California Environmental Protection Agency

Air Resources Board

Supplement to the Final Statement of Reasons for Rulemaking

FOR THE ADOPTION OF A PROPOSED REGULATION TO REDUCE EMISSIONS FROM IN-USE ON-ROAD DIESEL VEHICLES MADE AS PART OF THE PUBLIC HEARING TO CONSIDER PROPOSED REGULATION TO REDUCE EMISSIONS FROM IN-USE ON-ROAD DIESEL VEHICLES, AND AMENDMENTS TO THE REGULATIONS FOR IN-USE OFF-ROAD VEHICLES, DRAYAGE TRUCKS, MUNICIPALITY AND UTILITY VEHICLES, MOBILE CARGO HANDLING EQUIPMENT, PORTABLE ENGINES AND EQUIPMENT, HEAVY-DUTY ENGINES AND VEHICLE EXHAUST EMISSIONS STANDARDS AND TEST PROCEDURES AND COMMERCIAL MOTOR VEHICLE IDLING

Comments and Responses of the Emission Inventory and Emissions Benefits Estimates Section

Public Hearing Date: December 11 and 12, 2008
Agenda Item No.: 08-11-3

1. Emission Inventory and Emission Benefits Estimates

a) Emissions Inventory Methodology

1. Comment: The emission inventory and emission benefit estimates for the proposed regulation that is being presented to the Board were not developed using CARB's official EMFAC2007 model, which forms the basis for the State Implementation Plan. Staff freely admits that it has developed a new methodology, based on new data and assumptions, for modeling emissions from heavy-duty diesel vehicles as well as the benefits of the proposed regulations.[1] This methodology has not been subjected to any form of peer review, as evidenced by the lack of any reference whatsoever to peer review and the complete absence of any peer reviewer comments in the regulatory documents.

In addition to not having been subjected to peer review, CARB staff's new methodology has not been disclosed to the public in general. Unlike the EMFAC2007 model, which, along with its documentation, is publicly available on the CARB website, the only information released about the new calculation methodology used by CARB staff to estimate the baseline emission inventory and emission benefits of the proposed regulation is contained in the regulatory documents, including Appendix G and an Excel spreadsheet posted by CARB staff on the agency website on November 7, 2008. However, neither Appendix G nor the Excel spreadsheet contains the actual data, assumptions, and calculations used by CARB staff to arrive at the baseline emission inventory or the emission benefit estimates for the proposed regulation. In response to a request for disclosure of all details related to the new methodology made on December 2, 2008, CARB staff released a large computer database on December 9, 2008, only one day before the deadline for submission of these comments and two days before the hearing on the regulations. Given CARB's failure to provide information in a timely manner, it has not been possible to conduct a meaningful review of the new methodology.

Without both peer review and timely public disclosure of the new methodology developed by CARB staff specifically to support the proposed regulation, the accuracy of either the baseline inventory or the emission benefit estimates being presented to the Board could not be verified. Given the lack of peer review and public disclosure, the Board must defer action on the proposed regulation until such time that a proper peer review has been conducted and the public has had at least 45 days to review and comment on all of the data, assumptions, and calculations that comprise the staff's new emissions methodology. (SRES2)

2. Comment: CARB staff has failed to publish or provide upon request key data related to the baseline emission inventory and emission benefit estimates. The following equation used to calculate the emissions in tons per year for a given calendar year is presented on page G-2 of Appendix G.

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[1] The commenter's letter referred to page 45 of the Initial Statement of Reasons and Page G-1 of Appendix G of the Technical Support Document.

$$EMS_{CY} = \sum_{MY,\,C} \left(POP_{MY,\,C} \text{ X } AC_{MY,\,C} \text{ X } ER_{MY,\,C} \right)$$

where: EMS_{CY} is the emissions calculated in tons per day for a given calendar year CY.

