase a standard school bus.

Because this proposal does not mandate additional costs on schools, the estimated benefits of this proposal are entirely contingent on the availability of external funding sources to assist public school districts and private transportation companies that contract with public schools. In this report, the staff has identified known sources of available external funding and has based its emission benefit estimates on expected external funding levels of approximately $11 million per year.

Based on the identified funding being available for new bus purchases, the ARB staff estimates that this proposal will result in a 0.04 ton per day NOx reduction and a 0.001 ton per day PM reduction in the SCAQMD in 2010. The proposal would result in an additional PM reduction of 0.01 ton per day in 2010 if external funding of approximately $4 million per year becomes available for implementation of the in-use diesel school bus retrofit requirements.

If costs are split between NOx and PM reductions, the cost effectiveness of the new bus purchase requirements is approximately $60,000 per ton of NOx and $405,000 per ton of PM reduced. The cost effectiveness of this rule is less favorable compared to cost effectiveness values for other NOx and PM control measures that have been recently approved by the Board, most of which ranged from $400 to $16,000 per ton of ozone precursor reduced. For PM control, two recently adopted measures have cost effectiveness values ranging from $50,000 to $64,000 per ton of PM reduced, if costs are split between NOx and PM reductions.

The regulation is contained in new sections 2024 and 2024.1, title 13, California Code of Regulations and set forth in the proposed Regulation Order in Appendix A. Information on how to access the Technical Support Document for this rulemaking can be found at the end of this report.

I. INTRODUCTION

The Air Resources Board (ARB or "the Board") seeks to provide clean, healthful air to the residents of California. ARB is the state agency responsible for protecting public health and the environment from the harmful effects of air pollution. ARB oversees all air pollution control efforts in California, including the activities of 35 independent local air districts. ARB works in cooperation with the districts and the U.S. Environmental Protection Agency (U.S. EPA) on strategies to attain state and federal ambient air quality standards and to reduce air toxic emissions.

The South Coast Air Quality Management District (SCAQMD or District) is the local governmental agency primarily responsible for air quality assessment and improvement in the South Coast Air Basin and the desert portion of Riverside County in the Salton Sea Air Basin. The South Coast Air Basin, which includes Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino Counties, is federally designated as a serious nonattainment area for particulate matter (PM10 - particulate matter under 10 microns) and a severe nonattainment area for the eight-hour ozone standard. The Coachella Valley, located in the desert portion of Riverside County, is classified as a serious nonattainment area for PM10 and a severe nonattainment area for ozone.

Significant amounts of both particulate matter (PM) and oxides of nitrogen (NOx) are emitted from mobile sources. Diesel PM is a toxic air contaminant (TAC), a cancer-causing pollutant that also has significant short- and long-term negative cardiovascular impacts. NOx is a reactive, oxidizing gas that contributes to the atmospheric formation of ozone and fine particles, and causes respiratory illness and impaired lung functioning.

The SCAQMD performed a Multiple Air Toxics Exposure Study II (MATES II) that identified mobile sources, particularly diesel exhaust, as the overwhelming contributor to local air toxic risk levels. Based on the results of the MATES II study, in March 2000 the SCAQMD Governing Board adopted the Air Toxic Control Plan, which included an early action control measure known as the Clean Fleets program.

Under the Clean Fleets program, the SCAQMD adopted seven fleet rules from 2000 to 2001. The rules were developed to gradually shift public agencies and certain private entities to lower emission and alternative-fueled vehicles whenever a fleet operator, with 15 or more vehicles, purchases or leases a vehicle for replacement or addition to a fleet.

The SCAQMD developed fleet rules for transit buses, school buses, refuse collection vehicles, airport shuttles and taxis, street sweepers, light-duty and medium-duty publicly-owned vehicles, and heavy-duty publicly-owned vehicles.

A. Overview and Purpose

In 2000, the SCAQMD adopted several fleet rules as part of their Clean Fleets Program, including Rule 1195 for Clean On-Road School Buses. The SCAQMD adopted the fleet rules based on its authority granted by the State Legislature through Health and Safety Code Section 40447.5. Rule 1195 requires that school districts, private schools, and private companies that contract with school districts in the SCAQMD acquire only alternative-fuel vehicles when purchasing or leasing new school buses. Since their adoption by the District, the fleet rules, including Rule 1195, have been challenged in federal court based on authority issues. In April 2004, the U. S. Supreme Court ruled that certain aspects of the fleet rules were preempted by federal law. The U.S. Supreme Court then remanded the case back to a lower court to determine whether the fleet rules could be characterized as state purchase decisions and, if so, whether a different standard of preemption applies.

In response to the U.S. Supreme Court's decision, the SCAQMD requested that the ARB submit the SCAQMD's rules to the U.S. EPA for a waiver of preemption pursuant to Section 209(b) of the federal Clean Air Act (CAA). The ARB requested public comment and consulted with the U.S. EPA regarding the legal requirements for obtaining a waiver for a rule adopted by a local government. The ARB staff concluded, in consultation with the U.S. EPA, that the fleet rules would not receive a Section 209(b) waiver because they have not been adopted by the ARB as state regulations. As a result, the ARB staff initiated the public rulemaking process in February 2005 to develop a state regulation applicable to school buses operating in the South Coast region.

With concurrence from the SCAQMD, ARB limited the new rulemaking process to three fleet rules that were likely to be most effective in controlling diesel engine emissions. Those rules, with their current SCAQMD identifiers were:

Rule 1192	Clean On-Road Transit Buses
Rule 1193	Clean On-Road Residential and Commercial Refuse Collection Vehicles
Rule 1195	Clean On-Road School Buses

Meanwhile, the federal District Court continued its proceedings on the District rules. On May 5, 2005, the federal District Court ruled that the District's authority is not preempted under the market participant doctrine for the aspects of the District fleet rules that relate to purchasing decisions made by state and local governments. The federal District Court did not explicitly rule on the District's authority to regulate private fleets operating under contract to public agencies, however, which left some ambiguity as to the scope of the District's authority. The SCAQMD has no authority to regulate private schools that own or operate their own school bus fleets.

Adoption of this regulation would enable the SCAQMD to regulate the 21 school buses owned by the one private school with more than 15 buses. Adoption of this regulation would also help protect the SCAQMD in the event of further legal challenge to their authority to regulate private contractors to public agencies.

B. Regulatory Authority

The federal CAA grants California, alone among the states, the authority to adopt more stringent controls of emissions from new mobile sources. Under the federal CAA, California must apply for a Section 209(b) waiver for its requirements, demonstrating that the requirements are at least as protective of public health as applicable federal requirements.

In 1988, the California Legislature enacted the California Clean Air Act (Health and Safety Code sections 39002, 43013, and 43018), which declared that attainment of state ambient air quality standards is necessary to promote and protect public health, particularly the health of children, older people, and those with respiratory diseases. The Legislature directed that these standards be attained by the earliest practicable date.

C. Current Regulations and Voluntary Programs

Both the federal government and the State of California have adopted rules that reduce PM and NOx from on-and off-road vehicles. The following sections briefly describe the existing federal, state, local and voluntary programs that currently apply to diesel-fueled engines and vehicles operating in California.

1. Federal Standards for New Engines

Standards for smoke emissions from on-road heavy-duty diesel vehicles were set by the U.S. EPA beginning in 1970. New engines were subject to PM and NOx exhaust emission standards with the model year (MY) 1988. Over the years, more stringent emission standards have paralleled improvements in control technology. Recent amendments to the on-road standards regulate the heavy-duty vehicle and its fuel as a single system, including diesel-fuel sulfur-content requirements. Below is a brief discussion of federal emission standards for heavy-duty diesel-fueled engines and vehicles ; a summary of the current federal standards is provided in Table 1.

a. Current Standards

The current PM engine emission standard for on-road heavy-duty diesel trucks is 0.10 grams per brake-horsepower hour (g/bhp-hr) and the current federal and California PM emission standard for new urban transit bus engines is 0.05 g/bhp-hr. The current NOx emission standard for on-road heavy-duty diesel trucks and new urban transit bus engines is the same. This emission standard is 2.4 g/bhp-hr for NOx plus non-methane hydrocarbons (NMHC) or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC cap.

b. 2007-2010 MY Standards

The PM standard that takes effect for model year 2007 new heavy-duty diesel engines used in trucks and school buses is 0.01 g/bhp-hr, which is a 90 percent reduction from the existing standard. That standard is based on the use of high-efficiency exhaust emission control devices or comparably effective advanced technologies. Because these devices are less efficient when used with the current formulation of diesel fuel, reducing the level of sulfur in highway diesel fuel by 97 percent to 15 parts per million by weight (ppmw) by mid-2006 is also required.

The NOx standard in 2010 for new heavy-duty diesel engines used in trucks and buses is 0.2 g/bhp-hr. However, between 2007 and 2009, U.S. EPA requires only 50 percent of the heavy-duty diesel engine families (groupings) to meet this standard. Since averaging is allowed, a manufacturer may certify all of its engines to 1.2 g/bhp-hr as an alternative. Most engine manufacturers have indicated they plan to use this latter approach.

Table 1. Federal NOx and PM Emission Standards for Truck and Bus Engines (g/bhp-hr)

Model Year	Truck*		Urban Bus	
	NOx	PM	NOx	PM
2004	2.2 [(a)]		2.2 [(a)]	0.05 [(c)]
2007	1.2 [(b)]	0.01	1.2 [(b)]	0.01
2010	0.2 [(b)]		0.2 [(b)]	

* Truck standards apply to school buses.

(a) Nominal NOx value of 2.2 g/bhp-hr is based on emission standards of 2.4 g/bhp-hr for NOx plus NMHC or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC cap, which took effect in October 2002 for those engines subject to the U.S. EPA Consent Decrees and the California Settlement Agreements. The Consent Decree-complying engines had to comply with 2004 standards by October 1, 2002.

(b) Between 2007 and 2009, U.S. EPA requires 50 percent of heavy-duty diesel engine family certifications to meet the 0.2 g/bhp-hr NOx standard. Averaging is allowed, and it is expected that most engines will conform to the fleet NOx average of approximately 1.2 g/bhp-hr.

(c) In-use standard or 0.07 g/bhp-hr.

2. California Standards Affecting Heavy-Duty Engines

a. New Heavy-Duty Engines

California is the only state granted authority by the Federal Clean Air Act to set standards for new mobile engines. California has harmonized with federal standards for new heavy-duty diesel engines since 1988. However, California's urban bus standards are more stringent.

Heavy-duty school buses are generally powered by diesel engines and are subject to emission standards for heavy-duty truck engines (as opposed to emission standards for new urban bus engines). PM and NOx are the pollutants of most concern with heavy-duty diesel engines.

b. Optional Standards for New Engines

In addition to mandatory standards, California also has optional reduced-emission standards for new heavy-duty engines, as shown in Table 2. In general, only alternative-fueled vehicles have certified to a reduced-emission standard and thus have been eligible for incentive funding. Beginning in October 2002, optional PM standards ranging from 0.03 to 0.01 g/bhp-hr with an 0.01 increment were available.

Table 2. California Optional, Reduced-NOx Emission Standards *(g/bhp-hr)

Model Year	Optional Standards	Increment
2000	2.5-0.5	0.5
October 2002	1.8-0.3[(c)]	0.3
2004-2006 [(a, b)]	1.8-0.3[(c)]	0.3

* Truck standards apply to school buses.

(a) For urban buses, emission standards apply only to alternative fueled engines.

(b) For urban buses, engine manufacturers may sell diesel hybrid-electric buses certified at 1.8 g/bhp-hr standard to transit agencies with approved NOx offset plans.

(c) Optional emission standards of 1.8 – 0.3 g/bhp-hr are for NOx + NMHC. Engines certified to the optional NOx standard are excluded from participating in the Averaging, Banking, and Trading (ABT) program.

c. Medium-duty School Bus Standards

SCAQMD Rule 1195 and the staff's proposed regulation affect medium-duty school buses as well as heavy-duty school buses. Medium-duty school buses have a gross vehicle weight rating (GVWR) of 8,500 pounds to 14,000 pounds, whereas heavy-duty school buses have a GVWR of greater than 14,000 pounds. Medium-duty vehicle (MDV) emission standards (which affect medium-duty school buses) fall into two categories – chassis emission standards, wherein the engine

and vehicle are certified as a whole, and engine emission standards, wherein the engine is certified by itself.

Table 3 and Table 4 present ARB chassis emission standards for new 2004 and subsequent model year MDVs. Three vehicle emission categories are defined for these standards, low emission vehicle (LEV), ultra low emission vehicle (ULEV), and super ultra low emission vehicle (SULEV). The chassis emission standards are based on grams per mile (g/mi). Manufacturers must meet a fleet average requirement based on sales of vehicles in each of the emission categories.

Table 3. Chassis–Based Medium-Duty Vehicle Standards - 8,500 – 10,000 GVWR (g/mi)

(Vehicles in this category are tested at their adjusted loaded vehicle weight)

Vehicle Emission Category	Non Methane Organic Gas (NMOG)	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)	Formaldehyde (HCHO)	Particulates (PM)
LEV	0.195	6.4	0.2	32	0.12
ULEV	0.143	6.4	0.2	16	0.06
SULEV	0.100	3.2	0.1	8	0.06

Table 4. Chassis-Based Medium-Duty Vehicle Standards –10,000 – 14,000 GVWR (g/mi)

(Vehicles in this category are tested at their adjusted loaded vehicle weight)

Vehicle Emission Category	Non Methane Organic Gas (NMOG)	Carbon Monoxide (CO)	Oxides of Nitrogen NOx)	Formaldehyde (HCHO)	Particulates (PM)
LEV	0.230	7.3	0.4	40	0.12
ULEV	0.167	7.3	0.4	21	0.06
SULEV	0.117	3.7	0.2	10	0.06

Manufacturers can also certify medium-duty engines to engine standards, as illustrated in Table 5 and Table 6 below. Note that engine emission standards are given in grams per brake horsepower-hour. Diesel engines typically certify to engine-based standards, while gasoline engines typically certify to chassis-based standards.

Table 5. Engine Emission Standards for 2004-2006 MY Medium-Duty ULEVs and SULEVs (g/bhp-hr)				
Vehicle Emission Category	NOx + NMHC	CO	PM	HCHO
ULEV[(a)] OptionA	2.5 (with a 0.5 cap on NMHC	14.4	0.10	0.05
ULEV[(a)] Option B	2.4	14.4	0.10	0.05

(a) Emissions averaging may be used to meet these standards

Table 6 presents emission standards for 2007 and subsequent model year medium-duty engines. As with the heavy-duty engines previously discussed, manufacturers have the ability to phase-in the 0.2 g/bhp-hr NOx emission standard. Manufacturers have indicated this will be accomplished with 1.2 g/bhp-hr NOx engines, beginning in 2007.

Table 6. Engine Emission Standards for 2007 and Subsequent MY Medium-Duty ULEVs and SULEVs (g/bhp-hr)					
Vehicle Emission Category	NOx	NMHC or NMHCE	CO	PM	HCHO
ULEV (2007-2009) [(a)]	1.2	0.14	15.5	0.01	0.01
ULEV (2010 +)[(a)]	0.2	0.14	15.5	0.01	0.01
SULEV [(b)]	0.1	0.07	7.7	0.005	0.005

(a) Emissions averaging may be used to meet these standards
(b) Optional emission standards

3. Local Regulations Related to School Buses (need to check that this heading still makes sense after editing)

Local air districts participate with local transportation agencies to develop and implement transportation control measures aimed at reducing vehicle activity and emissions. Some districts have developed model ordinances to reduce idling of trucks and buses, to encourage the purchase of low-emission vehicles for public fleets, and to require public agency contracting that is '"green."

a. Current South Coast Air Quality Management District Fleet Rules

As previously discussed, the SCAQMD adopted seven fleet rules from 2000 to 2001. The rules were developed to gradually shift public agencies and certain private entities to lower emission and alternative-fueled vehicles whenever a fleet operator with 15 or more vehicles purchased or leased a vehicle for replacement or addition to a fleet. The SCAQMD defines alternative fuels as compressed natural gas, propane, or liquefied natural gas.

The SCAQMD has fleet rules for transit buses, school buses, refuse collection vehicles, airport shuttles and taxis, street sweepers, light and medium-duty publicly-owned vehicles, and heavy-duty publicly-owned vehicles.

For school buses, school bus operators are required to purchase or lease non-diesel buses, either alternative-fueled or gasoline, depending on the bus type, when acquiring or replacing school buses in their fleets. These requirements apply to fleets of 15 or more buses.

