Appendix K

School Bus Cost Methodology

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This appendix describes the methodology and staff assumptions made when determining the associated costs to both public and private school bus fleets for compliance with the proposed regulation. The regulatory cost of the proposed regulation on school bus fleets was estimated to be $69 million, with $27 million in costs attributed to the public school bus fleet and $42 million in regulatory costs to be incurred by the private school bus fleets, based on the cost value of money analysis in 2008 dollars. The capitol costs associated with the proposed regulation on school bus fleets is estimated at $190 million, with $119 million being associated with public school bus fleet compliance and $72 million in capitol outlays for the private school bus fleet.

A. Methodology

Costs of regulatory compliance are divided between publically owned fleets and privately owned school bus fleets based on the cost associated with retrofit of existing buses and the replacement of school buses that are not retrofittable with a VDECS. The regulatory cost for school bus replacement was estimated by multiplying the number of school buses that need to be replaced by the fraction of years remaining in the buses service life multiplied by the cost for a replacement school bus. It was assumed that a school bus that does not have a retrofittable engine would be replaced with a new bus, rather than purchasing a used bus or repowering the school bus with a newer engine.

The regulatory cost for school bus retrofits was estimated by multiplying the number of school buses that need to be retrofitted by the cost for the applicable retrofit device. The applicable retrofit device utilized (passive or active) varies by model year and is detailed below as well as the associated costs.

1. Implementation Options

It is assumed that public school bus fleets will follow the BACT Schedule for School Bus Fleets as the preferred compliance option and private fleets will use the BACT Percentage Limit method for compliance, see Table 1 below. Public school bus fleets tend to have a distribution of older school buses while their private counterparts tend to have newer school bus fleets. For the purpose of estimating the cost of the proposed regulation on school bus fleets it is assumed that no fleet would utilize the Fleet Average method for compliance with the proposed regulation, although some school bus fleets with large numbers of alternative-fueled buses and relatively few older diesel-fueled buses could find the fleet average compliance option less expensive.

Table 1: Compliance Options Used in School Bus Cost Methodology

Compliance Deadline, as of January 1	BACT Schedule, Model Year Buses Retrofitted by Compliance Deadline	Percentage of Fleet Method, Percentage of Fleet Retrofitted by Compliance Date
2011	2000 & newer	25%
2012	1994 - 1999	50%
2013	1987 - 1993	75%
2014	Pre-1987	100%

2. School Bus Population

School buses are required to be inspected by the California Highway Patrol (CHP) every 13 months to insure that they are in good working order and meet all state and federal safety requirements. The CHP issues a CHP form 292 to indicate that a school bus is in compliance with all school bus safety requirements and the form is required to be posted within the bus to legally transport students from home to school. In 2006, the CHP created a one-time electronic database of all the vehicles in 2005 that received a CHP form 292. In the fall of 2006, in support of the 2008 Lower-Emission School Bus Program guidelines, the ARB conducted phone surveys of public school districts with the pre-1987 school bus in their fleet to verify data presented in the CHP database. This 2005 CHP database has been a very important tool for the ARB in determining funding allocations to local air districts for implementation of the Lower-Emission School Bus Program. From the 2005 CHP Safety Certification Database it has been estimated that in 2010 there will be approximately 15,500 diesel-fueled school buses that will be covered by the proposed regulation, of which nearly one-half are already compliant with the proposed regulation or will be in the near future due to available State or local funding.

The population of school buses that are estimated to need either replacement or retrofit to comply with the proposed regulation can be found in Table 2.

Table 2: School Bus Population Needing Action to Comply with Proposed Regulation in 2010

Model Year Group	Applicable Retrofit Device	Buses Requiring Retrofit		Buses Requiring Replacement	
		Pubic	Private	Public	Private
Pre-1987	No Device Available	0	0	1642*	0*
1987 2-Strokes	No Device Available	0	0	127*	15*
1988 to 1993 2-strokes	No Device Available	0	0	688	170
1987 to 1993 4-strokes	Active DPF	658	151	0	0
1994 to 2002	½ Active ½ Passive	394	2016	0	0
2003 to 2006	Passive DPF	678	1773	0	0

* No associated costs for replacement in 2017.

3. Public Fleets

Public school bus fleets are typically owned by public school districts, a Joint Powers Authority (JPA, formed by several public school districts), County Departments of Education, the California Department of Education, or by public charter schools. The vast majority of public school bus fleets are owned and operated by public school districts or JPA's. Public school bus fleets typically operate their own maintenance shops able to perform most school bus maintenance operations. Public fleet size can vary between the rural one-bus school districts to the thousands of buses operated by Los Angeles Unified School District. As a result, the composition of the fleet can consist of many different fuel types, such as gasoline, diesel, natural gas, and propane in many different weight categories. Only diesel-fueled school buses over 14,000 GVWR are impacted by this proposed regulation.

4. Private Fleets

Private school bus fleets can be owned by companies, individuals, or private schools. Private fleets can have their own maintenance facilities or can utilize maintenance contracts with engine dealers or other maintenance facilities. Private school bus fleets can be as varied as their publicly owned counterparts, with fleets of one school bus to thousands of buses found in larger private school bus contractors.