$POP_{MY,\,C}$ is the population of trucks for model year MY within each inventory category C for a given calendar year;

$AC_{MY,\,C}$ is the accrual rate (miles traveled per year) per truck by model year MY and inventory category C in a given calendar year;

$ER_{MY,\,C}$ is the calculated emission rate, in grams pollutant per mile driven, assuming statewide speed travel distributions in EMFAC2007 and category-specific cumulative mileage accrual over the life of the truck, by model year MY and inventory category C;

Staff also developed the data required to use the equation, as evidenced by the fact that emission values were published for calendar years 2000 through 2025. However, staff has publicly disclosed values only for the accrual rates ($AC_{MY,\,C}$). Other than the $POP_{MY,\,C}$ values that apply for the 2008 model year (but which, according to CARB staff, have been modified for future years to reflect changes in new truck sales and which are presented only in graphical, not tabular, form for the 2008 model year, values used by CARB staff for "$POP_{MY,\,C}$" and "$ER_{MY,\,C}$" were not disclosed by CARB staff until December 9, 2008, although a request for them was made a week earlier. Furthermore, the methodology and calculations used by CARB staff to arrive at values for all three parameters on the right side of the emissions equation copied above were also not disclosed until December 9, 2008.

Without timely access to the values of "$POP_{MY,\,C}$" and "$ER_{MY,\,C}$" used by CARB staff, the accuracy of both the baseline inventory and the emission benefit estimates that are being presented to the Board could not be verified by the public, and therefore it is not appropriate for the Board to rely upon them in taking action regarding the proposed regulation. (SRES2)

Agency Response: During the regulatory development process, regulatory inventories are by nature dynamic as they evolve to reflect new data sources, feedback from stakeholders, and rule changes. In developing the statewide truck and bus rule inventory, ARB staff used the same basic emissions calculations methodologies as in the EMFAC2007 model but more detailed and current activity data assumptions. These assumptions and methodology were documented and shared with stakeholders throughout the regulatory development process. ARB staff actively solicited stakeholder feedback and peer review through a workshop and outreach process initiated in August 2007. In addition to an extensive series of public workshops, ARB staff met with industry stakeholders seven times between August 2007 and December 2008 to discuss the inventory methodology and assumptions.

During the development of the Statewide Truck and Bus Regulation Mobile Source Analysis Branch staff was in regular contact with representatives of the California Trucking Association, American Trucking Association, and their consultants regarding the development of the new emissions analysis. This contact included multiple emails,

telephone conversations, and meetings; and began in April of 2007. ARB staff met in person with representatives of the California Trucking Association, American Trucking Association, and their consultants on at least seven different occasions to discuss draft emissions inventory assessments and to exchange data. Their input and guidance was both useful and appreciated, and led to several significant additions to the analysis, including the linking of current and estimated future truck sales to future vehicle age distributions by category. While there was no formal peer review, the development of the inventory was a public process with many opportunities for interested parties to comment.

In addition to telephone conversations, email exchanges, and formal meetings, ARB staff held two series of public workshops dedicated specifically to the emissions inventory under development for the regulation. These workshops were held in July 2007 (in Sacramento and El Monte) and July 2008 (in Sacramento, Fresno, and El Monte). During and after these workshops attendees were provided the opportunity to comment on the emissions analysis that was presented.

On November 7, 2008 staff posted the emissions inventory data to the list serve and web site. To the best of ARB's knowledge, as evidenced by commenter's statements that they were in receipt of the inventory data, the data was available to all interested stakeholders by the reference to it in the Appendix G of the Staff Report and the public posting of it on the rulemakings regulatory website on November 7, 2008.

The Staff Report: Initial Statement of Reasons and associated Technical Support Document, released on October 24, 2008, referenced the Emission Inventory Database that was to be made available with the Staff Report. However, the database was posted to ARB's website on November 7, 2008, and was not available for the full 45-day comment period. This item was made available for public comment during a second "15-day" notice comment period, starting October 6, 2009 to insure compliance with Government Code section 11347.1. The combination of the emissions inventory data in conjunction with the information and methodology documented in Appendix G of the ISOR package and EMFAC2007 provided sufficient information to replicate the emissions inventory analysis.