4. Incentive Programs

Efforts to reduce air pollution outside of a mandated requirement are considered voluntary. Voluntary efforts play a key role in helping to achieve air quality goals. Incentives can induce vehicle owners to reduce vehicle emissions prior to compliance deadlines or by reducing emissions beyond regulatory requirements.

For school buses specifically, many of these incentive programs have provided funding support for the purchase of new buses, exhaust emission control devices for in-use buses, natural gas fueling facilities, and some maintenance facility modifications.

a. Federal Incentives

Voluntary Diesel Retrofit Program

The U.S. EPA established a Voluntary Diesel Retrofit Program to address pollution from diesel construction equipment and heavy-duty on-highway vehicles. This program, established in 2000, allows fleet operators to choose U.S. EPA-verified and, as of 2004, ARB-verified technologies that will reduce the emissions of the vehicles and engines in their fleets and identify potential funding sources to assist air quality planners and fleet operators as they create and implement retrofit programs. Approximately $14 million has funded appropriate projects through 2004. Of this funding, $10 million was spent on the Clean School Bus Program nationwide. For 2005, $8.3 million is set aside to fund Voluntary Diesel Retrofit Program projects; $7.5 million of that money is for clean school bus projects. Penalty revenues have also funded retrofits and ultra low sulfur diesel fuel for school buses.

b. State Incentives

The Carl Moyer Program

The Carl Moyer Program provides grants to fund the extra capital cost of cleaner-than-required diesel-powered heavy-duty vehicles and equipment. Between 1998 and 2003, $154 million was appropriated to the Carl Moyer Program to clean up 7000 engines. In 2004, the program was expanded to $140 million a year of incentive funding statewide.

To date, the SCAQMD has distributed approximately $28 million of Carl Moyer funding to transit buses, refuse trucks, street sweepers, and, on a very limited basis, school buses. The Carl Moyer Program has not been a significant source of funding for school buses due to the very low mileage of these vehicles, which causes school bus projects to exceed the cost effectiveness limits of the Carl Moyer Program.

The Lower-Emission School Bus Program

In 2000, the Lower-Emission School Bus Program was enacted. The goal of this program is to reduce school children's exposure air pollution by directly: 1) replacing pre-1987 model year school buses with new, lower-emitting models; and 2) retrofiting in-use diesel school buses with exhaust control devices.

Over fiscal years 2000 - 2001 and 2001 - 2002, statewide program funding was $66 million. Of this total, $49.5 million went to the purchase of safe, lower-emitting new school buses (alternative fuel and ultra low sulfur diesel). The remaining $16.5 million was spent on installation of exhaust control devices to reduce PM emissions from in-use diesel school buses.

Proposition 40, the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2000, granted additional school bus funding. The measure provided about $50 million over two years, 20 percent of which was to be spent for the acquisition of "clean, safe, school buses for use in California's public schools." The remainder was allocated to the Moyer Program. For the 2002 – 2003 fiscal year, $4.92 million was available for the purchase of new safe, lower-emitting school buses -- about 40 buses statewide. For the 2003 – 2004 fiscal year, $4.6 million was available for the purchase of new school buses – about 36 buses statewide.

During the four years the school bus program has been funded, the SCAQMD has received nearly $35 million total in state funds to purchase new school buses to replace pre-1987 model year buses and to retrofit in-use diesel buses. Of that funding amount, approximately $25.8 million has been dedicated to new bus purchases, with the remaining $8.9 million dedicated to in-use retrofits. With these state allocations, plus additional local funding totaling more than $21 million over the past five years from other incentive programs, settlement fees, and district funds, the SCAQMD has replaced nearly 400 pre-1987 model year buses with new lower-emitting models and has equipped over 2,100 in–use diesel buses with exhaust control devices (primarily diesel particulate filters) to significantly reduce PM.

State law authorizes air districts to increase motor vehicle registration fees by $2 to reduce air pollution through Carl Moyer Program projects, light-duty accelerated vehicle scrap programs, selected agricultural projects, and new school bus purchases pursuant to the Lower-Emission School Bus Program Guidelines. The SCAQMD raised those fees and has committed $14 million over the next 18

months to new school bus purchases and expects to commit similar funding levels yearly—approximately $9.3 million on an annual basis—to new bus purchases. This commitment represents the bulk of the incentive funding that would be available for implementation of the ARB's regulatory proposal.

Approximately $25M in new funding was earmarked in the state fiscal year 2005 - 2006 budget to continue implementing the Lower-Emission School Bus Program. However, at the time the staff developed its emission benefits analysis for this rulemaking, the state budget had not been finalized and approved. As such, this potential additional funding has not been factored into the ARB's emission benefit estimates of this proposal.

c. SCAQMD Incentive Funding Sources

State law also authorizes districts to impose a registration surcharge of $4 per vehicle for use in reducing air pollution from motor vehicles. The Department of Motor Vehicles (DMV) collects the fees at the request of the district. The SCAQMD has imposed the $4 per vehicle fee and the additional $2 per vehicle fee as authorized by AB 923 (2004). In addition, the SCAQMD has the authority to impose an additional $1 per vehicle until January 1, 2010, and has done so. Below is a brief description of the District's incentive funding sources using motor vehicle registration fees, as well as other local incentive funding sources.

Mobile Source Air Pollution Reduction Review Committee

In the South Coast region, the $4 per vehicle fee is distributed as follows: 30 percent to the District's general fund, 40 percent to cities and counties, and 30 percent to the Mobile Source Air Pollution Reduction Review Committee (MSRC) to contribute a funding match towards qualifying projects. The MSRC has provided a total of $42 million for the purchase of lower-emitting school buses, transit buses, street sweepers, and refuse trucks since the 1995-1996 fiscal year. The cities and counties portion of the DMV fees has funded some infrastructure needs for alternative-fueled school buses.

AB 923 Fees

The SCAQMD anticipates $22 million annually from the $2 increase in DMV fees in the South Coast region, which may be spent in four project areas, including new school bus purchases. Of the anticipated $22 million annually, the District has designated $14 million for school bus purchases over the next 18 months, and expects to commit a similar funding level on an annual basis in subsequent years.

Clean Fuel Fund

The $1 fee per vehicle funds the Clean Fuel Fund. The Clean Fuel Fund has been used to award grants for alternative fueling infrastructure projects for school buses, transit buses, refuse trucks, street sweepers. Since approximately 1998, over $30 million has been spent on infrastructure projects from this funding source.

South Coast Rule 2202

The Air Quality Investment Program (AQIP), Rule 2202, allows employers with 250 or more employees to participate in an air quality investment program in order to meet their emission reduction target. An employer may elect to participate in the program by investing annually $60 per employee or triennially $125 per employee into an AQMD administered restricted fund. Since 2000, over $1.6 million from AQIP has funded alternative fueled street sweepers and refuse trucks.

South Coast Rule 1309.1

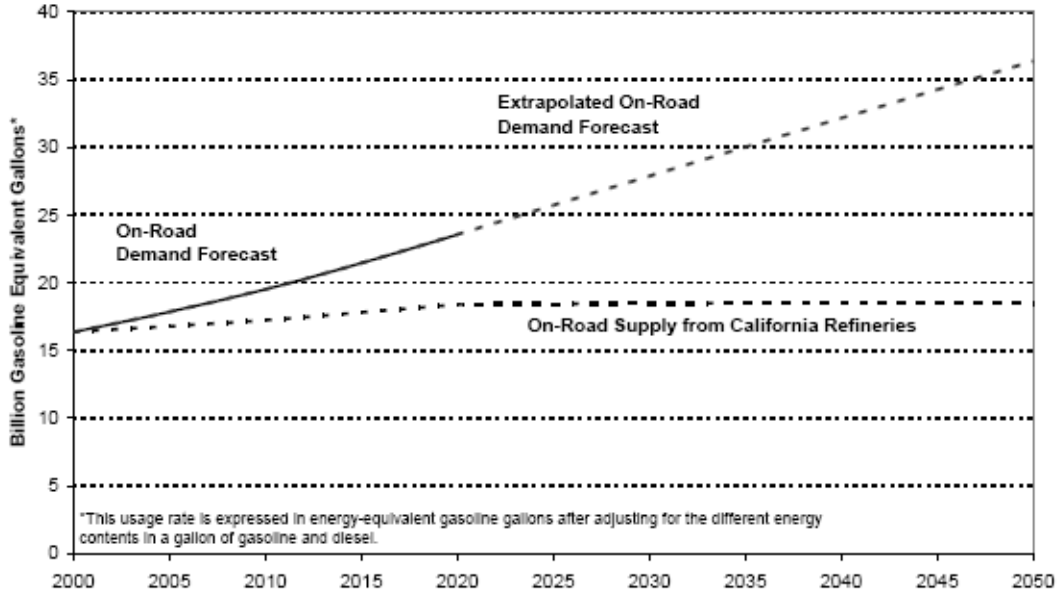
The Priority Reserve Fund, Rule 1309.1, which provides emission reduction credits for certain sources, allocated $12 million for implementation of the Chairman's School Bus Initiative. These funds were used for the purchase of new alternative-fueled school buses and retrofits of diesel buses with diesel particulate filters (DPFs) and diesel oxidation catalysts.

D. Role of Alternative Fuels

California's dependence on petroleum-based transportation fuels has become a major concern to the ARB and CEC over the last decade due to a number of factors. The state's petroleum refining infrastructure has not grown to keep up with the increasing demand for gasoline and diesel fuel. From a practical standpoint, the state's refining capacity has reached virtual full utilization, with only marginal incremental increases realized over the last five years. In contrast, diesel and gasoline annual demand continues to grow at 2.4 percent and 1.8 percent, respectively. Due to the constrained nature of the existing refining infrastructure, the state has grown increasingly dependent on imports of refined products.

The following figure illustrates the growing gap between in-state capacity and on-going fuel demand increases.

Figure 1 California On-Road Fuel Supply and Demand Forecast



In the summer of 2003, the CEC and ARB jointly adopted the following goals for the reduction in petroleum dependence pursuant to AB 2076 (ARB and CEC 2003):

- Reduced demand for on-road gasoline and diesel fuel of 15 percent below the 2003 levels by the year 2020, and to maintain this level of demand for the foreseeable future.
- Increased use of non-petroleum fuels to 20 percent of on-road fuel consumption by 2020 and to 30 percent by 2030.

These goals reflect the growing convergence of problems related to petroleum resource depletion, concerns over rising greenhouse gas emissions, and air pollution health affects. The continuing rise in global oil prices is one indication of the rising anxiety over the expected near term timing of the peak in global oil production. The combustion of petroleum-based fossil fuels has been directly associated rising carbon dioxide (CO_2) emissions, which on a global average basis, now exceed levels experienced over at least the past 100,000 years. Severe climatic alterations are now widely expected if CO_2 concentrations reach levels of 450 -550 parts per million (ppm) or higher (Hansen 2004).

There is also concern regarding the direct health effects of air pollutants, which result from petroleum fuel production, transport, distribution and end use. These latter concerns are especially pronounced due to the determination by the ARB in 1998 that diesel particulate is a TAC. More recent evidence linking diesel exhaust to asthma triggers in children, as well as other impacts, has focused special concern on diesel emission reductions.

Heavy-duty natural gas vehicles currently emit lower NOx and PM emissions compared to comparable diesel engines. Natural gas buses, for example, routinely exhibit an approximate 25 percent reduction in NOx, and already meet the 2007 PM standard for new engines. Natural gas engines are expected to continue to provide NOx emission reduction benefits relative to comparable diesel engines through 2009. Two manufacturers have announced plans to introduce natural gas engines in 2007 that meet the 2010 new on-road heavy-duty exhaust emission standard for NOx at 0.2 g/bhp-hr. Last year, U.S. EPA reported that leading diesel engine manufacturers are planning to meet the 2007 NOx emission standards through the averaging provisions afforded to them (U.S. EPA 2004a). As such, the majority of the diesel engines produced in the 2007 to 2009 timeframe will meet an average of 1.2 g/bhp-hr NOx. At this time, none of the diesel engine manufacturers have indicated production of diesel engines meeting the 2010 level of 0.2 g/bhp-hr (U.S. EPA 2004a). Diesel and natural gas engines will emit equivalent PM and toxic emissions beginning in 2007 due to new, more stringent emission standards taking effect.

Recent natural gas engine development efforts indicate that engines produced in the 2007 timeframe, will emit lower greenhouse gas emissions compared to their diesel counterparts, by as much as 17 percent. Alternative fuels such as natural gas also provide fuel diversification benefits that are helpful as California attempts to address its growing dependence on foreign oil imports to supply its burgeoning growth in gasoline and diesel demand. Diversity of supply enhances the security of supply, which has become a concern.

II. PUBLIC OUTREACH

A. Environmental Justice

On December 13, 2001, the Board approved Environmental Justice Policies and Actions, which formally established a framework for incorporating environmental justice into the ARB's programs, consistent with the directives of state law and policy (ARB 2001). “Environmental justice” is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. These policies apply to all communities in California, but environmental justice issues have been raised more in the context of low-income and minority communities because of past land use policies and the cumulative impact of a concentration of emitting facilities in some neighborhoods.

To achieve this ambitious goal, the ARB has established a Community Health Program and emphasized community health issues in our existing programs. To provide people with the basic tools and information needed to understand and participate in air pollution policy planning, permitting, and regulatory decision-making processes, ARB has published “The Public Participation Guide to Air Quality Decision Making in California.”

The Environmental Justice Policies are intended to promote the fair treatment of all Californians and cover the full spectrum of ARB activities. Underlying these policies is a recognition that we need to engage community members in a meaningful way as we carry out our activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all stakeholders; communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these Policies. Our outreach efforts, described in Section II.B, facilitate this objective. This proposal benefits these individuals and supports the ARB's Environmental Justice goals.

This regulatory proposal, if adopted, will provide air quality benefits by reducing exposure to NOx and PM emissions emitted by school buses. Diesel PM has been identified as a toxic air contaminant. NOx emissions contribute to respiratory impacts, fine particulate matter, and the formation of ozone. School buses operate in close proximity to students, teachers, and neighbors. Many schools provide bus services in heavily populated areas.

B. Outreach Efforts

1. South Coast Fleet Rules

Consistent with ARB's Environmental Justice Policy for strengthening the ARB's outreach efforts in all communities, the staff utilized many avenues to engage stakeholders in the rulemaking effort.

In October of 2004, a request for public comment concerning the SCAQMD's fleet rules was posted on the ARB website. We requested comment on whether ARB should submit the SCAQMD's fleet rules to EPA for a waiver of preemption, pursuant to section 209(b) of the CAA. We received thousands of comments, including over 4,800 electronic submittals. After a thorough review of the comments and consultation with the U.S. EPA, we made our decision to pursue a new rulemaking process for four fleet rules, with the generation of a new public record that would update relevant information on the effectiveness and costs of these rules.

Staff generated a webpage dedicated to the rulemaking effort. On this webpage, ARB provided notice of the rulemaking process with relevant background and contact information. Then staff generated a list serve from all those who had provided electronic comments. Along with those on ARB's mobile sources listserve, over 5,700 emails were sent to inform stakeholders of the rulemaking activity for all four fleet rule proposals originally undertaken by the ARB staff.

2. School Bus Regulatory Proposal for South Coast Region

Specific to the school bus regulatory proposal, ARB staff made site visits to seven school districts and one private school bus service contractor in the South Coast region. Staff participated in approximately eight conference calls with engine manufacturers and retrofit device manufacturers to discuss the status of current and future technologies. Additionally, staff visited a school district in the Sacramento County region to view two diesel buses that had been retrofitted with aftertreatment that reduces both NOx and PM. The staff also conducted a school bus working group meeting on March 10, 2005, to discuss with school districts, private school transportation providers, and school bus vendors, the ARB's preliminary concepts for its regulatory proposal.

A public workshop was held on April 7, 2005, in El Monte, which is located within the South Coast region. Hardcopies of the workshop notice and draft regulatory concepts were mailed to 413 addresses, and over 200 emails were sent to the working group/school district list. Targeted groups for hardcopy mailings included representatives on the ARB's mailing lists for Air Pollution Control Officers, environmental groups, the school bus stakeholders, and heavy-duty vehicle/engine manufacturers.

Workshop attendees included representatives from school districts, private school bus service contractors, school bus vendors, municipalities, engine manufacturers and marketers, aftertreatment manufacturers, natural gas refueling equipment manufacturers, alternative fuel distributors, environmental representatives, and other interested parties. These individuals participated both by providing data, commenting on the proposed regulation, and by participating in a lengthy question-and-answer session during the workshop.