5. Past and Current School Bus Retrofits and Replacements

In the cost calculation for school buses affected by the proposed regulation it was assumed that all Proposition 1B funds have been fully expended. It is estimated that under the 2008 Lower-Emission School Bus Program that approximately 1,100 pre-1987 model year school buses will be replaced and 3,500 Level-3 Diesel Particulate Filters (DPF) will be installed on middle-aged school buses. The estimated numbers of retrofit device installations from past and current funding sources are provided in Table 3 below. It was assumed that past retrofit funding was allocated equally toward the retrofit of model years 1994 to 2002 based on each model year's representation in the school bus population. Current funding with Proposition 1B funds was assumed to be allocated toward the retrofit of model year 1987 to 2006 bus engines based on that model years representation in the school bus population. Staff assumed that 90% of past retrofit funds have been allocated to public fleets and that 60% of Proposition 1B retrofit funds will be used by public school bus fleets, with the remaining retrofit funds going to private school bus fleets. It is important to note that retrofitted school buses with local funds have not been adequately captured. Therefore, the number of buses already retrofitted are slightly underestimated.

Table 3: School Bus Population Already Retrofitted with VDECS in 2010

MY Group	Funding Source	Public	Private
1994 to 2002	State and Local	3304	367
1987 to 2006	Prop 1B	2100*	1400*

*Anticipated, funds are currently being distributed.

School buses that have been replaced or will be replaced with current funding have been removed from the population of school buses that still need action to comply with the proposed regulation.

B. Costs

1. School Bus Replacement Cost

Currently, the Lower-Emission School Bus Program guidelines estimate the cost for a replacement school bus to be $140,000. The replacement school bus is assumed to be a transit-style diesel-fueled school bus, including tax. This same estimate is used as the cost associated with a school bus requiring replacement to be compliant with the proposed regulation.

The proposed regulation would require school buses manufactured before April 1, 1977 (pre-1977), before minimum federal safety standards, be removed from service by January 1, 2012. Currently, the Lower-Emission School Bus Program provides $140,000, without school district match, for the replacement of eligible pre-1977 public school buses. Therefore, no costs associated with the proposed regulation are attributed to the replacement of pre-1977 school buses under the proposed regulation.

In March of 2008 the ARB approved guideline revisions to the Lower-Emission School Bus Program where it was determined that 74 pre-1977 school buses were still in operation in public school bus fleets. All identified pre-1977 public school buses eligible for replacement are currently funded, with delivery of replacement buses expected by February 1, 2010. However, the existence of unidentified pre-1977 school buses in the public school bus fleet is probable into the near future.

School buses that were manufactured before 1987, as well as those that utilize two-stroke diesel engines are currently determined not to be retrofittable. Therefore, staff assumed these buses would be replaced in 2017. The service life of a school bus is estimated at 30 years, and by 2017 all 1987 and older buses are at or beyond their service life. Therefore, staff assumed that there is no associated regulatory cost for the replacement of pre-1987 model year school buses due to natural school bus fleet turnover.

It is estimated from the 2005 CHP safety certification database that approximately 1,000 two-stroke diesel fueled school buses model year 1987 to 1993 are still in use with California school bus fleets. These buses tend to have large seating capacity, some upwards of 90 students, which public school districts are reluctant to replace due to operational budgetary constraints. The estimated 1000, 1987 to 1993 two-stroke school buses will require replacement in 2017, in most cases before the end of their service life. The regulatory costs associated with school bus replacement are prorated to the remaining service life of the school bus.

Using the described school bus replacement costs and the school bus population requiring replacement described in Table 2, it was calculated that the replacement cost to public fleets would be $8.8 million and the cost to private fleets would be $2.6 million, based on the cost value of money analysis in 2008 dollars.

It is estimated that the remaining, 5670 school buses shown in Table 2, subject to the proposed regulation would meet the requirements by installing a VDECS as defined in the proposed regulation.

2. School Bus Retrofit Costs

It is estimated that a passive-style DPF cost about $11,000 and an active-style DPF will cost approximately $15,000. The only active-style VDECS currently available for school buses requires the installation of electrical infrastructure to allow for the DPF to be regenerated. Both active and passive-style DPFs have seen extensively use in the statewide school bus fleet.

School buses with four-stroke engines were assumed to be retrofittable with active or passive-style DPFs according to Table 4 below. School buses with 2007 and newer model year engines are already equipped with particulate filters that meet the requirements of the proposed regulation.

Table 4: Applicable Retrofit Devices for Model Year Groups

My Group	Applicable Retrofit Device for Applicable MY Group
Pre-1987	No Retrofit Device Available
1987 to 1993	Active-Style DPF
1994 to 2002	½ Active-Style ½ Passive-Style
2003 to 2006	Passive-Style

Using the described school bus retrofit costs and the school bus population needing retrofit to meet the requirements of the proposed regulation, it was calculated that the retrofit costs to public fleets would be $18 million and the cost to private fleets would be $39 million, based on the cost value of money analysis in 2008 dollars.

3. Maintenance and Electrical Costs

Public and private school bus fleets costs associated with filter maintenance and electrical costs are accounted for in Appendix I. Costs associated with reporting requirements to public or private school bus fleets are considered in Appendix I. The costs to public school districts that contract with private entities which would see additional operational costs due to the proposed regulation are not considered as a cost to the public school district but are attributed to the costs for private school bus fleets to comply with the proposed regulation.