3. **Comment:** At the request of Driving Toward a Cleaner California (DTCC), Sierra Research attempted to perform a detailed critical review of the new methodology. That was not possible because CARB staff failed to provide the public in a timely manner with all of the details regarding the methodology required to review, reproduce, or validate the emission inventory and emission benefit calculations performed by CARB staff related to the proposed regulation and regulatory alternatives. (SRES2)

4. **Comment:** Because CARB staff's current assessment of the need for the proposed regulation and its benefits, costs, and cost-effectiveness is flawed due to the lack of any meaningful review of the emission methodology and due to its reliance on assumptions regarding the current and future economy that are known to be incorrect, it is not appropriate for the Board to rely on that assessment in

considering whether to adopt the proposed regulation. Instead, Sierra Research recommends that the Board postpone action on the proposed regulation and direct the staff to perform a transparent re-evaluation of the baseline emission inventory, emission benefits, costs, and economic consequences of its adoption that takes full account of the current economic recession and its future consequences. In performing this re-evaluation, it is critical that CARB staff make all information and data available to the public so that it can be properly examined and reviewed. (SRES2)

Agency Response: As discussed above, beginning in August 2007, ARB staff provided many opportunities for stakeholder review of the inventory methodology and assumptions through a public workshop process, face to face meetings, email exchanges, telephone conversations, interim data products, documentation and databases. While ARB staff and CTA began discussing the emissions inventory in April 2007, it was not until December 2008 that Sierra Research attended any meetings with ARB staff on this issue. There were extensive opportunities for stakeholder comment beginning in August 2007.

5. **Comment:** CARB staff must be directed to release all revised emissions forecasts as well as all key data related to the baseline emission inventory and emissions benefit estimates, along with the revised methodology used to compute these estimates for at least 45 days to allow for stakeholder review and comment. (CTA2)

6. **Comment:** As serious partners in this effort to improve California's air quality, we fully recognize that this DTCC proposal must help achieve significant emission reductions and have developed it with that understanding. Unfortunately, we are prevented from conducting a complete evaluation of the emissions reductions that would be achieved under our alternative. We were recently informed by your staff in the Mobile Source Analysis Branch that they are working through the emissions inventory and air quality modeling aspects of the Board's proposal and therefore those tools would not be available to us to conduct this important evaluation at this time. Your staff has, however, indicated its willingness to assist us by conducting their own evaluation of our alternative proposal and providing a briefing to the Board and our members on its results. Therefore, we request that the Board conduct a thorough analysis of this alternative proposal and consider its adoption as we believe it demonstrates reasonable progress toward meeting California's needs for improved air quality and a sustained economy. And we ask that this analysis be provided well in advance of the scheduled hearing for consideration of this regulation. (DTCC3)

Agency Response: DTCC is a coalition of business and industry representatives that developed an alternative proposal to the Truck and Bus regulation with many elements of the DTCC alternative differing significantly from the ARB's regulation. ARB staff conducted a thorough review of the DTCC regulatory proposal and presented an evaluation of the DTCC proposal on current and future emissions estimates to industry stakeholders on October 20, 2008. The results of staff's analysis of the DTCC proposal are also presented in Chapter XVIII and Appendix N of the Technical Support Document

where staff concluded that the emissions benefits from the DTCC proposal would be substantially lower than staff's proposal and would not meet California's SIP commitments in any year.

b) Characterization of the Medium Heavy-Duty Fleet

7. Comment: The data in the staff report and particularly Appendices G and J of the Staff Report are inadequate for analyzing the rule. ARA was unable to closely reproduce ARB's inventory and emission factors or to rationalize differences. ARA examined the inventories from MHD single unit diesel trucks as a function of annual accumulated miles based upon the VIUS database. This database was relied upon by ARB to characterize the MHD fleet. We were able to reproduce the key characteristics for this fleet as detailed in Appendix G of the Staff Report by ARB but not the emission factors used.

ARB has provided emission factors for the MHD and HHD fleets. The HHD data are from Zhou[2] while the MHD data are reported in Appendix G of the Staff Report. In estimating emissions, we assumed that ARB's fleet specific inventory emissions scale with these emission factors in each weight group through VMT. This means that multipliers for speed adjustments, idle time etc is a fixed proportional adjustments to the basis emission factors.