To generate additional public participation and to enhance the information flow between ARB and interested persons, staff made the workshop notices, draft regulatory concepts, draft regulatory language, and workshop presentations available on the ARB webpage. Notice of the rulemaking activity and workshop were also posted on the SCAQMD's webpage.

III. NEED FOR EMISSION REDUCTIONS

The following sections discuss the status of air quality in the South Coast region, the impacts of air pollution, and thus the need to reduce emission to improve air quality.

A. Air Quality in the South Coast Air Quality Management District

Despite significant progress made in reducing harmful air emissions over the past 20 years, the District continues to experience serious air quality problems. Reductions of emissions from school buses would contribute to an overall reduction of motor vehicle emissions in the District.

B. Children's Exposure to Pollutants During School Bus Commutes

In 2003, the ARB sponsored a study conducted by researchers at the University of California Riverside and Los Angeles campuses to characterize the range of children's exposures to diesel vehicle-related pollutants and other vehicle pollutants during their commutes in school buses. The study measured pollutant concentrations inside five conventional diesel school buses over actual school bus routes in Los Angeles. For comparison, pollutant concentrations from a diesel bus equipped with a diesel particulate filter and a CNG bus were also measured. The major findings of this study were:

- Self-pollution, that is, the intrusion of the bus' own exhaust into the cabin after leaving the exhaust pipe, is a significant source of exposure. The effect was worse when the windows were closed and in older buses;
- Traffic density is critical to pollutant exposure;
- Cleaner buses, such as CNG-fueled buses or diesel-fueled buses equipped with particulate filters, showed significantly reduced on-board concentrations of diesel-related pollutants compared to conventional diesel buses;
- Most exposure occurs from commuting on the bus, not loading and unloading.

As a follow-up to this study, the ARB is now sponsoring an additional study by the same researchers to evaluate the mechanisms of self-pollution in school buses and possible mitigation measures to reduce self-pollution. We expect results of the study to be available in the fall of 2005. The ARB is committed to following up on the results of this important research to minimize or eliminate self-pollution from school buses.

IV. SOUTH COAST SCHOOL BUS FLEET CHARACTERIZATION

A. Bus Population and Emission Inventory

In 2000, the SCAQMD conducted a survey to identify the number of school buses operating in the four counties of Los Angeles, Orange, San Bernardino, and Riverside. The detailed data resulting from the survey provided valuable information regarding school bus fleet composition in the SCAQMD and was useful to the staff in developing this regulatory proposal. However, because the survey data was compiled in 2000, the staff used ARB's On-Road Mobile Source Emission Inventory Model EMFAC2002 (version 2.2 April 23, 2003) to estimate the current school bus population in the SCAQMD and the resulting emissions. The sections below discuss SCAQMD 2000 survey data and the ARB's EMFAC population and emission estimates.

1. Bus Population

a. SCAQMD 2000 Survey

Based on the SCAQMD 2000 survey results, there were 129 school districts in the District, of which 84 owned or operated either their entire or part of their fleet.

Twelve private school bus contractors supplied buses to the remaining school districts. The survey revealed that the total number of school buses was 9,417, of which 8,795 were in school bus fleets of 15 or more and thus would be subject to SCAQMD's Rule 1195. These totals include diesel, gasoline, and alternative-fueled buses used in all four counties by the school districts, private schools, and contractors.

Table 7 summarizes the school bus population, by fuel type, operated by school districts, private schools, and contractors affected by SCAQMD's Rule 1195, based on the SCAQMD's 2000 survey results.

Table 7. SCAQMD 2000 Survey Estimated Number of Affected School Buses by Fuel Type - SCAQMD 2000 Survey (Fleets of 15 or More)

	Diesel	Gasoline	Methanol	CNG	Electric	Total
School Districts	3,288	386	3	111	3	3,791
Contractors	4,844	45	0	2	0	4,891
Private Schools	60	52	0	1	0	113
Total	8,192	483	3	114	3	8,795

In addition, the survey also classified the affected diesel and gasoline population into medium-duty and heavy-duty buses. The distribution of affected gasoline and diesel school buses into medium-duty and heavy-duty buses is shown in Table 8.

Table 8. Distribution of Affected Diesel and Gasoline Population into Medium - Duty and Heavy - Duty Buses - SCAQMD 2000 Survey

DIESEL	Medium-Duty	Heavy-Duty	Total
School Districts & Private Schools	1,013	2,335	3,348
Contractors	2,656	2,188	4,844
Total	3,669	4,523	8,192
GASOLINE	**Medium-Duty**	**Heavy-Duty**	**Total**
School Districts & Private Schools	378	60	438
Contractors	38	7	45
Total	416	67	483
Total Gasoline & Diesel	4,085	4,590	8,675

b. EMFAC 2005 Population Estimates

According to EMFAC, the estimated school bus population in the SCAQMD for the 2005 calendar year is 9,209. The school bus category in EMFAC covers all buses that are registered as school buses with the DMV. EMFAC's output consolidates school buses of all GVWRs and thus does not differentiate the population into medium-duty and heavy-duty school buses. Moreover, EMFAC does not split the output by school districts, private schools, and contractors. Table 9 provides the estimated EMFAC baseline population of school buses in the SCAQMD.

Table 9. EMFAC2002 School Bus Population in Year 2005 for SCAQMD

	TOTAL
Gasoline	1,236
Diesel	7,973
Total	9,209

The 9,209 buses estimated in EMFAC for calendar year 2005 is ARB's best estimate of current school bus population in the SCAQMD. This estimate is slightly lower than the 9,417 buses identified in the SCAQMD survey in 2000. While CNG-fueled school buses are not accounted for separately in EMFAC, there are about 440 CNG-fueled school buses currently operating in the SCAQMD, based on updated school bus fleet information from SCAQMD.

c. Private Schools Affected by the Proposed Regulation

The 2000 survey indicated that there were six private schools with fleets of 15 or more that were subject to the SCAQMD's regulation. Those six schools had a total of 113 buses. Based on recent SCAQMD and ARB phone calls to school districts (in June 2005), there is now only one private school with a school bus fleet of 15 or more buses that would be subject to ARB's proposed regulation. This private school fleet contains a total of 21 buses.

2. Emission Inventory

In order to estimate the emissions of NOx and PM from all the school buses operating in the District, the EMFAC model was run for the 2005, 2007, and 2010 calendar years. The EMFAC model uses emission rates of medium-heavy duty engines to quantify the emissions from school buses. The baseline tons per day (TPD) emissions of NOx and PM from gasoline-fueled and diesel-fueled school buses are summarized in Table 10. Total emissions in calendar year 2010 from school buses in the SCAQMD are 4.60 tons per day (TPD) NOx and 0.17 TPD PM. Total school bus emissions, shown below, provide a gauge for the significance of the estimated emissions benefits in 2010 for this regulatory proposal.

Table 10. EMFAC2002 Baseline Emissions in the SCAQMD from Gasoline and Diesel School Buses (TPD)			
CY 2005	**Gasoline**	**Diesel**	**Total**
NOX	0.20	4.44	4.64
PM	0.01	0.17	0.18
CY 2007	**Gasoline**	**Diesel**	**Total**
NOX	0.18	4.45	4.63
PM	0.00	0.17	0.17
CY 2010	**Gasoline**	**Diesel**	**Total**
NOX	0.17	4.43	4.60
PM	0.00	0.17	0.17

B. CNG Refueling Infrastructure and Maintenance

1. School Bus Fueling Requirements

CNG fueling systems currently in use in the SCAQMD include time-fill (also known as “slow-fill”), fast-fill, vehicle refueling appliance, portable compressor station, and tube trailer systems.

School buses typically operate on fixed schedules at the beginning and end of the school day. Consequently, the evening and night are available for school bus maintenance and refueling. School districts and school bus service providers with smaller fleets of CNG-fueled buses often utilize time-fill refueling systems that take advantage of the eight to ten hours available to fuel their buses. Time-fill fueling systems are typically less expensive than alternative systems because they require less equipment (e.g., compressed gas storage tanks).

School districts and providers with larger fleets of CNG-fueled school buses, and school districts that share fueling facilities with other organizations or the public often utilize fueling systems with fast-fill capabilities. Refueling a school bus at a fast-fill facility typically takes 20 minutes or less. Refueling times depend on the remaining amount of fuel in the school bus and the storage capacity of the fueling site.

Time- and fast-fill systems have specific advantages that can be exploited by the users. For example, slower refueling will result in a more complete fill of the fuel tank (and consequently, provide a longer driving range), while rapid refueling

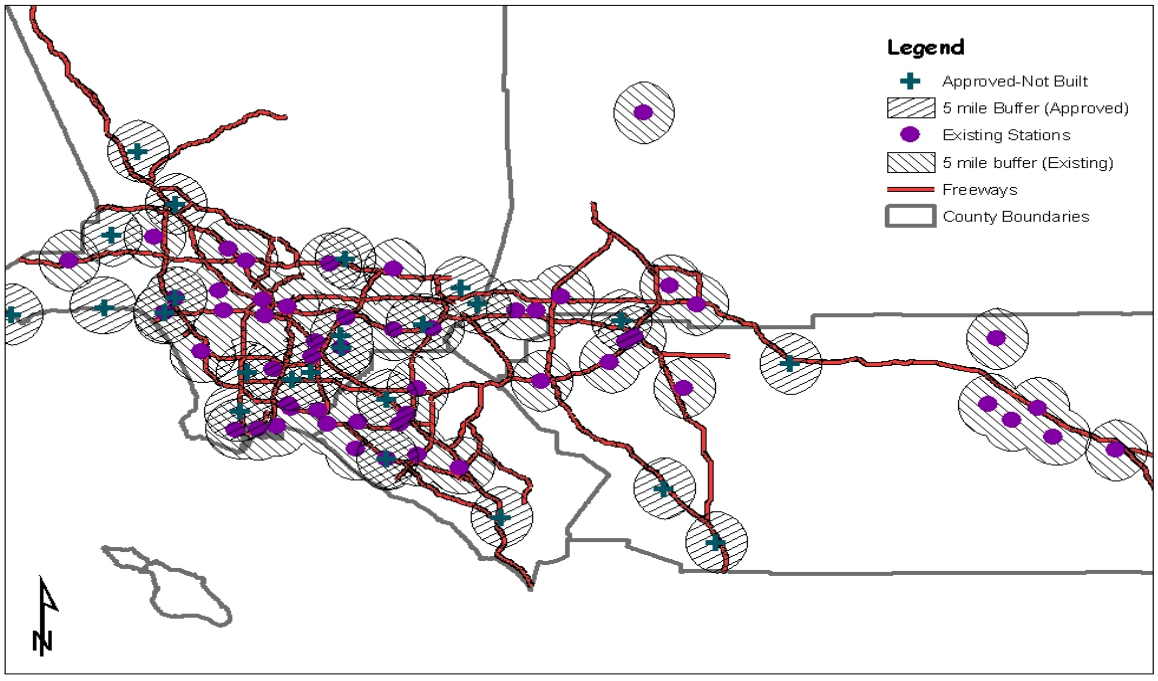
provides a quick turnaround and relieves the need to have personnel monitor the fueling process over an eight to ten hour period.

2. Existing Fueling Stations

SCAQMD regulations require public access to fueling stations built with alternative fuel incentive funding. However, "public access" to school district fueling stations typically refers to access for public fleets such as regional transit or municipal waste fleets. Private-citizen access to school district fueling facilities opens the district to liability and security issues that could encumber the use of their fueling stations.

SCAQMD alternate-fuel incentive programs have significantly increased the number of CNG fueling stations within their area of responsibility. There are more than 100 CNG fueling stations in the region that could provide fueling access to school districts and school bus providers. The following map (Figure 2) illustrates the locations of existing natural gas fueling stations in the SCAQMD (in Spring 2005) that are either fully operational or in the planning and permitting stage. The hatched-line circle drawn around each site is used to identify geographical areas in the region that have sufficient penetration of CNG fueling infrastructure to make CNG-fueled school buses a practical option at this time.

Figure 2 CNG Fueling Stations in the South Coast Air Basin



The web site www.cleancarmaps.com provides addresses and driving directions to available CNG and other alternative fueling stations in California, Nevada, and Arizona.

The SCAQMD reports nine school districts are not located within five miles of a CNG refueling station, as shown in Table 11.

Table 11. School Districts with No CNG Refueling within 5 Miles
Acton-Agua Dulce Unified School District
Bear Valley Unified School District
Capistrano Unified School District
Castaic Union School District
Desert Center
Nuview Union School District
Rialto Unified School District
Rim of the World Unified School District
Sulphur Springs

3. Fueling Infrastructure Costs

School bus fleet operators prefer to have an on-site, central fueling station to reduce overhead and labor costs (versus refueling offsite). The majority of school districts responding to a survey provided by the SCAQMD indicated that they owned, co-owned, or had access to a CNG refueling station (SCAQMD 2005).

Most of the school districts with central fueling stations received assistance funding from the SCAQMD and other regional and government agencies interested in the development of CNG fueling infrastructure in the South Coast Air Basin. The Governing Board of the SCAQMD authorized $12 million to assist in regional infrastructure development for natural gas fueling. Additional funding from other agencies is also available for this purpose. As more school bus fleets convert to CNG fuel, additional funding will be required in future years.

Analysis of school district surveys provided by the SCAQMD reveals that the costs to school districts for self-funded, dedicated CNG fueling sites can be cost prohibitive. Fast fill stations capable of refueling up to 20 school buses overnight can cost approximately $320,000 (SCAQMD 2005), while larger sites capable of fueling up to 50 CNG vehicles overnight can cost closer to $700,000. Time-fill infrastructure, which trades infrastructure cost for slower tank fills, can cost approximately one-third the price of fast-fill systems.

A few independent corporations produce CNG fueling systems that cost about $12,000 per CNG-fueled school bus (to time-fill a single bus). In a recent bid to develop the infrastructure needed for 34 CNG-fueled school buses in the South Coast Air Basin, it was estimated that up to $250,000 would be required for a combination of 20 time-fill units and one fast-fill unit. The estimated cost on a per-bus basis would be about $7,350 (SCAQMD 2001a).

Some school bus operators have maintenance or lease agreements with fuel infrastructure providers of CNG and diesel. This type of arrangement provides fuel access without the burdens of ownership, and typically costs around $760 per month in addition to the actual cost of the CNG fuel. In other cases, the provider installs and maintains the fueling station and the end user pays a small premium on the fuel price to pay for the station and accompanying maintenance costs.

4. Repair Facility Modification

California's building codes restrict CNG-fueled vehicle repair facilities from operation unless they meet strict guidelines to reduce the opportunity of an indoor fuel flash or explosion. Closed-door CNG school bus repair operations are only permitted in buildings built or modified specifically for that purpose, and must meet requirements for venting, deflagration venting, and access to rooms containing CNG equipment (CEC 1995).

The cost of repair facility upgrades can range from a few thousand dollars to over $200,000 depending on the conditions of the existing facility. Many existing school bus repair facility buildings do not meet building code standards for CNG-fueled vehicle repair. Consequently, code requirements have induced some school districts and school transportation providers to repair their CNG-fueled buses outdoors until money is secured to retrofit the repair buildings. In this process, some school districts have discovered that relatively low-cost alternatives to extensive repair facility upgrades prove completely adequate for their CNG-fueled bus repair needs.

The ARB staff spoke with several school districts in the South Coast region using CNG buses to better understand the end-users' experiences with and costs for alternative-fuel technology. One school district with 20 CNG buses reported using a canvas-type enclosure to service its CNG-fueled school buses at a total cost of approximately $15,000, which equates to $750 per bus. Another school district, which will soon have a total of 42 CNG-fueled school buses in its fleet, paid $50,000 for an outside hydraulic repair lift for CNG-fueled school bus maintenance and $15,000 for the associated cement pad, which equates to less than $1,600 per bus. At the high-end of the cost scale for repair facility modifications, a school district with about 95 CNG-fueled school buses performed an extensive upgrade to its repair facility at a cost of $350,000 to $400,000, or approximately $4,000 per bus.

5. Operating Costs

SCAQMD's analysis of school district survey data and information from the California Energy Commission (CEC 1995) indicate that, on average, CNG-fueled school bus operation costs one or two cents more per mile than diesel-fueled school bus operation. Based on SCAQMD's analysis, diesel-fueled school bus operation averages about 40 cents per mile for buses less than five years old. The analysis also indicated that there were noteworthy variations in costs between

school districts and operators throughout the air basin. This is the result of significant variations in administrative policies, purchasing operations, age of buses (including vehicles under warrantee), and other factors.

