

## **ATTACHMENT B**

### **ADDITIONAL SUPPORTING DOCUMENTS AND INFORMATION**

The following additional supporting documents and information are available for public comments during the supplemental public comment period for the 2012 rulemaking approving the revisions to on-board diagnostic system requirements for heavy-duty engines, passenger cars, light-duty trucks, medium-duty vehicles and engines regulations.

#### **Additional Rationale for Definition of “Alternate Phase-In”**

In the 45-day notice, staff proposed in the amendments to the HD OBD regulation a new definition of “alternate phase-in” that is similar to that currently provided in the OBD II regulation and would provide manufacturers with compliance flexibility in meeting some regulation requirements with prescribed phase-in schedules. The HD OBD regulation previously did not include any prescribed phase-in schedules and, thus, there was no need for alternate phase-in schedules. However, as part of the 45-day notice, staff proposed several phase-in schedules for several different requirements and included a new definition for “alternate phase-in” that would provide the same flexibility as currently exists under the OBD II regulation.

#### **Additional Information on Costs**

Staff is also providing more information concerning the costs attributed to the proposed amendments. In the Initial Statement of Reasons: Staff Report (Staff Report) for the present amendments, staff described the incremental costs that manufacturers would incur under the amendments for heavy-duty diesel engines. Specifically, the Staff Report indicated that the proposed amendments would result in some added costs for heavy-duty diesel engines attributable to the more comprehensive diesel misfire monitoring requirements that begin in the 2016 model year. As stated, the reporting requirements for these amendments, when fully phased-in, would result in costs of up to \$30,000 annually. On a per vehicle basis, a large manufacturer is estimated to have an incremental retail cost of less than \$0.56 per vehicle. Subsequent to the release of the Staff Report, staff adjusted the cost analysis to allow for a six percent cost of capital recovery for truck builders. This adjustment results in an incremental retail cost of \$0.59 per vehicle, a \$0.03 increase from the cost initially reported (i.e., less than 0.01 percent increase in the retail price of a typical heavy duty vehicle).

Staff’s analysis took the national sales numbers for the top nine engine manufacturers and determined a composite manufacturer average value of 72,440 engines that will be annually produced and sold nationwide. This number was rounded to 72,000 for the analysis. Staff then estimated the incremental costs for an engine manufacturer with sales of 72,000 engines. Staff further assumed the hypothetical engine manufacturer would have three engine families that would require separate misfire monitoring data to be generated. It then calculated the total costs for such a manufacturer using estimated

testing cost information obtained from emission test laboratories and heavy-duty engine manufacturers. The data generation and associated reporting costs for the updated misfire monitoring requirements was estimated to cost \$10,000 per engine family for a total cost of \$30,000 for a typical large manufacturer.

The Staff Report did not address how the incremental costs of \$0.59 per vehicle (previously \$0.56 per vehicle as described above) were calculated. The incremental costs were obtained by adding the testing and reporting costs over four years for all eleven heavy-duty diesel engine manufacturers (from the 2016 model year through the 2019 model year) and dividing the costs by the estimated number of heavy-duty diesel engines that are projected to be produced for sale nationwide over the same time period by all eleven manufacturers. Nationwide volumes were used instead of California-only volumes because it is assumed (and consistent with past practice) that manufacturers will make one engine for the entire nation to comply with both the U.S. EPA and ARB HD OBD requirements. The total costs consist of the total number of engine families estimated to be tested by manufacturers multiplied by \$10,000 per engine family. A total of 99 engine families are projected to be tested over the four years at a total cost of \$990,000. The total number of heavy-duty diesel engines was obtained by multiplying the projected nationwide sales of 2012 model year diesel engines (479,000) by four (years). The incremental costs were then adjusted with a six percent profit margin each for the engine manufacturer, truck builder, and dealer (assuming trucks are in the dealership for three months) to calculate the total incremental costs for consumers (i.e., new heavy-duty vehicle purchasers).

In the Staff Report, staff also estimated the incremental costs that heavy-duty alternate-fueled engine manufacturers would incur due to the proposed amendment to move up the start date for full OBD systems on heavy-duty alternate-fueled engines by two years (from the 2020 to the 2018 model year). Since the amendment would require these manufacturers to implement OBD systems two years earlier than previously required, the majority of costs were already accounted for in the 2009 HD OBD biennial review rulemaking. The only additional costs would be those costs incurred for the proposed misfire monitoring requirement amendments described above and the time value of money cost that is incurred due to using money two years earlier instead of earning investment returns. Specifically, this would cover the earlier hiring of additional staff or purchasing of equipment needed for compliance and include some annual costs for recalibration within this earlier compliance timeframe. Also, since the alternate-fueled engines will have OBD systems on them two years earlier, buyers of such engines in these two years will see an incremental price increase that otherwise would not have occurred until later. From staff's analysis, the incremental retail cost to buyers of these engines/vehicles for these two years has been estimated to range from \$21 per vehicle to \$207 per vehicle, depending on the size of the manufacturer. Subsequent to the release of the Staff Report, staff adjusted the incremental costs to include a six percent profit margin for truck builders and dealers. As such, the incremental retail cost to buyers of these vehicles for the two years has been adjusted to range from \$23 per vehicle to \$228 per vehicle (less than a 1.0 percent increase in the retail price of the vehicle).