ARB used a number of data sources, with the Federal 2002 FWHA database, VIUS, playing a prominent role, especially for the MHD fleet. In our analysis, we assume that the sample is random and sufficiently large so it fairly accurately characterizes the important qualities of the California owned fleet from a vehicle characterization perspective. It is well understood that the emissions from a vehicle, the emission factor, depend primarily on engine model year, vehicle characteristics (size, shape, transmission), operating weight, type of driving (local or freeway for example), and tampering and malmaintenance related to the vehicle.

Because VIUS is a mail back survey, it captures primarily California-owned or based vehicles. ARB has found that there is very little interstate MHD traffic. Thus, VIUS should represent the MHD fleet well. Indeed, ARB lists VIUS as its primary data source. VIUS, however, would not properly capture interstate trucking for trucks originating outside California. It would also not capture the portion of California VMT for California interstate trucks. ARB used IRP and IFTA data to develop its interstate truck populations. Details related to these data and a reference are not provided in Appendix G of the Staff Report; these data may have been collected from a proprietary database. A study conducted by U.C. Davis that found considerably less interstate traffic and an older interstate fleet seems not to have been used by ARB.[3] We sorted VIUS to include the subset of California and

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[2] Zhou, L., "Revision of Heavy Duty Diesel Truck Emission Factors and Speed Correction Factors." ARB, 2006

[3] Lutsey, N., "Assessment of Out-of-State Heavy-Duty Truck Activity Trends in California", FINAL REPORT to California Air Resources Board, Contract #04-328, March 14, 2008.

diesel vehicles only. ARB apparently used DMV data or other data to estimate the total size and distribution of ages of the MHD fleet. (ARA1)

Agency Response: Appendix G of the staff report describes how CRC E55-59 data were used to update medium-heavy duty diesel truck emission rates. In order to provide reviewers more detailed output from the emissions inventory analysis, medium-heavy duty diesel truck emission rates by inventory category and model year were posted on-line as part of the emissions inventory data posted on November 7, 2008. With respect to the availability of this database, see staff's response to Comment 2.

Differences in emission factors were calculated using EMFAC2007, which is publicly available; estimated mileage accrual rates by model year and inventory category which were provided in Appendix G and the posted inventory database; and adjustment factors based on CRC E55-59 described in Appendix G.

The Vehicle Inventory and Use Survey (VIUS) was a primary data source used to develop the new emissions analysis for the Rule. VIUS is a nationally developed statistically representative data set released by the U.S. Census Bureau in 2002. It was designed to be statistically representative for heavy duty trucks both nationally, and for California. ARB staff used this data source where more direct data were not available.

To develop medium-heavy duty truck populations, staff used DMV registration for trucks registered in California, and samples of International Registration Plan (IRP) data. Staff analysis suggested very few medium-heavy duty diesel trucks travel across state lines into or out of California. UC Davis survey results were analyzed, but provided information specific to heavy-heavy duty diesel trucks. The UC Davis study did provide heavy-heavy duty diesel population and VMT estimates based on their survey work. However ARB staff placed less emphasis on the UC Davis study because those estimates were not as current or detailed as fuel tax data from the International Fuel Tax Agreement (IFTA) program administered by the California State Board of Equalization.

8. **Comment:** ARA sorted the California VIUS dataset into four groups for MHD single unit trucks, one group for medium heavy-duty tractor-trailers, seven groups for HHD single unit trucks and seven groups for HHD tractor-trailer trucks. VIUS also provided inflators to correct the sample for fleet population and annual mileage. We examined averages based upon fleet counts and fleets averaged using the inflation factors. Because the weight groups of the MHD fleet had similar properties, the group characterizations were very similar. Since the inflation factors adjusted for fleet growth between 2002 and 2008 (3.1 % growth assumed per Appendix G of the Staff Report) did not closely match either the MHD vehicle count or total VMT in 2008, we used sample count to characterize the fleet. Sample count does not reproduce the population-age distribution in Figure F of Appendix G of the Staff Report. (ARA1)

Based on the uninflated sample count from VIUS, about 93 % of the fleet is made up of single unit or straight trucks. Only 5% of the single unit trucks in the 26,001-

33,000 GVWR group pull equipment trailers or dump trailers. The most common trailers pulled by tractors are reported to be flatbeds (30%) and two axle box vans(55%). It would seem that the reported weight for these vehicles doesn't consider the trailers. These vehicles may actually fall into the HHD category. To the extent that these are in ARB's MHD inventory, these trucks should be moved to the heavy-heavy duty inventory since they tow trailers that result in increasing the combined weight to above 33,000 pounds.