6. User Experience

CNG engine-specific parts are more expensive for school buses compared to engine parts for diesel-fueled school buses. Future increases in the numbers of CNG-fueled public works vehicles and school buses in the South Coast Air Basin will likely result in an eventual decrease in the cost of CNG school bus engine parts, and an increase in the cost of engine and emission control parts for diesel school buses and public works vehicles utilizing advanced electronics for pollution control. For the first few years after purchase (typically five years), many of the CNG-specific engine parts are under manufacturers warranty. Consequently, school bus engine parts under warrantee are replaced at the manufacturer's expense. SCAQMD staff has facilitated efforts to develop training programs for mechanics working on CNG-fueled engines, and has provided financial assistance to help cover the training materials or costs.

While some school districts in the South Coast region support and remain committed to alternative-fueled school buses, many other school districts oppose any requirements to purchase alternative-fueled school buses based primarily on cost issues.

V. South Coast Fleet Rule 1195

This section describes Rule 1195 and how it has been implemented over the last four years. ARB staff believes modifications are needed to reestablish exemptions that have sunset under Rule 1195, to ensure that rule compliance is dependent on the availability of external funding sources, and to clarify that the one private school bus fleet in the District would be subject to the regulation.

A. Requirements

Rule 1195 applies to school bus fleets operating in the District with 15 or more school buses. These fleets may be operated by public school districts, private schools, and by private companies that provide school transportation to public and private schools.

Under Rule 1195, school bus operators are required to purchase or lease gasoline-fueled or alternative-fueled buses when adding or replacing school buses in their fleets. Rule 1195 also contains provisions to retrofit specified percentages of in-use diesel school buses as part of the exemption process that fleet operators must use to acquire diesel school buses and as a means for delaying compliance with the purchase requirements.

Implementation is contingent on the availability of external funding to pay for:
1) the incremental purchase cost of lower-emitting alternative-fueled school buses;
2) the incremental purchase cost of new lower-emitting diesel buses equipped with

filters; and 3) some costs associated with alternative-fuel infrastructure and alternative-fuel maintenance facility upgrades. However, implementation of requirements to equip in-use diesel buses with ARB-verified diesel emission control devices is not contingent upon availability of external funding in all cases. Exemptions in Rule 1195 that allow the purchase of diesel buses based on the lack of external funding for alternative-fuel infrastructure and alternative-fuel maintenance facility upgrades have sunset and need to be reinstated in the ARB's proposed regulation.

The external funding necessary to cover incremental costs must be enough to pay for the difference in purchase cost between a rule-compliant new bus purchase and a diesel-fueled school bus equipped with a diesel emission matter control device (i.e., a DPF). If funding is not available, then the school bus fleet owner or operator may acquire a different bus type in the following order: 1) an intermediate diesel-fueled school bus as defined by the ARB's Lower-Emission School Bus Program Guidelines adopted in 2000; 2) a gasoline-fueled school bus; or finally 3) a diesel-fueled school bus with an ARB-verified diesel emission control device (DPF) installed. These purchase options are discussed below.

Purchase Options

*Intermediate Diesel School Buses***.** Rule 1195 allowed for the purchase (or lease) of an "intermediate diesel school bus" as defined by the ARB's Lower-Emission School Bus Program Guidelines. These buses had certified NOx emissions of 3.0 g/bhp-hr (at a time when the current NOx standard was 4.0 g/bhp-hr) and certified PM emissions of 0.01 g/bhp-hr. Beginning October 2002, NOx emission standards ratcheted down to 2.4 g/bhp-hr for NOx plus NMHC (or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC cap); thus new "intermediate diesel school buses" are no longer available.

*Gasoline-fueled School Buse*s. If external funding was not available for a intermediate diesel school bus during the time it was commercially available, Rule 1195 then required the fleet operator to consider a gasoline-fueled school bus.

Diesel-fueled School Buses with Aftertreatment. If a gasoline-fueled school bus is not a viable purchase option and a school district submits supporting documentation demonstrating the need for a diesel-fueled school bus, the school district may purchase (or lease) a diesel-fueled school bus equipped with a diesel emission control device (i.e., a DPF), if funding outside of the school bus fleet operator's fiscal budget is available. Without external funding to cover the cost of the diesel emission control device, the fleet operator is allowed to purchase a conventional diesel-fueled school bus without the diesel emission control device.

Additional Requirement for Diesel-fueled School Bus Purchases. If a school bus fleet operator receives an exemption to purchase a diesel-fueled school bus with or without a diesel emission control device, then Rule 1195 imposes an

additional requirement to annually retrofit 15 percent of a fleet's in-use diesel-fueled school buses with an ARB-verified diesel emission control device, if external funding is available.

B. Exemptions

1. Lack of Funding For Alternative-Fuel Fueling Stations and Alternative-Fuel Maintenance Facility Upgrade

Rule 1195 specified funding amounts, on a per school bus basis, that must be available to the school bus fleet operator to use for building a new alternative-fuel fueling station and to upgrade existing maintenance facilities to required standards to accommodate alternative-fueled school buses. If those funding amounts were not available, and the school district was not within five miles of an existing alternative-fuel fueling station, the school bus fleet operator was then able to use the exemption process to purchase a diesel-fueled school bus. As already stated, these funding provisions for specified funding amounts to assist in building alternative-fuel fueling stations and upgrading existing maintenance facilities have sunset under Rule 1195 and need to be reinstated.

2. Other Available Exemptions

Rule 1195 includes other exemption provisions to accommodate school bus fleets' differing transportation needs. The list below categorizes the other types of exemptions available to school bus fleets. The ARB's proposal retains these exemptions in concept, but with minor modifications in some cases.

- Lack of alternative-fueled engine/chassis/body configuration in a specific size or for a specific route
- A scrapping (i.e., bus retirement) provision to allow non-compliant pre-owned school bus purchases
- Exemptions for unforeseen circumstances, business mergers, prior contract agreements, and field trips

C. Implementation History

Implementation of the existing fleet rule over the last four years is a function of the requirements, available funding, and exemptions granted by the SCAQMD. This section discusses implementation to date including vehicles purchased, actual emission reductions, status of infrastructure, and exemptions.

1. Compliant Vehicle Purchases

SCAQMD staff reports purchases of 519 compliant vehicles from the adoption of Rule 1195 on April 20, 2001, through February 11, 2005 (see Table 12 below). SCAQMD staff also estimated 0.07 tons per day of NOx and 0.003 tons per day PM emission benefits from those four years of rule adoption. This includes both medium-duty and heavy-duty school bus purchases. The actual emission benefits

from Rule 1195 are significantly less than what the SCAQMD staff estimated in its April 2001 staff report.

Table 12. Rule 1195 Compliant School Bus Purchases, 2001 - 2005						
Affected Fleet Population	**Compliant Vehicles Purchased**		**NOx Reductions (tons/day)**		**PM Reductions (tons/day)**	
	Actual	2001 Staff Report	Actual	2001 Staff Report	Actual	2001 Staff Report
8897	519	1342	0.07	0.15	0.003	0.011

Rule-compliant vehicles purchased were primarily buses used in public school bus fleets. Funding for rule-compliant school bus purchases over this period came from the state-funded Lower-Emission School Bus Program, the MSRC, and AQMD penalty settlement funds.

Table 13. Rule 1195 Exemptions Granted				
Exemptions Granted				**Non-Compliant Vehicles Purchased after April 28, 2004**
4/01 to 4/04*		4/04 to 2/05*		
Public	Private Contractors	Public	Private Contractors	Private Contractors
64	995	6	0	243

*Rule 1195 was adopted on April 20, 2001. The U.S. Supreme Court decision regarding SCAQMD authority over private fleet purchases with respect to these fleet rules was noticed on April 28, 2004.

Most of the exemptions were issued due to lack of funding, followed by lack of model availability and lack of refueling infrastructure.

2. Medium-Duty School Bus Purchases

Table 13 includes medium-duty school bus purchases from 2001 through 2004. All of the 210 gasoline and alternative-fueled buses purchased since rule implementation were certified as ULEV. Of the 210 buses purchased, 185 were gasoline school buses and virtually all of these gasoline buses replaced diesel buses. The annual turnover rate for medium-duty school buses is much lower than the SCAQMD staff estimated in its staff report for Rule 1195. This is partially because of state school funding issues and the cyclical nature of school bus replacement schedules.

Medium-duty school buses have been ineligible for most of the funding programs discussed in Section I. Most of the state and local funding has been directed to replacement of heavy-duty school buses. However, a portion of the DMV fees can be used to fund medium-duty school buses.

SCAQMD's MSRC, which administers 30 percent of the DMV fees collected in the South Coast, has provided school bus funding for several years. The last funding cycle included medium-duty school buses. The MSRC program supports the purchase of alternative fuel school buses only. The MSRC has provided funding support for 24 medium-duty natural gas school buses. That funding was a flat $25,000 per bus, which was intended to cover the incremental cost of the natural gas bus and provide some funding to support fueling infrastructure. The MSRC creates a new work program each year. At the time this report was developed, the work program for 2005 - 2006 had not yet been completed.

The SCAQMD's Chairman's School Bus Initiative also provides funding support for alternative-fueled school buses. One medium-duty school bus has been purchased through this program so far. Another potential source of funding for medium-duty school buses could be air district collected fines and penalties.

VI. SUMMARY OF PROPOSED REGULATION

The proposed regulation has performance-based purchase requirements, dependent on the availability of external funding sources, that are approximately equivalent to the purchase/lease requirements of the SCAQMD Rule 1195. Additionally, the proposal would reinstate exemption options that have sunset in the SCAQMD rule. This section summarizes the proposed regulation and compares it to the SCAQMD's Rule 1195.

A. Requirements

This proposal specifies emission criteria for buses purchased or leased by public and private school bus fleets within the SCAQMD that operate 15 or more buses. These requirements include criteria for both medium-duty and heavy-duty school buses, newly manufactured and pre-owned. The proposed regulatory program is to be administered by the SCAQMD staff.

Like SCAQMD Rule 1195, the regulatory proposal provides exemptions, particularly for lack of external funding. If this funding is not available, the school bus fleet operator may apply for an exemption from these requirements.

Additional hardship exemptions are available based on the lack of availability of alternative-fuel refueling facilities or lack of funding for installation of refueling facilities. Exemptions may also be granted based on the lack of availability of the bus size required for a fixed route that meets the emission criteria, buses required for field trips, and the occasion when an urgent need arises for the quick acquisition of additional buses due to unforeseen circumstances. Additionally, there is a provision for the merger of two private bus fleets or the case where one fleet purchases another. These provisions apply only if both fleets are operating within the SCAQMD at the time of the purchase or merger.

The regulatory proposal includes a provision to reduce emissions from school buses currently operating in fleets. The proposal would require that owners and operators of public and private school bus fleets of 15 or more buses install ARB-verified diesel emission control methods on at least 25 percent of their buses that can utilize such methods each year, if external funding is available. This requirement differs from SCAQMD Rule 1195 in that it is a requirement independent of the exemption process.

Lastly, the regulatory proposal includes record keeping requirements for compliance auditing and enforcement.

1. Purpose

The purpose of the regulatory proposal is to reduce air toxic and criteria pollutant emissions by requiring public and private school bus fleet operators and owners to acquire less-polluting school buses when purchasing or leasing these vehicles for operation in the SCAQMD.

2. Definitions

A school bus means any vehicle that is used for the specific purpose of carrying students between home and school and to school activities. This applies to students through the twelfth grade. A medium-duty school bus is any school bus having a gross vehicle weight rating of from 6,000 to 14,000 pounds. A heavy-duty school bus is any school bus with a gross vehicle weight rating of over 14,000 pounds.

3. Purchase and Lease Requirements

a. Purchase and Lease Requirements for Newly Manufactured Vehicles

The regulatory proposal places purchase and lease requirements on operators of school bus fleets of 15 or more medium and/or heavy-duty school buses. This proposal requires that when adding to or replacing medium and heavy-duty school buses in an existing fleet, these fleet operators purchase or lease new school buses equipped with engines meeting a set of standards which have been given the designation of best engine selection/technology (BEST).

Best Engine Selection/Technology (BEST) Purchase Criteria

Medium-Duty: The BEST criterion for the purchase or lease of a newly manufactured medium-duty school bus is that the bus be equipped with a non-diesel engine certified as ULEV or cleaner. As previously discussed, diesel engines certify to engine-based standards, while gasoline engines typically certify to chassis-based standards. Both the engine standards and the chassis standards have a “ULEV” designation, however the chassis-based ULEV standard is more stringent than the engine-based ULEV standard. Therefore, requiring medium-

duty buses to be non-diesel buses certified as ULEVs is consistent with the BEST criterion.

There are currently ULEV certified gasoline-fueled buses available for use as smaller van or cutaway style medium-duty school buses which typically carry 10 to 24 students. The availability of an alternative-fueled bus for this application is uncertain. The larger medium-duty buses, with gross vehicle weigh ratings of 10,000 to 14,000 pounds and that carry from 30 to 35 students, are currently only available as diesel-fueled models. An alternative-fueled bus of this size is not expected to be commercially available before 2007.

Heavy-Duty: BEST criteria for the purchase or lease of a newly manufactured heavy-duty school bus include emission standards for both NOx and PM that require increasingly cleaner vehicles as the program progresses.

> The standards for 2005-2006 model year engines require certification to the optional NOx plus NMHC standard of 1.8 g/bhp-hr and to the corresponding PM standard of 0.03 g/bhp-hr, as specified in title 13, CCR section 1956.8 (a)(2)(A). The bus engines currently available that are able to meet these standards would either be alternatively-fueled or, if diesel-fueled, would include a verified diesel emission control strategy that reduces both NOx and PM.
>
> 2007-2009 model year engine school bus purchases or leases require certification to a 0.2 g/bhp-hr maximum NOx family emission limit (FEL) and to the 0.01 g/bhp-hr required PM standard, specified in title 13, CCR, section 1956.8 (a)(2)(A) for 2007 and subsequent year engines. At this time, only alternative-fueled engines are expected to be able to meet 0.2 g/bhp-hr NOx FEL.
>
> 2010 and later model year school bus purchases and leases would also require certification to the required NOx standard of 0.2 g/bhp-hr and the required PM standard of 0.01 g/bhp-hr. Since this is the requirement for all newly manufactured heavy-duty engines in 2010, it is expected that both alternative-fueled and diesel-fueled buses will meet these standards and have equivalent emissions.

b. Purchase and Lease Requirements for Pre-Owned School Buses

When public or private school bus fleet operators with 15 or more school buses purchase or lease a pre-owned heavy-duty school bus, the regulatory proposal will require that school bus be repowered with a new engine that meets the BEST criteria. When public or private school bus fleet operators with 15 or more school buses purchase or lease a pre-owned medium-duty school bus, the regulatory proposal will require that they purchase or lease a school bus with an engine certified to the LEV emission levels or cleaner.

4. Exemptions from Purchase Requirements

The regulatory proposal includes provisions to exempt school bus fleets operators from the purchase requirements discussed above, based on the non-availability of grants and external funding required to implement the requirements, and based on hardship due to difficulty in the practical application of the regulatory proposal's requirements. Operators of public and private school buses may apply to the Executive Officer of the SCAQMD for an exemption from these purchases and/or lease requirements based on the reasons discussed in the following paragraphs.

a. Lack of Funding for Incremental Cost of BEST

These purchase and/or lease requirements are dependent on sufficient funding being available from grants or other external sources outside of the school bus fleet operator's fiscal budget to cover the incremental cost of complying with the regulatory proposal. The grant or external source funding must be enough to pay for the difference between the cost of the purchase required by the BEST criteria and the cost of a comparable standard purchase school bus. This differential cost includes costs of warranties comparable to base warranties for a comparable standard school bus.

If this funding is not available, then the school bus fleet operator may purchase a new bus not meeting the BEST requirements providing the bus purchased is equipped with a California-certified engine meeting a PM standard of 0.01 g/bhp-hr. This PM standard is an optional standard for the 2005-2006 model years. However, for the 2007-2009 model years, 0.01 g/bhp-hr will become the PM standard for all heavy-duty engines. Both International and Caterpillar will have an engine for use in school buses available for the 2005-2006 model years that will meet this standard through the use of a diesel particulate filter; it will have a purchase price higher than a standard diesel bus purchase. If, for the 2005-2006 model years, there is insufficient external incremental funding to purchase a California-certified engine meeting the PM standard of 0.01 g/bhp-hr, a fleet operator may purchase a standard heavy-duty school bus that does not meet the optional standard. This exemption covers both medium and heavy-duty engine purchases.

b. Lack of Available Infrastructure

It is expected that the only available engines that will meet the heavy-duty 2007-2009 model year BEST criteria will be alternative-fueled. A public or private school bus fleet operator may purchase or lease heavy-duty school buses that are not alternative-fueled if they can demonstrate that there is neither an alternative-fuel refueling station nor funds to provide a refueling facility available. The fleet operator must demonstrate that there is not an alternative-fuel refueling station within five miles of where the buses are stored or where bus maintenance is performed.