The Staff Report did not provide an explanation as to how the incremental costs of \$23 per vehicle to \$228 per vehicle were calculated. The incremental cost for heavy-duty alternate-fueled vehicles was determined separately for small and large manufacturers because the resources and production volume of these two industry segments are significantly different. Similar to heavy-duty diesel engine manufacturers, the misfire monitoring amendments will add testing and reporting costs for alternate-fueled engine manufacturers. Staff assumed that heavy-duty alternate-fueled engine manufacturers would have one engine family that would require misfire monitoring data to be generated. This will result in estimated costs of \$10,000 per manufacturer annually. The incremental costs per vehicle were then obtained by dividing the testing and reporting costs by the assumed production volumes for a typical large and small heavy-duty alternate-fueled engine manufacturer. For these calculations, a typical large manufacturer was assumed to produce 5,000 engines nationwide per year and a typical small manufacturer was assumed to produce 500 engines nationwide per year. These costs are expected to be passed on to consumers (new heavy-duty engine/vehicle purchasers) so a six percent profit margin for engine builders, truck builders, and dealers were each applied to the reporting costs. As a result, the total incremental retail cost for the misfire monitoring amendment is estimated at \$2.38 per vehicle for a large alternate-fueled engine manufacturer and \$23.82 per vehicle for a small alternate-fueled engine manufacturer.

To evaluate the time value money cost for the two year earlier implementation of HD OBD for heavy-duty alternate-fueled vehicles, staff estimated the time value of money cost to be 13.75 percent over the two years. Although current rates of return in investments have been near zero in recent years, staff assumed an annualized return rate of 6.65 percent. This annualized return rate was used based on the average annualized returns on the Standard and Poor's (S&P) 500 Index from 2003 through 2011 (5.92 percent) plus a 25 percent margin to arrive at the 6.65 percent rate. Applying the 6.65 percent annual rate of return over two years results in an overall return rate of 13.75 percent assuming all moneys are reinvested and interest rate is compounded annually. Staff then applied 13.75 percent to the overall incremental costs calculated in the 2009 cost analysis, giving an adjusted incremental cost of \$18.19 per vehicle. This cost is a conservative value considering that the 2009 cost estimates included algorithm development and calibration costs to implement all OBD diagnostics while alternate-fueled engines are expected to be derived from existing diesel or gasoline-fueled heavy-duty engines that already have base algorithms and calibrations and would only require a portion of the algorithm development and calibration costs. Heavy-duty alternate-fueled engine manufacturers will likely only need to recalibrate a few of the major monitors such as fuel system, catalyst, and EGR and develop a few comprehensive component monitors for added components related to the fuel conversion. By adding the \$2.38 per vehicle reporting costs to the \$18.19 per vehicle cost and applying a six percent profit margin for truck builders and another six percent profit margin for dealers, a total incremental cost of \$23 is obtained for large heavy-duty alternate-fueled engine manufacturers.

For small heavy-duty alternate-fueled engine manufacturers, a similar approach was used to calculate the incremental costs. A typical small manufacturer is estimated to produce 500 engines per year which is a factor of ten less than a typical large manufacturer. Assuming the scaling of the volume also affects costs in a similar manner, the cost determined above for large alternate-fueled engine manufacturers results in an incremental cost of \$181.90 per vehicle for small volume manufacturers. To obtain the total incremental cost for small heavy-duty alternate-fueled engine manufacturers of \$228 per vehicle, the \$23.82 per vehicle reporting cost was added to the \$181.90 cost after a six percent profit margin was applied to account for truck builder and dealer profits. A summary table of the incremental consumer costs for alternate-fueled vehicles is shown in Table 1 below. The cost numbers for the 2009 analysis below were presented in the 2009 HD OBD Staff Report.

**Table 1: Incremental Consumer Cost of Heavy-Duty Diesel Vehicles**

		2009 Analysis			2012 Analysis	
		1971.1 Costs  (dollars)	1971.5 Costs  (dollars)	Total HD OBD Costs  (dollars)	Total Large Alt Fuels HD OBD Costs  (dollars)	Total Small Alt Fuels Costs  (dollars)
Variable costs	Component	\$37.18	\$0.00	\$37.18	\$5.12	\$51.20
	Assembly	\$0.68	\$0.00	\$0.68	\$0.09	\$0.90
	Warranty	\$1.64	\$0.00	\$1.64	\$0.23	\$2.30
	Shipping	\$1.20	\$0.00	\$1.20	\$0.17	\$1.70
Support costs	Research	\$22.49	\$0.00	\$22.49	\$3.09	\$30.90
	Engineering Support	\$0.14	\$0.06	\$0.20	\$0.03	\$0.30
	Legal	\$0.35	\$0.00	\$0.35	\$0.05	\$0.50
	Administrative	\$2.08	\$0.31	\$2.39	\$0.33	\$3.30
Investment recovery costs	Machine & equipment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	Assembly plant changes	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	Development/Testing	\$57.34	\$1.22	\$58.56	\$8.05	\$80.50
Engine manufacturer profit (a)	\$7.39	\$0.10	\$7.49	\$1.03	\$10.30	
Truck Builder profit (a)				\$1.09	\$10.91	
Dealer profit (a)				\$1.16	\$11.57	
Misfire Monitor costs(a)(b)				\$2.38	\$23.82	
Total cost		\$130.49	\$1.69	\$132.18	\$22.82	\$228.20

(a) Profit was calculated at 6% of the total incremental costs.

(b) Engine manufacturer profit, truck builder profit, and dealer profit were all applied.