We assumed that the VIUS fleet included only California registered MHD vehicles on the roads in California called the "In-State" MHDD fleet. Generally, the fleet age, odometer reading and annual mileage are consistent in the two analyses. The VIUS MHDD fleet consists of 267 vehicles. Scaling VIUS inflation adjusted VMT to the State Fleet Count of 198,525 vehicles in 2008 yields 11,177,973 miles traveled per day, which compares well with the ARB's daily VMT of 12,731,247 miles per day.

Using the emission factors in Appendix G of the Staff Report, we computed the total emissions for the fleet.

The MHD sample was divided into weight groups and each weight group was characterized at annual miles driven of various quantities. Because we believe that including 26,000-33,000 pound tractors in the MHD class is erroneous, we removed these vehicles from our analysis. The data suggest that these vehicles exhibit different characteristics as they are older, have significantly higher odometer readings and are driven more miles than single unit MHD vehicles.

We assumed that vehicle model year was equivalent to engine model year. This is supported in Zhou.[2] The emission factors from Table 17 of Appendix G of the Staff Report were used and the 2008 factors were adjusted for the mix of 2009 and 2008 vehicles per the Appendix G age distribution as well as for the average age vehicle over 16 years. Using the emission factors for MHD vehicles and the model year and odometer readings for each vehicle in the fleet, the VIUS data were used to compute fleet emissions. For the entire MHD fleet including tractors, the raw emissions totals are 156 TPD for NOx and 10.8 TPD for PM compared to 124 TPD and 4.6 TPD developed by ARB. The fleet emission factors are 12.0 g/mi for NOx and 0.83 g/mi for PM respectively. These are significantly higher than those derived from the fleet emissions for this portion of the fleet as developed by ARB.

We normalized our calculations to the ARB emissions. These were then scaled to the 2008 ARB inventory as a function of annual miles assuming the scaling factors for NOx and PM were constant.

Overall Emission Factor Comparison

	5,000 miles per year		Fleet Average	
	ARB	ARA	ARB	ARA
NOx	13.06	9.69	8.84	0.33
PM	0.64	0.35	0.33	0.33

The comparable fleet average emission factors necessarily are the same. Since the table above shows that the trip parameter is independent of annual miles accumulated, the trip parameters that define the overall emission factors should be essentially the same regardless of annual miles. Also, since the odometer reading is independent of annual miles, the adjustment for deterioration should be similar. Since the 5000-mile fleet is only 3 years older, age effects and speed adjustment factors don't seem to explain the 48% and 93% increases in the emission factors for the 5000 mile fleet compared to the average fleet for the ARB analysis (ARA1)

Agency Response: As discussed in Appendix G, heavy duty truck populations representing California were developed using DMV registration databases. DMV data provide a direct measure of vehicle population, unlike VIUS which provides a statistical estimate. DMV population data were split first by gross vehicle rated weight (GVWR) which is provided by the manufacturer and coded in each vehicle's VIN number. The GVWR is representative of the rated weight, and not the declared combined weight of the vehicle that is declared to DMV by the registered truck operator. ARB staff used GVWR to split medium- and heavy-heavy duty diesel trucks for consistency with emissions factor tests conducted in the CRC E55/59 test program, where medium- and heavy-duty trucks were tested at an assumed average weight for each GVWR category. Staff agrees that some heavier medium-heavy GVWR trucks may in fact pull a larger combined weight which could fall in the heavy-heavy duty diesel truck category. ARB staff believe a combined-weight classification scheme may have the effect of increasing heavy-duty truck population and emissions marginally; as a result our current inventory could be marginally underestimated and benefits of the regulation also marginally underestimated. Staff believes this inventory difference would be relatively small; however it is an issue ARB staff are continuing to assess.