This exemption does not apply if funding for providing new refueling facilities of at least $13,000 per each alternative-fueled BEST school bus to be purchased or

leased is available from grants or other external sources. Several of the clean school bus incentive programs provide funds for significantly more than the incremental cost difference between the alternative-fueled bus and a standard purchase bus. Consequently, a provision has been included that this exemption does not apply if the external funding received by the fleet operator for the purchase of the alternative-fueled BEST bus exceeds the incremental capital cost of the bus purchase by at least $13,000 for building or expanding an alternative refueling station and up to an additional $4,000 for required maintenance facility upgrades. Required funding for maintenance facility upgrades is discussed in the following paragraph.

c. Lack of Funding for Maintenance Facility Upgrades

This exemption provides relief from the BEST purchase requirement if external funding beyond the fleet operator's fiscal budget of up to $4,000 per BEST bus is not available to upgrade an existing maintenance facility to meet the required standards to handle alternative-fueled bus technology. The cost of the facility upgrades required by different fleets when acquiring alternative-fueled buses since the adoption of the SCAQMD Rule 1195 have varied significantly depending on the configuration of their existing facilities and the number of alternative-fueled buses in their fleet. These upgrades and their associated cost per bus are discussed in Section IV.B.4. Due to this large variation, this exemption was not crafted to set a minimum funding requirement but instead caps the required exemption amount at a value that encompasses the facility upgrades that have been required by various fleets in the past few years. This exemption allows a public or private school bus fleet operator to purchase a diesel powered school bus with a California-certified engine meeting a PM standard of 0.01 g/bhp-hr. If, for the 2005-2006 model years, there is insufficient external incremental funding to purchase a California-certified engine meeting the PM standard of 0.01 g/bhp-hr, a fleet operator may purchase a standard heavy-duty school bus that does not meet the optional standard.

This exemption does not apply if the external funding received by the fleet operator for the purchase of the alternative-fueled BEST bus exceeds the incremental capital cost of the bus purchase by at least $13,000 for building or expanding an alternative refueling station and up to an additional $4,000 for required maintenance facility upgrades.

d. Lack of Available Engine/Chassis/Body Configuration

Exemptions to the purchase requirements may be granted if a school bus meeting BEST criteria is not commercially available in the required bus size or in a bus size or type required for use on a specific fixed bus route. If the exemption is granted for a 2005-2006 model year purchase, the fleet operator may purchase or lease a diesel-fueled bus with a California-certified engine meeting the PM standard of 0.01 g/bhp-hr. If the fleet operator does not receive external funding for the purchase of a California-certified engine meeting the PM standard, a school bus that does not meet the optional standard may be purchased. For the 2007-2009

model years, 0.01 g/bhp-hr will become the PM standard. Consequently, if an exemption is granted for these model years, the fleet operator may purchase or lease a new standard purchase diesel-fueled school bus.

e. Lack of Funding for A California-Certified Engine Meeting an Optional PM Standard

For the 2005-2006 model years, if there is insufficient external incremental funding to purchase a California-certified engine meeting the optional PM standard of 0.01 g/bhp-hr, a fleet operator may purchase a standard heavy-duty school bus that does not meet the optional standard.

f. Field Trips

Public and private school bus fleet operators may apply for an exemption from BEST purchase requirements for a specified number of buses that are used for transporting passengers on field trips if all of the other buses in the fleet meet the BEST criteria. The number of buses that may be exempt for field trip use is dependent on fleet size, as shown in Table 14 below.

Table 14. Number of Non Compliant Field Trip Buses Allowed

Fleet Size (School Buses)	Maximum # of Field Trip Buses
≥ 100	10% of fleet
51 < 100	10
≤ 50	5

The Executive Officer of the SCAQMD may allow a higher number of purchase exemptions for field trip buses if the fleet can provide three years of bus dispatch logs that show that a higher number of field trip buses are necessary.

g. Unforeseen Circumstances

Public and private school bus fleet operators may lease buses that do not meet BEST criteria if unforeseen circumstances arise that create a need for the fleet to operate additional buses. In order to lease buses that do not meet the BEST criteria, the fleet owner or operator must show that a BEST compliant bus cannot be deployed within one month from the date the bus order was placed. The owner or operator may lease the number of buses needed for the length of time required to purchase or lease BEST compliant buses. The lease time for the non-compliant buses may not be longer than the time remaining in the school year.

h. Mergers

If a private school bus fleet operator either forms a merger with another private school bus fleet operator or purchases another private school bus fleet then the transfer of ownership of school buses due to the merger or fleet purchase will not

be subject to BEST criteria if both private school bus fleets were already operating in the SCAQMD at the time of the purchase or merger.

i. Exemptions from Pre-Owned School Bus Purchase Requirements

Operators of public and private school bus fleets may apply for an exemption from these purchase requirements for a pre-owned bus if the oldest school bus in the operator's existing fleet is scrapped or permanently removed from operation in the fleet. The pre-owned school bus that is added to the fleet must utilize a verified diesel emission control method if it such a control method is available, and if grants or external funding is available for the incremental cost of the verified diesel emission control strategy.

5. Diesel Emission Control Methods for In-Use School Buses

Public or private school bus fleet operators with 15 or more school buses will be required to install verified diesel emission control methods on at least 25 percent of their in-use fleet that can utilize these control methods every year beginning January 1, 2006. This requirement only applies to school buses with engines for which an in-use control has been ARB-verified. The control method utilized must be the highest level of emission control that has been verified for the specific engine on which it will be used. If the original engine warranty is still in effect when the emission control strategy is installed, the installation of the emission control strategy must not jeopardize the original engine warranty.

If the emission control method is fuel-based, then the school bus operator must continue to use the fuel-based method as long as the bus is being operated in the fleet. If the operator wishes to discontinue using the fuel-based method, he must apply to the SCAQMD to change to another verified method for the remaining operating life of the bus.

6. Compliance, Auditing and Enforcement

The proposed regulation includes provisions requiring record keeping for purposes of determining compliance, auditing, and enforcement, functions which are to be performed by the SCAQMD. Specifically, fleet information including manufacturer, model, model year, and fuel type must be made available to the SCAQMD upon request to demonstrate compliance. Other records to be retained by the fleet operator include proof supporting exemptions and purchase records for fuel and fuel additives that are elements of an emission control method.

The proposal includes a provision prohibiting fleet owners from circumventing the regulation by creating multiple fleets under common ownership that contain less than 15 vehicles.

B. Differences Between South Coast Rule 1195 and Staff Proposal

The regulatory proposal differs from South Coast Rule 1195 in three primary areas and in other less significant ways, mainly in definitions and exemption requirements. The primary differences are summarized below.

- *Purchase requirements:* Rule 1195's purchase criteria require alternative-fueled vehicles for heavy duty, medium duty, and repowers whereas this proposal's purchase criteria are emission based.
- *Funding Exemption for requirement of an approved emission control device on diesel vehicles:* In multiple cases where Rule 1195 allows the purchase of a diesel bus due to an exemption, it requires that the bus be equipped with an approved diesel emission control device regardless of the availability of external funding. The proposal stipulates that, in all cases, external funding sources must be available for required purchases.
- *Exemptions*: The proposal reinstates two Rule 1195 exemptions that have sunset in addition to adding a new exemption. The reinstated exemptions are for non-availability of funding for refueling facilities and non-availability of an existing refueling facility within five miles. The proposal creates a separate exemption for availability of funding for maintenance facility upgrades.

The following delineates the minor differences.

- *Definitions:* Definitions of medium-duty and heavy-duty school buses in Rule 1195 include passenger capacity whereas this was omitted from the proposal in anticipation of decreased bus seating capacity when requirements for lap/shoulder restraint systems on larger school buses (primarily buses classified as heavy-duty) go into effect on July 1, 2005, under California law (Senate Bill 568, Statutes of 2001, Chapter 581).

- *Exemption requirements:*
  - Rule 1195 specifies a diesel vehicle with an approved control device as the baseline for determining incremental funding whereas the proposal specifies a standard purchase diesel vehicle (a diesel bus without an approved control device) for the 2005 – 2006 model years.
  - Rule 1195 links requirements for equipping the in-use diesel fleet with emission control devices to the exemption process as a means of delaying purchase requirements whereas this proposal's requirements are separate from the exemption process.
  - Rule 1195 requires that a pre-owned bus must be less than six years old if bought on the condition of scrapping the oldest bus in the fleet. The proposal does not include this maximum bus age requirement.

- *Compliance, auditing, and enforcement:* The proposal includes provisions not included in Rule 1195 for the use of fuel or fuel additives as a diesel emission control method and the corresponding requirements for record keeping for demonstrating compliance.

VII. AVAILABILITY & TECHNOLOGICAL FEASIBILITY

A. Technology Assessment: School Bus Engines

1. Heavy-Duty School Bus Engines

For years 2005 and 2006 there are three natural gas engine models available for school buses that meet the proposed standards for these years. However, only one of these engines is currently being installed in new school bus chassis. The emission levels for these three engines range from 1.5 - 1.8 g/bhp-hr of NOx + NMHC. John Deere's 2005 model year 6081H engine is certified to the 1.5 g/bhp-hr NOx + NMHC level and to 0.01 g/bhp-hr PM. This John Deere engine is currently found on Blue Bird and ThomasBuilt heavy-duty natural gas-fueled school buses of varying configurations.

In the near future it is anticipated that several other engine makes and models will become available that will meet or exceed ARB's optional NOx emission level. These additional engines are expected to provide expanded horsepower and torque ranges to meet the needs of a larger segment of the school bus market.

Currently there are no diesel-fueled engines available or anticipated for years 2005 and 2006 that will meet the proposed NOx emission level of 1.8 g/bhp-hr NOx + NMHC. Other fuel types such as propane-fueled engines are in production, but are certified to a less stringent standard of 2.5 g/bhp-hr NOx + NMHC.

In 2007, it is anticipated that there will be several engine models that will meet the 0.2 g/bhp-hr NOx FEL and 0.01 g/bhp-hr PM required standard. For school bus applications, fuel types for these available 2007 engines could be natural gas or propane. As engine manufacturers announce their intentions for 2007 model year engines, the availability of 0.2 g/bhp-hr NOx FEL engines will become clearer.

2. Medium-Duty School Bus Engines

There are currently ULEV-certified gasoline engines available for smaller medium-duty van or cutaway style school buses. These include the GM 4.8L and 6.0 L engines. These medium duty vehicle standards remain the same through 2010, and a presumption can be made that these engine/vehicle combinations will continue to be available.

The availability of natural gas engines for smaller medium-duty school buses is less certain. In the past, Ford had certified its natural gas E450 in a cutaway configuration for school buses. However, Ford will no longer produce the natural gas model of this engine. Although there is currently an aftermarket version of this engine undergoing ARB certification, Ford does not allow the engine to be used in its chassis. Therefore, the engine manufacturer of record would need to seek agreement from a chassis manufacturer to integrate the engine into a school bus configuration. Another aftermarket engine manufacturer is pursuing certification of

natural gas and propane GM 4.8L and 6.0L engines. Again, the engines would need to be integrated into a chassis and configured as a school bus before they could be considered commercially available.

Of the medium-duty school buses, the larger ones (30-35 passenger variety) are diesel-fueled. There are currently no ULEV versions of a 220-250 horsepower engine, which is typically used in this application. Navistar will offer their Green Diesel Technology school buses in 2005 and 2006. These buses utilize the Navistar DT 466 engine with EGR, and a passive regeneration particulate filter. Emission certification levels are expected to be 2.2 g/bhp-hr NOx and 0.01 g/bhp-hr PM. In 2007, this engine is expected to be certified to 1.2 g/bhp-hr NOx and 0.01 g/bhp-hr PM, and in 2010, the engines will be certified to the 0.2 g/bhp-hr NOx standard. Thus this engine will not meet the proposed emission standards until 2010.

John Deere is developing a natural gas engine with 250 horsepower which they plan to have available for the school bus market beginning in 2007. The design goal for this engine is 0.2 g/bhp-hr NOx.

B. Verified Aftertreatment Devices

Diesel engine aftertreatment devices currently verified for use in California can provide both NOx and PM emission reductions. However, the devices already verified do not apply to 2005 and later model year engines and future applicability is uncertain.

Currently there is only one device that has been verified for use in California that provides both NOx and PM emission reductions simultaneously. The Cleaire Alliance Longview is a lean NOx catalyst mated with a DPF that is designed for specific model year 1993 to 2003 engines. This device provides a 25 percent reduction in NOx emissions and an 85 percent or greater reduction in PM emissions. There is an approximate three percent fuel economy penalty associated with employing the Alliance Longview. The use of ultra low sulfur diesel fuel is required in conjunction with this device.

Plans for verifying the device for 2005 and 2006 model year engines are unclear, and the device is not capable of reducing NOx sufficiently to meet the proposed 2007 NOx standard. Other verified devices reduce PM, but do not reduce NOx, and thus do not offer a viable method of reducing emissions from a current diesel engine sufficiently to allow compliance with the proposed emission standards.

C. Future Aftertreatment and Retrofit Devices

Many advances are being made in the diesel retrofit device industry. New types of DPFs are being developed to apply to older model year engines and those vehicles that do not have the operational parameters that would allow for the use of currently verified DPFs.

Selective catalytic reduction (SCR) devices promise to provide large NOx emission reductions. The use of SCR technology has already been verified for use in California for off-road engines. SCRs have been employed in the power generation industry for many decades and it is considered a mature technology. SCRs require the use of a reductant normally urea but ammonia gas can also be used. The SCR process reduces NOx to nitrogen gas and oxygen.

NOx absorber technology is another of the options that is being pursued by engine manufacturers to meet the 2007 0.2 g NOx + NMHC/bhp-hr standard. It is entirely feasible that a retrofit NOx absorber unit could be developed once this technology has proven itself in the on-road heavy-heavy duty diesel engine market. However, technological hurdles remain that must be overcome for this technology to come to fruition.

The transit bus industry has already started to employ the use of gasoline electric hybrid powertrain systems on new buses. These devices are currently very expensive, but can significantly reduce emissions of NOx and PM as well as increase fuel economy. In the near future other types of hybrid retrofit technology may be developed and marketed such as diesel hydraulic and diesel electric hybrid systems.

Other emission reduction technology that is currently in service in the off-road engine market may one day be used in the on-road sector. Items such as emission reducing diesel fuel injectors or special formulations of diesel fuel may provide emission reductions for in use school buses. Once these devices have been verified to provide emission reductions reliably and effectively they will be available to school bus fleet managers as methods to reduce the emissions of NOx and PM.

VIII. REGULATORY ALTERNATIVES

The staff evaluated two alternatives to the existing regulatory proposal. Below is a brief summary of those alternatives and the staff's conclusion.

A. Do Not Adopt this Rule

One alternative considered by the staff was to not go forward with this regulatory proposal. In the absence of this regulation, much of the estimated emission benefits would still occur. Based on the May 2005 District Court ruling, the SCAQMD clearly has the authority to regulate the approximately 3800 buses in public school fleets with 15 or more buses. In addition, the SCAQMD maintains that it has the authority to regulate the 4800 school buses owned by private contractors that contract to public agencies (the public schools). Staff understands that the SCAQMD may begin enforcing its rule on private contractors to public schools in the near future.

There is still a risk of legal challenge, however, and SCAQMD has no authority over private schools. Adoption of this regulation would enable the SCAQMD to

regulate the 21 school buses owned by the one private school with more than 15 buses. Adoption of this regulation would serve as backup in the event of further legal challenge to their authority to regulate private contractors to public agencies. Staff rejected the no regulation alternative for the reasons cited above, and to provide the Board the opportunity to evaluate the proposal on its merits.

B. Allow School Bus Fleet Operators to Purchase/Lease Heavy-Duty School Buses Equipped with Engines with a Declared NOx FEL of 0.9 g/bhp-hr for Model Year 2007 through 2009

Another alternative to the staff's current proposal would be to set the BEST NOx heavy-duty engine emission level criterion for the 2007 through 2009 model years at 0.9 g/bhp-hr declared FEL, instead of 0.2 g/bhp-hr. It is possible an engine manufacturer may certify a diesel engine at the 0.9 g/bhp-hr level (25 percent below the standard required of other heavy-duty engines). It is possible, but not likely, that a NOx retrofit device could lower conventional diesel engine NOx emissions to the required standards. The 0.9 g/bhp-hr NOx BEST emission level criterion may also increase the availability of natural gas or propane engines that would be available, should diesel engines fail to meet the more stringent 0.2 g/bhp-hr NOx FEL alternative.

The staff presented this alternative at its April 7, 2005, public workshop to generate discussion amongst stakeholders and to spur the introduction of cleaner diesel technology prior to 2010. Comments presented at the workshop and thereafter through an informal comment period indicated that affected stakeholders were split on supporting the NOx FEL limit (environmental groups, the SCAQMD, alternative-fuel providers favored the lower NOx limit; school bus fleet operators favored the higher NOx limit). Since the workshop, the staff has learned that the one manufacturer of a verified diesel emission control strategy that reduces NOx emissions by 25 percent and would have allowed new diesel engines to meet the 0.9 g/bhp-hr NOx FEL does not have plans to apply for ARB verification to extend the emission control device for use on 2007 through 2009 model year engines. At this time, the staff is unaware of plans by any other manufacturer of a diesel emission control strategy to apply for verification for a device to reduce NOx emissions to the 0.9 g/bhp-hr NOx FEL.

Without a verified diesel emission control method that would allow new diesel engines to meet the 0.9 g/bhp-hr NOx FEL in the 2007 through 2009 timeframe, the only diesel engines expected to be commercially available are those that just meet mandatory emission standards. Thus this alternative is not viable. Accordingly, staff rejected this approach in favor of the more stringent NOx standard (0.2 g/bhp-hr) being targeted by several developers of alternative-fueled engines.

IX. ECONOMIC IMPACT

A. Legal Requirement

Sections 11346.3 and 11346.5 of the Government Code require state agencies proposing to adopt or amend any administrative regulation to assess the potential for adverse economic impact on California business enterprises and individuals. The assessment shall include consideration of the impact of the proposed regulation on California jobs; on business expansion, elimination, or creation; and on the ability of California businesses to compete in other states.

State agencies are also required to estimate the cost or savings to any state or local agency or school district in accordance with instructions adopted by the Department of Finance. This estimate is to include non-discretionary costs or savings to local agencies, and the costs or savings in federal funding to the state.

B. Affected Businesses

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on private businesses. The businesses directly affected by this regulatory proposal are private school bus fleets that operate within the SCAQMD and contain 15 or more buses. These fleets include one private school fleet and 12 private school bus contractor fleets. Because this regulatory proposal is structured to exempt school bus fleets from requirements if external funding is not available, the staff believes there will be no significant impact on small businesses. In addition, the proposed regulation exempts fleets with fewer than 15 buses, making it even less likely that small businesses will be impacted.

Businesses indirectly affected by the regulatory proposal are school bus manufacturers, diesel and alternative-fueled engine manufacturers, diesel retrofit manufacturers, alternative fuel providers, and alternative fuel refueling equipment manufacturers and installers.

C. Potential Impact on Businesses

This regulatory proposal requires that buses replaced or added to bus fleets operating in the SCAQMD be cleaner than required by current standards. However, a provision is included that specifies that compliance with the requirements of the proposal are contingent on the availability of grant funding or external sources of funding beyond that of the public or private school bus fleet's fiscal budget. Additionally, there are exemptions based on lack of funding for alternative fuel refueling infrastructure and maintenance facility upgrades. Consequently, the fiscal impact of the regulatory proposal on affected fleets is estimated to be minimal.

The fiscal impact on school bus fleets is primarily due to additional record keeping required to show compliance to the regulation and preparing paperwork for purchase exemption applications. The average cost per fleet has been estimated at $350 per year.

This regulatory proposal could indirectly impact the sale of school buses in SCAQMD. Sales of alternative-fueled buses may increase due to the purchase requirements of the proposal and SCAQMD's choice to fund only the purchase of new alternative-fueled buses. Additionally, these factors may impact the sales of bus manufacturers and engine manufacturers who market only diesel fueled buses and engines, possibly reducing sales. It is also possible that the lack of funding for diesel fueled buses may be a deterrent to fleet turnover in fleets with no current alternative-fueled buses and no reasonable access to refueling infrastructure. However, no evidence of an impact on fleet turnover is observable in the sales reported since the adoption of this fleet rule in 2001. However, sales data trends may be difficult to discern due to the cyclical nature and large variability in the rate of school bus sales.

Alternative fuel providers and refueling equipment manufacturers and installers may profit from increased business due to the increase in the number of alternative-fueled buses encouraged by the proposal.

The proposal option for retrofitting in-use diesel buses may increase the sales of diesel retrofit devices. As mentioned earlier in this report, approximately $25M in new funding has been earmarked through the 2005 – 2006 fiscal year state budget process to continue implementing the Lower-Emission School Bus Program. Approximately half of this funding may be available statewide for in-use diesel school bus retrofits. However, at the time the staff developed its cost and emission benefits analysis for this rulemaking, the state budget had not been finalized and approved; as such, this potential additional funding has not been factored into the ARB's analysis.

D. Potential Impact on Businesses Competitiveness

There is no expected impact on the ability of California businesses to compete in other states.

E. Potential Impact on Employment

No jobs are expected to be eliminated due to the regulatory proposal. Some jobs could potentially be created due to the regulatory proposal related to the increased use of alternative-fueled buses. This proposal could prompt the installation of new natural gas refueling facilities potentially creating jobs dealing with construction of the stations and installation of equipment. It could also potentially increase the demand for natural gas engine mechanics.

F. Potential Impact on Creation, Elimination, or Expansion

This regulatory proposal is not expected to impact the creation, elimination, or expansion of school bus fleets.

G. Potential Cost to Local and State Agencies

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on local and state agencies. The proposed requirements are not expected to result in an increase in costs for state and local agencies. Local government affected by this regulatory proposal are public school bus fleets that operate within the SCAQMD and contain 15 or more buses. There are 65 affected public school bus fleets in the SCAQMD.

Under Education Code title 1, division 1, part 10.8, section 17920 et seq., state mandated programs placed on public schools must be funded. Consequently, the incremental implementation cost for this regulatory proposal will be funded by public grants and funding sources external to the school bus fleet's fiscal budget. The sources of these funds are described in Section I.C.4. The costs that the different funds cover are discussed below. The implementation cost of this regulatory proposal is the cost differential between a standard purchase diesel bus and the purchase required by the proposal, any costs associated with providing refueling and maintenance facility upgrades required, and any increase in operating and maintenance costs for the new bus purchased. We anticipate expenditures between $5.3 and $6 million, which would only occur if external funding is available to the school bus fleet owner or operator.

1. Federal Regulations

There are no federal regulations comparable to the regulatory proposal. However, the reductions under this proposal directly help the SCAQMD to meet federal ambient air quality standards.

2. Implementation Cost

The number of buses that could be purchased from the incentive funding available was estimated in order to determine the implementation cost of the proposal. The total funding available from the incentive sources mentioned above is projected to be $11.1 million per year over the five years of the program. These funding sources are directed primarily at funding a substantial portion of the capital cost of clean bus purchases. It is estimated that between 90 and 93 new alternative-fueled buses will be funded per year based on the funds available and an estimate of the portion of the purchase price that will be funded. Section X.A presents the estimated emission benefits based associated with the purchase of these alternative-fueled buses.

The largest source of funding, the Lower Emission School Bus Program (LESB), is projected to provide approximately $9.33 million per year, based on current funding levels. These funds are only available to public school bus fleets. The LESB Program guidelines allow ten percent of the funds to be spent for alternative fuel refueling infrastructure. These guidelines cap the amount of money that the public school fleet contributes to the purchase price of the bus if they scrap a pre-1977 or pre-1987 school bus and replace it with the clean bus purchased. The public

school contribution cap is $10,000 for a pre-1977 bus scrapped and $25,000 for a pre-1987 bus scrapped. This funding source will fund approximately 65 to 68 new alternative-fueled buses per year assuming that 10 percent of the funds go towards infrastructure and the LESB Program funds the cost of the bus in excess of the public school bus fleet contribution cap.

The MSRC program, whose funds are available to both public and private fleets, is projected to provide $1.5 million per year for bus purchases. The MSRC program funds are estimated to fund approximately 25 buses based on a funding level of about $60,000 per bus.

The Clean Fuels Fund is projected to provide the remaining available funding of $325,000 per year. This funding will be used for required infrastructure upgrades to support the alternative-fueled bus purchases.

The incremental cost of this proposal was estimated based on the number of buses to be bought with expected funding and the incremental cost for each bus. $30.1 million is estimated to be the total incremental cost of the regulatory proposal over the five years that the requirements will be in effect. The sections below discuss the incremental cost estimate for new alternative-fueled buses. This cost includes all perceived cost increases due to replacing a standard diesel bus with an alternative-fueled bus.

SCAQMD has chosen to fund only the purchase of alternative-fueled buses. Consequently, no funding is currently available for either DPF retrofit of in-use diesel buses or new diesel school bus purchases. However, ARB staff prepared an implementation cost analyses for these scenarios in recognition that additional funding for these purchases could become available. Two scenarios for new diesel school bus purchases are presented in Appendix C**.** Retrofit of in-use diesel buses is discussed below.

The majority of the over 3,000 in-use diesel buses that can be retrofit with a DPF have been retrofitted. However, ARB staff estimates that approximately 1,300 of these 3,000 eligible buses have not been retrofit with a DPF. The vast majority of these remaining 1,300 buses are in private contractor fleets. The implementation cost to retrofit these remaining diesel buses is estimated to be a total of $15.6 million. This cost includes both the capital cost of the DPF as well as the maintenance cost of cleaning the DPF.

a. Cost Estimates for Heavy-Duty Alternative-Fueled Vehicles

The incremental cost for complying to the purchase requirements of this regulatory proposal are estimated to be approximately $65,000 to $66,500 per bus. These estimates considered differences in capital cost and operating and maintenance and include funds for refueling station installation and facility upgrades. These costs are summarized in Table 15 below. These costs were all calculated in 2005 dollars.

Table 15. Incremental Costs per Bus Over 25 Year Lifetime		
Model Year	***2005- 2006***	***2007-2009***
School Bus Capital Incremental Cost	$31,000	$29,300
Fueling Station Infrastructure	$13,000	$13,000
Maintenance Facility Upgrade	$4,000	$4,000
Replacement Fuel Tank	$15,000	$15,000
Operational Expenses[(a)]	$3,417	$3,417
Total	**$66,417**	**64,717**
(a) Incremental operational expenses = $0.01/mile X 13,666 miles X 25 years		

The incremental capital cost of an alternative-fueled bus was calculated to be $31,000 in 2005 and 2006 and $29,300 in 2007 through 2009. The incremental cost for an alternative-fueled bus purchase is expected to drop slightly in 2007 due to an increase in the cost of the standard diesel bus purchase. The standard purchase diesel bus capital cost, with DPF, is expected to increase by approximately $1,700 in 2007, from $113,00 to $114,700, due to technology advancements necessary to meet 2007 emission standards. The average capital cost of an alternative-fueled school bus of $144,000 was based on current costs.

The costs for refueling station installation and maintenance facility upgrade were set at the minimum required available funding amounts specified in the regulatory proposal. These values were $13,000 per bus for refueling station installation and $4,000 per bus for maintenance facility upgrade.

Natural gas fuel tanks have a life of 15 years. A school bus life of 25 years requires that the natural gas fuel tanks be replaced once during the life of the bus. The total cost of fuel tank replacement was estimated at $15,000.

Operating and maintenance costs were based on the yearly vehicle miles traveled (VMT), the school bus life, and an average increase in fuel and maintenance costs for alternative-fueled buses from a survey conducted by SCAQMD. An average of 13,666 vehicle miles traveled per year and a school bus life of 25 years were used based on data from the emissions inventory model, EMFAC 2002 V2.2, April 23, 2003. An increased operating and maintenance cost of $0.01 per mile was used to capture differences in fuel and maintenance costs as compared to operating a diesel bus. This value is the average difference for school buses less than 5 years old as reported in the school bus fleets survey conducted by SCAQMD (SCAQMD 2005). A lifetime operational cost differential of approximately $3,400 was calculated based on a $0.01/year operating cost increase combined with the average yearly VMT and a 25 year life.

b. Cost Estimates for Capital and Operating Costs of Medium-Duty School Buses

Although school districts are not mandated to provide general student transportation, they are mandated to provide transportation for special needs

students. It is this sector where medium-duty school buses are chiefly utilized. Often these buses are equipped with wheelchair accommodations and other special equipment. To deal with the increasing demand for special needs transportation, and provide transportation flexibility, some school districts are purchasing more larger medium-duty (30-35 passenger) school buses when they replace smaller (10-24 passenger) buses. These buses are configured in such a way that they can accommodate several wheelchairs or can be equipped with all ambulatory seating. These larger medium-duty buses are all diesel, heavy-duty vehicles, with a life expectancy of 15 years.

Capital Cost of Medium-Duty Buses

The current cost of a smaller (10-24 passenger) medium-duty gasoline cutaway school bus is about $50,000. A diesel version would be about $3,000 more. These smaller medium-duty buses have a 10-12 year life, whether they are diesel or gasoline. Although a diesel engine may not be at its useful life in ten years, the relatively light-duty cutaway chassis will reach its useful life in this timeframe. Typically, the old bus is used as a trade-in, with little value. Prior to Rule 1195 implementation, youth groups or churches often purchased these old buses. Since rule implementation, these old buses are sold out-of-state and in Mexico.

Larger (30-35 passenger) medium-duty school buses are diesel-fueled, on a heavier chassis with an approximate 15 year-life. The capital cost of a larger medium-duty diesel bus is about $75,000-$80,000. There are currently no gasoline or natural gas versions of a 30-35 passenger medium-duty school bus.

Operational Costs of Medium-Duty Buses

The assertion has been made that the cost of operation of gasoline school buses is higher than that of diesel buses. Although this assertion may have been true several years ago, it is not the case with current engines. Gasoline engines are completely computerized and the first tune-up is typically at 100,000+ miles. The difference in the cost of maintenance between current models of gasoline and diesel engines is negligible.

Miles-per-gallon is often cited as a cost factor between diesel and gasoline buses. New, gasoline smaller medium-duty school buses achieve 12-13 miles per gallon, versus 13-14 miles per gallon for a comparable diesel engine. If the average medium-duty school bus travels about 14,000 miles a year, a gasoline school bus would consume approximately 1,077 gallons of gasoline in a year and a diesel school bus would consume approximately 1,000 gallons of diesel fuel. The rack price of gasoline in April 2004 was $1.40 and the price of diesel was $1.10. The rack price is used for ease in comparison of fuel costs, and does not include any taxes. The annual fuel cost would be $1,508 for gasoline and $1,100 for diesel. In April 2005 the rack price of gasoline was $1.82 and the rack price of diesel was $1.75, making the annual fuel cost $1,960, gasoline, and $1,750, diesel. This is a $200-400/year difference in annual fuel costs between gasoline and diesel. However, with a lower capital cost of about $3,000 for gasoline smaller medium-

duty buses, the combined capital and operational costs of gasoline buses is about the same as their diesel counterparts.

Longevity of a diesel vs. gasoline school bus has been brought up as another cost issue. As stated previously, the useful life of a smaller medium-duty school bus, whether it is gasoline or diesel, is considered to be ten years. The useful life of a larger medium-duty diesel school bus is 15 years. There is no gasoline engine available for this size bus.

There are some natural gas smaller medium-duty buses in operation, although there is not currently an engine and chassis available for sale for natural gas operation. There should be no maintenance issues between gasoline smaller medium-duty buses and their natural gas counterparts.

Because of the low volume of natural gas school buses produced, parts have been relatively expensive. John Deere, a major natural gas engine manufacturer for the heavy-duty school bus market, has recognized this issue and is taking steps to ensure that parts will be more cost competitive in the future.

c. Cost Estimates for In-Use Diesel Retrofits

The cost for a DPF retrofit of an in-use diesel vehicle is placed at $12,000. This value was based on an $8,000 cost for the DPF and an additional $4,000 for providing for cleaning and baking the DPF as required for maintenance.

d. Costs to Individuals

The incremental cost for these clean bus purchases are being paid by a variety of funds described in Section I.C.4. The citizens of SCAQMD are paying these costs, primarily through DMV fees. The cost per individual can be based on the estimated implementation cost ($30.1 million for the 5 year program) and the population of SCAQMD (15.7 million). This cost is approximately $0.38 per individual per year.

X. ENVIRONMENTAL IMPACTS AND COST EFFECTIVENESS

A. Benefits within the South Coast Air Basin

Staff's estimates of the environmental effects of the proposal are summarized in the following sections. A full description of the factors that were used to determine the cost effectiveness of the proposed regulation is provided in Appendix C. To calculate cost effectiveness, both the emission benefit from the proposal and the incremental cost of the proposal must be considered.