Our analysis did not separate California registered medium heavy duty trucks by body type. Staff used VIUS to estimate accrual rates for all California-registered medium heavy duty diesel trucks as defined by GVWR. As a result the accrual rates are not biased towards longer or shorter haul vehicles. As discussed in Appendix G, ARB staff updated medium-heavy duty diesel truck emission factors consistent with CRC E55/59; and used EMFAC2007 to estimate differences in emission rates by model year that are derived by varying accrual rates by inventory category. Although the zero-mile rates and deterioration rates in Tables 16&17 of Appendix G are the basis of emission factors in EMFAC, EMFAC also includes speed profiles, speed correction factors and other factors to better model the emissions from actual driving conditions. The emission factors used in the inventory analysis were posted to our web site on November 7, 2008.

Without additional information on the specific methodology used to generate the analysis, it is not possible to fully evaluate the claims discussed in comment 8.

c) Accounting for Age and Use of Vehicles

9. Comment: The segmenting of the diesel truck fleet into medium-heavy duty diesel (MHD) and heavy-heavy duty diesel (HHD) parts for regulatory purposes is

arbitrary. This segmentation could be justified because many HHD trucks are interstate vehicles traveling many freeway miles per trip while many MHD trucks are used for more local purposes, traveling shorter distances per trip. The over-the-road trucks accumulate many miles per year and the emission factors are higher due to deterioration. But a significant portion of the HHD fleet is single-unit trucks like dump trucks, concrete trucks and trash-hauling trucks with drive cycles that generate lower annual miles per truck similar to the MHD fleet. The division between HHD and MHD lessens the distinction between high use HHD tractors and MHD single unit trucks because of the inclusion of single unit trucks in the HHD fleet. Yet, both fleets are fitted with engines that are certified to meet the same emission standards for a given model year.

The principal difference in emission factors between MHD and a major segment of the HHD fleets is related to driving cycle. MHD truck trips tend to be shorter and possibly exhibit more transient operation. Much over the road truck driving is at freeway speeds. The single unit HHD fleet contains a significant number of trash, concrete, dump, and tanker trucks. The driving cycle for the single unit MHD and HHD fleets should be similar. This conclusion is supported by the similar annual mileage accrual of all of the single unit trucks.

We do not know how ARB accounted for trash vehicles in the HHDD fleet since these are covered by a separate regulation. We did not attempt to sort the HHDD SU fleet for agricultural vehicles or trash vehicles. We computed the total emissions from the (unadjusted?) emission factors as tabulated by Zhou. We predicted total HHDD single unit fleet emissions that agree well with ARB's totals. (ARA1)

Agency Response: The separation of vehicles into inventory categories based on GVWR and inventory category is anything but arbitrary. The CRC E55/59 program found a significant difference in emission rates by GVWR, precisely because a vehicle pulling a heavy weight must perform more work per mile than the same vehicle pulling a lighter weight. Within the GVWR classification of heavy- or medium heavy duty trucks, staff identified major operational differences by body type and vocation. For example, as discussed in Appendix G California registered heavy-heavy duty combination tractors drive about twice as many miles per model year as California registered heavy-heavy duty single-unit trucks. Differences in mileage accrual relate directly to differences in deteriorated emission rates by model year.

CRC E55/59 emissions testing was conducted on a 4-mode test cycle that was designed to represent typical driving conditions in California across all trucks. Staff agree that individual categories of trucks, such as refuse trucks, concrete mixers, and other categories may diverge from this average due to higher transient operations or hard accelerations under urban driving conditions. Medium heavy duty trucks may also fit this pattern. It would also follow that longer haul trucks, which travel a higher frequency of their miles on open freeways between urban centers may also deviate from the average due to higher cruise and high speed cruise operations. However these differences were not included in the new inventory analysis due to lack of sufficient emissions testing information. Overall, longer haul trucks tend to be newer,

while shorter haul trucks tend to be older. In the emissions analysis California registered trucks (which are older than interstate trucks) were responsible for around 50 percent of the VMT and 60 percent of criteria pollutant emissions. If emissions from these vehicles were underestimated due to cycle differences that staff did not reflect, it would tend to understate the benefits of the regulation.