1. Emission Reductions From New Heavy-Duty School Bus Purchases

Staff's estimates of this proposal's emission benefits from heavy-duty school bus purchases are shown in Table 16. The staff's emission reduction estimate is based on available external funding to purchase approximately 92 new heavy-duty school buses per year.

Table 16. Emission Benefits in 2010 from Regulatory Proposal: Heavy-Duty School Bus Purchases		
Year	**PM Reductions (TPY)**	**NOx Reductions (TPY)**
2005 - 2009	0.5	14

The regulatory proposal addresses model year purchases for 2005 through 2009. Similar to Rule 1195, the regulatory proposal would not provide PM emission benefits for new bus purchases for model years 2007 through 2009. However, the regulatory proposal's BEST standards include a NOx FEL requirement that is more stringent than the nominal standard that diesel engine manufacturers will certify to in the 2007 through 2009 timeframe and so provides a NOx benefit for new heavy-duty school bus purchases during this timeframe.

Based on available identified external funding, most of the estimated emission benefits from new heavy-duty school bus purchases would still occur in the absence of this proposed regulation. However, additional PM benefits could be achieved through the proposal's requirements for retrofits on in-use vehicles now that approximately $12.5 million has been earmarked in the 2005 – 2006 state budget to retrofit in-use diesel school buses throughout the state.

2. Emission Reductions From New Medium-Duty Bus Purchases

The proposed regulation requires that medium-duty school buses be replaced with non-diesel buses certified as ULEV. Based on actual medium-duty school bus purchases within the District between 2002 and 2004, about 70 new medium-duty school buses are purchased annually. If the replacement buses are gasoline-fueled and simply meet the emission standards, emission benefits will be small. If natural gas-fueled buses are available, there may be additional benefits. However, the availability of natural gas engines for medium-duty school buses is uncertain, as discussed previously in this report. The natural gas engine currently available for smaller medium-duty buses is no longer being produced, and all of the larger medium-duty buses available are diesel-fueled.

The SCAQMD staff estimated the maximum emission reductions to date from medium-duty school bus purchases to be about 12 tons per year NOx and 0.5 tons per year PM. Based on the uncertainty of natural gas engine availability, the future emission benefits from the medium-duty school bus requirements in this proposal could range from zero to 12 tons per year NOx and from zero to 0.5 tons per year PM from 2005 through 2009. The staff expects the benefits to be near the lower end of this range due to the current unavailability of natural gas engines in the medium-duty school bus market.

Though the NOx emission reductions for model years 2005 through 2009 are estimated to be small, there would still be a PM and HC benefit from the replacement of diesel-fueled buses with gasoline-fueled or natural gas-fueled buses. The discussion in Section IX.G.2 illustrates that there is little if any real additional cost to a school district for the purchase and operation of gasoline versus diesel medium-duty school buses. Therefore, the proposed regulation requires the use of gasoline-fueled and alternative-fueled medium-duty school buses where feasible and provided they are available.

3. Emission Reductions From In-Use Diesel Bus Retrofits

DPF retrofit of in-use diesel buses would provide additional emission benefits. As mentioned previously, approximately $25M in new funding has been earmarked through the 2005 – 2006 fiscal year state budget process to continue implementing the Lower-Emission School Bus Program. Approximately half of this funding may be available statewide for in-use diesel school bus retrofits. However, at the time the staff developed its emission benefits analysis for this rulemaking, the state budget had not been finalized and approved; as such, the portion of this additional funding that is available to the South Coast region has not been factored into the ARB's analysis.

However, ARB staff has estimated the emission benefit possible from a DPF retrofit scenario in recognition that additional funding for this purpose could become available. ARB staff estimates that there are approximately 1,300 buses that are eligible for DPF retrofit which have not yet been retrofitted. DPF retrofit of these 1,300 buses would provide an additional emission benefit of approximately 3.4 TPY of PM and 5.3 TPY of non-methane hydrocarbons in 2010.

4. Benefits of the Proposal

The regulatory proposal would reduce approximately 346 tons of NOx by 2033, the end of the 25 year life of the last school buses with reduced NOx emissions purchased in 2009. Approximately 13 tons of PM would be reduced by 2030, the end of the 25 year life of the last school buses with reduced PM emissions purchased in 2006.

B. Cost-Effectiveness of Proposed Regulation

For the Scenario One analysis it was assumed that 92 CNG school buses would be funded each year starting in 2005 and going through 2009. The emission benefits and costs that were associated with these school buses were then determined.

The cost effectiveness calculated for Scenario One was determined to be $60,000 per ton of NOx reduced and $405,000 per ton of PM reduced.

For the Scenario Two analyses it was assumed that 325 in-use school buses could be retrofitted with DPFs every year for four years starting in 2006. It was assumed that the DPF would have a lifetime of 11 years. Since the majority of the public school bus fleet has already been retrofitted with diesel particulate filters, it was assumed that the remaining school buses in the air district eligible for retrofits with DPFs would be those school buses operated by private bus contractors providing services to the public schools.

The cost effectiveness calculated for Scenario Two was determined to be $380,000 per ton of PM reduced.

C. Potential Negative Impacts

1. Creation of Nitrogen Dioxide by Passive Catalyzed Diesel Particulate Filters

Passive catalyzed diesel particulate filters use the heat in the engine exhaust, with the assistance of a catalyst, to burn off particulate matter collected in the filter. Most passive filters use platinum group metal catalysts to oxidize NO in the exhaust gas to NO_2, which burns particulate matter captured in the filter. Nitrogen dioxide can burn diesel particulate matter at higher rates, and at lower temperatures, than oxygen, increasing the rate of filter regeneration.

The platinum group catalyst in a passive filter can significantly increase the fraction of NO_2 in the exhaust. Typical engine out NOx emissions are composed of 5 to 15 percent NO_2. The filter catalyst can increase the NO_2 fraction to more than 50 percent of the total NOx in the exhaust (Dieselnet 2004). In principal, NO_2 is reduced to NO and N_2 in the process of burning the PM. However, filter regeneration rates are higher if there is excess NO_2 so, in practice, the amount of NO_2 in the exhaust may be significantly increased. Measurements of NOx emissions (NO and NO2) from heavy-duty diesel vehicles equipped with passive catalyzed filters have shown an increase in the NO_2 fraction, though total NOx emissions remain approximately the same.

Increased levels of exhaust NO_2 are a concern due to its high toxicity. NO_2 acts mainly as an irritant affecting the mucous membranes of the eyes, nose, throat, and respiratory tract. Extremely high-dose exposure (as in a building fire) to NO_2 may result in pulmonary edema and diffuse lung injury. Continued exposure to high NO_2 levels can contribute to the development of acute or chronic bronchitis. Low level NO_2 exposure may cause increased bronchial reactivity in some asthmatics, decreased lung function in patients with chronic obstructive pulmonary disease and increased risk of respiratory infections, especially in young children (U.S EPA Indoor Air Quality website).

Atmospheric modeling results suggest that an increase in engine out NO_2 emissions could have a negative air quality impact on the ambient ozone, nitric acid, and NO_2 levels. However, the analysis showed that the disbenefit of a

modest increase in engine out NO_2 emissions is offset by the reductions in PM and NMHC emissions achieved by the catalyzed diesel particulate filter (ARB 2002). Consequently, a maximum allowable NO_2 increase has been set by the ARB verification procedure for in-use strategies to control diesel engine emissions.

The ARB verification procedure for in-use strategies to control diesel engine emissions specifies that post-control NO_2 emission must not exceed 20 percent of the total baseline (pre-control) NOx emissions beginning January 1, 2007. However, prior to 2007, there are no requirements on the increase of NO_2 emission for in-use strategies in California.

2. Toxics from Diesel-Fueled and Alternative-Fueled Engines

Historically diesel engines were perceived as having higher PM emissions and other deleterious compounds known to have adverse health effects than similar natural gas engines. Natural gas engines were typically thought of as “low emission”, as emitting less PM and NOx, than their diesel counterparts (Ahlvik et al 2000; Clark et al 1995; Clark et al 1999; Ayala et al 2002). However, with the advent of aftertreatment technologies such as diesel oxidation catalysts and diesel particulate filters, and the fact that vehicle exhaust is a complex composition of many compounds, not just PM and NOx, the assumption that natural gas engines are inherently less polluting than diesel equipped with aftertreatment was called into question.

To this end, the ARB led a multi-agency research effort to compare emissions from diesel and natural gas urban bus engines. The study evaluated natural gas and diesel urban bus engines with and without exhaust aftertreatment. Summarized in Table 17 is a comparison of emissions based on this study, applied to school bus engines and the emission standards they must meet. As shown in the table, the comparison of emissions varies by year depending on the applicable emission standards (that diesel engines typically meet with a small margin of safety) and the actual emission levels of natural gas engines

For NOx, natural gas engines remain cleaner through 2009 (assuming a 0.2 g/bhp-hr natural gas engine usable in school buses is certified in 2007). In 2010 and beyond, NOx emissions of diesel and natural gas engines are expected to be the same. Natural gas engines currently emit less PM and toxics than a diesel engine, but beginning in 2007, the emissions will be the same because all diesel engines will use a particulate filter that reduces both PM and toxics greatly.

Table 17. Emission Comparison: Diesel Truck Engine vs. Natural Gas Truck Engine					
Model Year Truck	**Truck Emission Standards (g/bhp-hr)**		**Natural Gas, Compared to Diesel, Is Typically:**		
	NOx	**PM**	**NOx**	**PM**	**Other Toxics**
Mid-1990s to 2002 (diesel w/o filter and NG w/o catalyst)	4	0.1	50% cleaner	60% cleaner	Varies
Today (2003 - 2006) (diesel w/o filter and NG w/ catalyst	~2.2	0.1	25% cleaner	80% cleaner	Less
2007 (diesel w/ filter and NG w/ catalyst	1.2	0.01	80% cleaner[1]	Same	Same
2010 (diesel w/ filter + absorber and NG w/ 3-way catalyst	0.2	0.01	Same	Same	Same

(1) Several natural gas engines that may have application to school buses are expected to comply with the 2010 0.2 g/bhp-hr NOx standard by 2007, in which case they would be about 80% cleaner. For other natural gas engines the NOx emissions will likely be the same as diesel.

3. Ammonia Slip from Selective Catalytic Reduction

A potential environmental issue is the emissions of ammonia from selective catalytic reduction systems that may be used as retrofits or as part of new engine technology to meet BEST levels. A selective catalytic reduction system injects ammonia or urea into the exhaust gas stream to react with NOx in the presence of a catalyst. Such systems, if not carefully designed or calibrated could potentially release excess ammonia into the atmosphere. In general, the possibility of ammonia slip increases with the desired NOx reduction, as more ammonia must be used to reduce more NOx. However, given the relatively modest percentage reductions expected (80 percent reduction to reduce a 1.2 g/bhp-hr engine to 0.2 g/bhp-hr), highly aggressive SCR systems will likely not be necessary.

Furthermore, careful calibration and use of a clean-up oxidation catalyst can virtually eliminate ammonia slip. To ensure that ammonia emissions do not become a problem, the diesel emission control system verification procedure on requires that ammonia slip not exceed 25 parts per million on average. Although there are no SCR systems currently verified for on-road use, there is one verified

for off-road use. Several companies have expressed interest in verifying SCR systems for on-road use in the near future.

4. Ash Management

Diesel particulate filter technology may generate a new hazardous waste stream. The carbonaceous component of the PM captured by the filter is burned off when the filter regenerates. Any inorganic components left behind after regeneration as ash in the filter must eventually be cleaned from the filter. Based on preliminary data from two samples, the ash may be classified as hazardous waste because of its zinc content.

Ash collected from a diesel engine using a typical lubrication oil and no fuel additives has been analyzed and is primarily composed of oxides of the following elements: calcium, zinc, phosphorus, silicon, sulfur, and iron. Zinc is the element of primary concern because, if present in high enough concentration, it can make a waste a hazardous waste. Title 22, CCR, section 66261.24 establishes two limits for zinc in a waste: 250 milligrams per liter for the Soluble Threshold Limit Concentration and 5,000 milligrams per kilogram for the Total Threshold Limit Concentration. The presence of zinc at or above these levels would cause a sample of ash to be characterized as a hazardous waste.

Under California law, it is the generator's responsibility to determine whether their waste is hazardous or not. Applicable hazardous waste laws are found in the Health and Safety Code, division 20; title 22, CCR, division 4.5; and title 40 of the Code of Federal Regulations. Staff recommends owners who install a diesel particulate filter on a vehicle contact both the manufacturer of the DECS and the California Department of Toxic Substances Control (DTSC) for advice on waste management.

ARB staff has consulted with personnel of the DTSC regarding management of the ash from diesel particulate filters. DTSC personnel have advised ARB that it has a list of facilities that accept waste from businesses that qualify as a conditionally exempt small quantity generator. Such a business can dispose of a specific quantify of hazardous waste at certain Household Hazardous Waste events, usually for a small fee. An owner who does not know whether or not he qualifies or who needs specific information regarding the identification and acceptable disposal methods for this waste should contact the California DTSC. Information can be obtained from local duty officers and from the website: http://www.dtsc.ca.gov.

XI. ISSUES

A. School Transportation Funding and School Bus Ridership

One issue raised by multiple school districts is inadequate transportation funding, and the corresponding decline in school bus ridership. School funding advocates blame, in part, Proposition 13, which was passed in 1978. Proposition 13 reduced property taxes by about 57 percent, and made new state and local taxes difficult to

pass (California Educator 2005). In contrast, Proposition 98, passed in 1988, guarantees that schools and community colleges receive a minimum amount (about 40 percent) of revenue from state taxes and local property taxes (California Educator 2005).

Today, education represents 54 percent of the state's general fund, or about $45 billion (FACSNET 2005). Nonetheless, state reimbursement for school bus transportation (as a percentage) has decreased since the late 1970s (Surface Transportation Policy Project et.al. 2003). The state provides transportation funding at an average rate of 46 percent of the total cost of pupil transportation services (with a range from zero to 100 percent for some schools) (CSPTA 2004).

Funding for school transportation services comes from school district general funds. There are insufficient special state or local funding sources designated for this non-mandated service. School transportation must compete for both capital and operating funds with mandated school district responsibilities, and the need for funding to go directly to support classroom needs. School transportation officials cope with this lack of funding in various ways. Many school districts have increased the distance criteria for providing home to school transportation services to students so that fewer buses are needed. Because general home to school transportation is not state-mandated, some school districts do not provide transportation themselves but rely on public transportation or parent-provided transportation. One choice school districts make is to keep existing buses operating as long as possible to avoid the capital expenditure of purchasing new school buses. Because of state school funding issues in the last two years, school districts often opt to continue operation of these buses rather than purchase new buses. The result is an aging fleet of buses. Because of the low annual mileage of school buses, the buses continue to operate reliably and have relatively few maintenance issues. However, these older buses have very high emissions.

As previously mentioned, school districts are not required to provide free bus service. An exception to this is transportation of special needs children (Surface Transportation Policy Project et.al. 2003). Faced with tight budgets, some school districts are reducing the amount of school transportation they provide. Thus, the percentage of school children riding school buses is on the decline. In fact, California is almost last in the percent of students riding the bus – scoring only behind Minnesota, Hawaii, and the District of Columbia (School Transportation News Buyer's Guide 2005). As shown in Table 18, less than 16 percent of enrolled kindergarten through twelfth grade (K-12) students ride the school bus.

While ARB staff acknowledges that transportation funding is tight and that school bus ridership has declined, that is true across the state, not just in the South Coast. The pertinent issue is how this proposed rulemaking impacts transportation costs. The proposed rulemaking is structured such that purchases are required only if funding is available. The proposed rulemaking restores some of the exemptions that had sunset under the SCAQMD rule. For these reasons, ARB staff believes

the proposed rule would have a neutral or positive effect on school districts' transportation costs. A separate argument is that available funds would go farther and would replace more school buses if the purchase of less expensive diesel buses was allowed. Staff acknowledges this point. However air quality incentive funds are tied to measureable improvements in air quality, which can only be obtained by going beyond conventional technology to the most advanced (or BEST) technology available.

Table 18. School Bus Ridership By State

State	Enrollment	Transported	Buses	% Student Ridership
Alabama	732,462	366,297	8,291	50.0
Alaska	137,000	43,300	1,020	31.6
Arizona	1,008,418	320,318	6,045	31.8
Arkansas	443,536	321,860	5,357	72.6
California	**6,244,408**	**992,649**	**26,171**	**15.9**
Colorado	757,668	294,931	6,550	38.9
Connecticut	625,645	480,300	6,000	76.8
Delaware	145,752	105,603	1,684	72.5
District of Columbia	78,842	3,856	692	**4.9**
Florida	2,591,033	1,025,921	20,344	39.6
Georgia	1,522,720	1,218,879	17,194	80.0
Hawaii	176,000	24,000	900	**13.6**
Idaho	254,037	111,824	2,638	44.0
Illinois	2,020,939	1,031,065	16,000	51.0
Indiana	1,080,668	752,004	12,736	69.6
Iowa	526,614	257,546	5,200	48.9
Kansas	498,505	200,294	5,581	40.2
Kentucky	650,000	459,628	9,650	70.7
Louisiana	835,799	495,933	8,067	59.3
Maine	221,195	180,240	2,764	81.5
Maryland	866,743	605,154	6,783	69.8
Massachusetts	957,926	631,272	8,500	65.9
Michigan	1,891,969	823,281	17,213	43.5
Minnesota	934,832	18,087	10,292	**1.9**
Mississippi	491,623	430,779	6,954	87.6
Missouri	893,146	555,283	11,311	62.2
Montana	148,801	64,478	2,535	43.3
Nebraska	316,315	72,400	2,500	22.9
Nevada	381,045	182,328	2,083	47.8
New Hampshire	230,887	151,600	2,726	65.7
New Jersey	1,579,461	567,346	21,781	35.9
New Mexico	352,208	168,878	2,390	47.9

Table 18. School Bus Ridership By State

State	Enrollment	Transported	Buses	% Student Ridership
New York	3,355,500	2,598,035	47,742	77.4
North Carolina	1,347,247	719,600	13,374	53.4
North Dakota	101,137	43,249	2,355	42.8
Ohio	2,045,252	1,280,067	18,297	62.6
Oklahoma	590,711	345,042	7,257	58.4
Oregon	551,368	272,761	6,321	49.5
Pennsylvania	2,129,792	1,538,799	28,353	72.3
Rhode Island	180,000	92,000	1,480	51.1
South Carolina	723,147	365,162	6,631	50.5
South Dakota	95,440	44,595	1,650	46.7
Tennessee	528,802	465,419	8,106	88.0
Texas	4,255,821	1,477,444	35,082	34.7
Utah	490,191	165,280	2,329	33.7
Vermont	104,600	102,000	1,300	97.5
Virginia	1,176,557	917,711	12,200	78.0
Washington	1,008,487	484,606	9,316	48.1
West Virginia	299,516	220,325	2,966	73.6
Wisconsin	868,867	590,000	10,000	67.9
Wyoming	86,117	32,390	1,424	37.6
TOTALS	49,584,319	25,515,357	482,357	51.5

2005 School Transportation News Buyer's Guide, National Association of State Directors of Pupil Transportation Services, 2005.

Data for most states is from the 2003-04 school year, but for some, including California, data is for the 2002-03 school year, and a few states have 2001-02 data.

B. Funding Split between Alternative-Fuel and Lower-Emitting Diesel Purchases

With the adoption of the Lower-Emission School Bus Program Guidelines (Guidelines) in December 2000, the Board designated two-thirds of the new bus purchase funding for alternative-fuel school buses and one third of the funding for diesel school buses equipped with particulate filters and operating on ultra low sulfur diesel fuel. The Board's intent was for this policy to be implemented on a regional basis; therefore, air districts with distinct funding allocations were required to award funds consistent with the designated funding split, to the extent possible. This policy was practical to implement during the first two years of the Lower-Emission School Bus Program (the 2000-2001 and 2001-2002 fiscal years) when it

was significantly funded through the state budget process. While funding was provided for the program for the next two fiscal years through Proposition 40 (the voter-approved initiative to conserve natural resources) and Assembly Bill 425 (Statutes of 2002, Chapter 379), the total amount was significantly reduced, which made it impractical to maintain the funding split on a regional basis.

With the program's guideline revision in May 2003, the Board modified its policy to maintain the funding split between alternative-fuel and diesel purchases as a statewide goal, rather than a region-specific mandate. At that time, the SCAQMD opted to target its funding allocation entirely to alternative-fuel purchases as a way to introduce the lowest-emitting technologies into the region. As a result, some school districts within the jurisdiction of the SCAQMD have argued that the district's alternative-fuel only funding policy is not consistent with the goals of the ARB's Guidelines. It is the ARB staff's belief that the existing Guidelines are not intended to restrict the SCAQMD's ability to fund only alternative-fuel school bus purchases. Therefore, in conjunction with presenting this regulatory proposal to the Board, the staff will recommend to the Board that it clarify its funding policy to explicitly provide the SCAQMD the flexibility and authority to target funds subject to requirements of the Guidelines (e.g., AB 923 funds) solely on alternative-fuel purchases. In practice, this means that the SCAQMD is expected to allocate slightly over $9 million per year from its AB 923 funds to new, alternative-fuel school bus purchases and associated refueling infrastructure.

C. Federal Clean Air Act Waiver of Preemption Challenges

Some workshop commenters challenged California's authority to adopt and enforce fleet regulations in SCAQMD based on federal statutory preemption. Federal Clean Air Act section 209(a) preempts states and localities from adopting or enforcing any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines. Notwithstanding this general preemption of state authority for new engines and new vehicles, CAA section 209(b) expressly authorizes U.S. EPA's Administrator to waive the preemption for California.

One challenge is based on the view that ARB will not be able to obtain a waiver of preemption for state standards under CAA section 209(b) because the Board's regulations are subject to the requirements of CAA section 202(a)(3)(C). Section 202(a)(3)(C) requires that in adopting standards, U.S. EPA's Administrator is to provide specified periods of lead-time and stability to classes or categories of new heavy-duty vehicles or engines. As the text of the provision itself dictates, the provision is not applicable to California:

> Any *standard promulgated or revised under this paragraph* and applicable to classes or categories of heavy-duty vehicles or engines shall apply for a period of no less than 3 model years beginning no earlier than the model year commencing 4 years after such revised standard is promulgated. [Italics added for emphasis.]

The text states that "standards promulgated or revised under this paragraph," that is, under CAA section 202(a), must provide the specified lead-time and stability. In the person of the Administrator, U.S. EPA prescribes standards under 202(a). Clearly the provisions apply to U.S. EPA.

California, however, does not promulgate its standards under the grant of authority in section 202(a). California promulgates vehicular emission standards under grants of authority in state law[1] and under the waiver of federal preemption of state standards contained in CAA section 209(b). Since section 202(a)(3)(C) is only applicable to standards promulgated under section 202(a) and since California does not promulgate its standards under 202(a), the provision does not apply to California. And, if the provision does not apply, its specified lead-time and stability requirements do not apply to California.

The inapplicability of CAA section 202(a)(3)(C) to the standards that California promulgates is also consistent with the legislative history of the CAA and the waiver of federal preemption. The legislative history of the waiver provision has emphasized that California is to have "the broadest possible discretion in selecting the best means to protect the health of its citizens." H.R.REP No. 95-294, at 302-02, quoted in Motor and Equipment Manufacturers Association, Inc. v. Environmental Protection Agency.[2] Other courts have also frequently noted that Congress consciously chose to permit California to blaze its own trail.[3]

A second challenge is based on the view that U.S. EPA will need to grant waivers of preemption under CAA section 209(b) prior to the enforcement of any aspect of the proposals. ARB already has waivers of preemption for all of the types of emissions and categories of new engines and new vehicles to which the proposed regulations would apply. For this reason, any new waiver would be needed only for those aspects of the regulations for which California has never before been granted a waiver of preemption. For any aspect of the regulations for which waivers have already been granted, ARB's practice has been to request confirmation that the regulations are within the scope of the previous waivers and to pursue enforcement against new engines and vehicles already covered by the waiver of preemption. For those aspects of the proposal that apply to in-use engines and vehicles, no waiver of preemption is needed since the preemption applies only to new vehicles and new vehicle engines.

---

[1] California Health & Safety Code Division 26.

[2] 627 F.2d 1095, at 1110 (D.C.Cir. 1979).

[3] Ford Motor Co. v. EPA, 606 F.2d 1293, at 1297 (D.C.Cir. 1979); Engine Manufacturers Association v. U.S. EPA, 88 F.3d 1075, at 1080 (D.C.Cir. 1996), Motor and Equipment Manufacturers Association, Inc. v. Nichols, 142 F.3d 449, at 463 (D.C.Cir. 1998).

D. Waiver Process Will Delay Regulation Implementation

When the U.S. Supreme Court ruled that a purchase requirement is, in fact, an emission standard under the federal Clean Air Act, implementation of the District rule required a waiver of federal preemption. The ARB determined that only the state can request a waiver of federal preemption, and that the rule subject to the request must be adopted by the state. This is the principle reason for this proposal being brought before ARB for consideration.

Stakeholders have pointed out that it can take several years following Board adoption before a waiver is received from U.S. EPA. This does not usually create a problem because most requests for a waiver involve a regulation that includes lead time to develop new knowledge and will be implemented in three to four years. In the case of this proposed regulation, the emission benefits of the regulation accrue only from now until the end of 2009. If the waiver process takes several years, much of the emission benefit of the regulation will be lost.

The ARB staff believes the rule qualifies as "within the scope" of a previous waiver. In such instances, ARB can implement the rule immediately. However, the Engine Manufacturers Association disagrees with the staff's position, and may challenge our waiver request. Discussions with U.S. EPA also have not resulted in a definitive picture of how it will approach ARB's waiver request. Thus, there is uncertainty regarding when the regulation, if adopted, can be implemented. Any substantial delay will reduce the emission reductions achieved.

XII. SUMMARY AND STAFF RECOMMENDATION

Board adoption of the new sections 2024 and 2024.1, title 13, California Code of Regulations, as set forth in the proposed Regulation Order in Appendix A, would enact in state regulation a fleet rule affecting school bus operators in the South Coast Air Quality Management District. Based on the May 2005 lower court ruling, the SCAQMD has the authority to regulate the approximately 3800 buses in public school fleets with 15 or more buses. Staff understands that the SCAQMD also intends to begin again enforcing its rule on private contractors to public schools in the near future.

Adoption of this regulation would enable the SCAQMD to regulate the 21 school buses owned by the one private school with more than 15 buses. Adoption of this regulation would also serve as backup in the event of further legal challenge to the SCAQMD’s authority to regulate private contractors to public agencies. Staff rejected the no regulation alternative for the reasons cited above, and to provide the Board the opportunity to evaluate the proposal on its merits.

As stated previously, based on the identified funding available for new bus purchases, the staff estimates that the proposal would result in a 0.04 ton per day NOx reduction and a 0.001 ton per day PM reduction in the SCAQMD in 2010.

The staff estimates the total incremental cost for implementation of the new bus purchase requirements of the proposal at $30.1 million for 2005 through 2009. If costs are split between NOx and PM reductions, the cost effectiveness is approximately $60,000 per ton of NOx and $405,000 per ton of PM reduced. The cost effectiveness of this rule is less favorable compared to cost effectiveness values for other NOx and PM control measures that have been recently approved by the Board.

XIII. REFERENCES

A Public Participation Guide to Air Quality Decision Making in California. Air Resources Board, Available at: http://www.arb.ca.gov/ch/public_participation_guide.pdf

Ahlvik and Brandberg 2000. Ahlvik, P.J.E., Brandberg, A.R.L., "Relative Impact on Environment and Health from the Introduction of Low Emission City Buses in Sweden," SAE Tech. Paper 2000-01-1882, 2000.

ARB 2001. Air Resources Board, Policies and Actions for Environmental Justice, approved on December 13, 2001. Available at: http://www.arb.ca.gov/ch/ejpolicies_121301.pdf

ARB 2002. Air Resources Board, Briefing Paper on Interim Results and Tentative Conclusions For ARB's Study of Emissions from "Late-model" Diesel and CNG Heavy-duty Transit Buses", April 2002

ARB 2005. Air Resources Board, Review of the California Ambient Air Quality Standar For Ozone, California Environmental Protection Agency, Vol I, March 11, 2005.

ARB and CEC 2003. Air Resources Board and California Energy Commission, Reducing California's Petroleum Dependence, Final Adopted Report, August, 2003. Available at:: http://www.energy.ca.gov/reports/2003-08-14_600-03-005.PDF

ARB and OEHHA 1998. Air Resources Board and Office of Environmental Health Hazard Assessment, Executive Summary for the "Proposed Identification of Diese Exhaust as a Toxic Air Contaminant", April 22, 1998. Available at: http://www.arb.ca.gov/toxics/dieseltac/finexsum.pdf

Ayala et.al. 2002. Ayala, A., N.Y. Kado, R.A. Okamoto, B.A. Holmen, P.A. Kuzmicky, R. Kobayashi, and K.E. Stiglitz, "Diesel and CNG Heavy-duty Transit Bus Emissions over Multiple Driving Schedules: Regulated Pollutants and Project Overview," Journal of Lubricants and Fuels, 2002, SAE Transactions, Vol. 111, pp 735-747 (Also SAE Tech. Paper 2002-01-1722)

California Educator 2005. California Educator, excerpted from "California's school funding went from first . . . to among the worst. What went wrong?" February 2005, which attributes the information to Education Week, and notes that it is based on the regional cost of living.

CEC 1995. California Energy Commission Resource Guide, Publication Number P500-95-004, June 1995 California Energy Commission Publications Unit, 1516 Ninth Street, MS-13, Sacramento, CA 95814

Clark et.al. 1995. Clark, N. N., Gadapati, C. J., Kelly, K., White, C. L., Lyons, D. W., Wang, W., Gautam, M., and Bata, R., "Comparative Emissions from Natural Gas and Diesel Buses," SAE Tech. Paper 952746, 1995.

Clark et.al. 1999. Clark, N. N., M. Gautam, B. L. Rapp, D. W. Lyons, M. S. Graboski, R. L. McCormick, T. L. Alleman, and P. Norton, “Diesel and CNG Transit Bus Emissions Characterization By Two Chassis Dynamometer Laboratories: Results and Issues,” SAE Tech. Paper 1999-01-1469, 1999.

CSPTA 2004. California State Parent Teacher Association resolution on “School transportation: equitable and adequate funding” adopted May 2004.

Dieselnet 2004. http://www.dieselnet.com/tech/dpf_regen.html , “Diesel Filter Regeneration”, Revision 2004.11a

FACSNET 2005. Foundation for American Communications, a nonprofit educational organization, from on-line article “Sorting through the blame game in the California state budget crisis” posted on May 16, 2005.

Hansen 2004. Dr. James Hansen, “Defusing the Global Warming Time Bomb.” Sci. Amer. 290, no. 3, 68-77, 2004. Available at: http://pubs.giss.nasa.gov/docs/2004/2004_Hansen1.pdf

SCAQMD 2001a. Rule 1195 Staff Report, Proposed Rule 1195—Clean On Road School Buses. Author: Ali R. Ghasemi, SCAQMD, April 2001

SCAQMD 2001b. Board meeting document: Agenda Number 37, Adopt Proposed Rule 1195 – Clean On-Road School Buses, 20 April 2001

SCAQMD 2005. Draft White Paper: Results of School Bus and Infrastructure Survey, January 2005. Author: Von Loveland

School Transportation News Buyer's Guide 2005. School Transportation News Buyer's Guide, National Association of State Directors of Pupil Transportation Services, 2005. Available at: http://www.stnonline.com/stn/data_statistics/2003-04_schoolyear.htm

Surface Transportation Policy Project et.al. 2003. Surface Transportation Policy Project, the Transportation and Land Use Coalition, and the Latino Issues Forum, from “Can’t get there from here: the declining mobility of California’s children and youth” September, 2003.

U.S. EPA Indoor Air Quality website. Sources of Indoor Air Pollution – Nitrogen Dioxide (NO2), htttp://www.epa.gov/iaq/no2.html

U.S. EPA 2004. U.S. Environmental Protection Agency. Highway Diesel Progress Review Report 2 (EPA420-S-04-001). March 2004. Available at: http://www.epa.gov/otaq/regs/hd2007/420s04001.pdf

XIV. AVAILABILITY OF TECHNICAL SUPPORT DOCUMENT

An electronic version of the technical support document for the proposal is available at http://www.arb.ca.gov/regact/scschl05/scschl05.htm. If you would like a hard copy of this document, please fill out this form and mail or fax it to:

Public Information Office
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812
Fax: (916) 445-5025

Please mail the **TECHNICAL SUPPORT DOCUMENT: PROPOSED REGULATION FOR THE PROPOSED SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FLEET RULES** to:

Name:_____

Address:_____

_____

_____