10. Comment: We computed the HHD single unit fleet emission contribution for the fleet at 7,500 miles. At 7,500 miles, the fleet age is 12.7 years, the odometer is 231,183 miles, and the trip indicator average is 2.2 when removing vehicles listed as used primarily off-road. The low odometer is consistent with the low use nature of the vehicles. This has a significant effect on the deterioration contribution for emissions. The trip parameter suggests that the average trip is near 50 miles and confirms that the single unit MHD and HHD trucks have similar driving patterns. The table below provides the estimated inventories based upon appropriate weighted sums of the relevant variables. The VMT, NOx and PM are about 75% of those from ARB's analysis. The weighted emission factors are in good agreement. At equal VMT, the NOx emission would be 2.57 TRPD and the PM emission would be 0.12 TPD, and we reproduce the PM emission while NOx is underestimated by 9%. What is important is that we would have expected that the NOx and PM emission factors would have been 50% and 100% larger respectively mirroring the MHD calculations. (ARA1)

Table: HHD SU Fleet Data

	7500 Miles			
	ARB		ARA	
	NOx	PM	NOx	PM
VMT	122,180		91,322	
TPD	2.81	0.12	1.92	0.09
EF, g/mi	20.73	0.89	19.1	0.89
	Total Fleet			
VMT	3,410,860		3,410,860	
TPD	57.8	1.9	59.4	2.5
EF, g/mi	15.4	0.51	15.8	0.65

Agency Response: Without additional information on the specific methodology used to generate the above analysis, it is not possible to fully evaluate the claims discussed in comment 8 or 10.

When staff evaluated the impact of low mileage provisions, staff used VIUS to estimate the percentage of the total population and VMT that would be below the mileage threshold by model year. Because of the variability in mileage accrual rates within model year and category, staff did not think it useful to estimate differential odometer schedules between higher and lower mileage trucks.

11. Comment: The MHD fleet is a less significant contributor to the 2008 diesel truck emission inventory than the HHD fleet. The NOx and PM emissions from the entire

MHD fleet are about 15% of the total NOx and PM inventories attributable to on-road diesel trucks. The average California registered HHD tractor-trailer travels 55,000 miles per year in California compared to 29,000 miles for the average in-State single unit HHD truck and 23,400 miles for the average MHD truck. The average odometer value of the CA registered tractor-trailer HHD fleet is 696,000 miles compared to 339,000 miles for the HHD single unit truck fleet and 207,000 for the MHDD fleet. The in-state HHD tractor-trailer fleet is 8 years old compared to 8 years for the MHD fleet. The HHD-single unit truck fleet is 9 years old. (ARA1)

Agency Response: Several of the statistics reported in this comment are not consistent with ARB findings described in Appendix G. However, our analysis did identify that medium heavy duty trucks represent about 23% of vehicles covered by this rule, and generate about 15% of the NOx and PM2.5 generated by vehicles covered by this rule. Per mile emission rates as posted on our website show that medium heavy duty trucks emit fewer pollutants per mile than heavy duty diesel trucks of equivalent model years. Even so, medium heavy duty diesel trucks contribute significantly to overall heavy duty truck emissions both statewide and regionally, and are regulated under this rule for that reason.

12. Comment: Certain trucks have been regulated less severely or have been totally exempted even though they are higher emitters than MHD vehicles. Heavy heavy-duty drayage trucks travel 49,000 miles per year, are 12 years old and have accumulated 840,000 miles in their lifetime. Heavy agricultural trucks are 17 years old, travel 26,700 miles per year and have accumulated 601,000 lifetime miles. We estimate, the portion of the MHD fleet traveling 10,000 miles per year or less produce about 1 % of the 2008 NOx and PM heavy truck inventory and less than 2% at 15,000 miles. This seems inconsequential and from an economic perspective, very expensive NOx and PM to control. (ARA1)

Agency Response: It is true that different categories of vehicles are regulated differently under the proposed regulation. The regulation applies differently by fleet size, mileage thresholds, method of compliance, vocation, and many other factors. Several truck categories, such as public fleets, utility fleets, and drayage trucks are treated differently in this regulation because they are also regulated under separate ARB rules. Regulatory distinctions were made in areas where ARB staff felt they were warranted for cost and economic reasons. However it should be noted that nearly all vehicles, including drayage trucks, agricultural trucks, and other categories are all required to meet the same standard by the end date of the regulation in 2023.

13. Comment: The proposed rule does not consider the emission level per vehicle. The fewer the emissions, the greater the cost of emission control per unit. The table below shows that medium duty trucks are the lowest emitters per class and yet the regulation targets these with vigor equal to that for the heavy-duty fleet. The average truck in the HDV truck tractor fleet drives 2.5 times as many miles per year and emits 2 times as much per mile on average compared to the MHD truck.

Thus, the emissions per year for a typical HHD-TT are five times that of a typical MHD truck. (ARA1)

Comparative Emissions

		2008 NOx Data	
Fleet	Count	Tons/day	Tons/Truck/Yr
HHD-IRP	60,263	139.6	0.85
HHD-TT	63,684	194.1	1.11
HHD_SU	43,275	57.8	0.49
HHD_Drayage	21,650	70	1.18
HHD_Ag	11,998	17.3	0.53
MHD-In-state	198,525	125	0.23

Agency Response: On a per truck basis, medium-heavy duty trucks do emit less than heavy-heavy duty trucks due to lower emission factors, lower accrual rates and younger average fleet overall. However, the total emissions from medium-heavy duty trucks are a significant portion of the statewide inventory that ARB needs to regulate to meet SIP commitments.

14. Comment: Greater emissions reductions might be achieved by accounting for age and use in the rule. Lower use vehicles are penalized in the rule while higher use more polluting vehicles receive a benefit. Many medium heavy-duty vehicles are used relatively little. In the rental fleet, most trucks are 26,000 pounds and are used for non-commercial local trips that might involve moving or home repair. The average age of vehicles in the rental fleet is 6.5 years and the annual average miles accrued is 8,000. Eighty-six percent of the rental fleet is 10 years old or less and is more or less uniformly distributed with respect to age and 95% of the fleet is less than 16 years old. This supports a fleet model where the majority of the fleet is being turned over completely every 10-years and a small number of specialty vehicles are held for a much longer time or alternately that a small portion of the fleet was purchased used. For the rental fleet, the average fleet odometer for the 10-year old fleet is 48,196 miles. For the complete rental fleet, which includes delivery trucks as well as rental trucks the median odometer is 44,971 miles and the average odometer is 67,414 miles. In our survey sample, 68% of the rental vehicles accumulated 10,000 miles per year or less, 83% accumulated 12,500 miles per year or less and 88% accumulated 15,000 miles per year or less. These values confirm the consistent low-use nature of the rental fleet.

The 10-year portion of the fleet would be in averaging compliance naturally by 2017 as a result of rollover. In fact, this part of the fleet would always be in NOx compliance but would be out of PM compliance for 2013 through 2015. Similarly, the fleet fails BACT and percentage BACT. Thus, the rule would force rental truck fleets to add VDECS to vehicles that they intended to turnover in a few years anyway. Since the normal turnover of this fleet always provides considerable NOx averaging room, requiring filters could actually delay their turnover for cost recovery, resulting in increased NOx emissions in order to reduce PM. (ARA1)

Agency Response: The new emissions analysis and the adopted rule consider age and use in medium and heavy-heavy duty diesel trucks. In the emissions analysis, age and mileage accrual are considered explicitly, with medium heavy duty diesel trucks driving fewer miles than most other categories at an equivalent age. This is documented in Appendix G and the data posted on November 7, 2008. The rule itself has provisions based on fleet size and mileage thresholds to ease compliance requirements for low use vehicles. However, the regulation is also tailored to meet SIP emissions reduction targets and to reduce diesel particulate matter health risk. As such, emissions reductions are required of nearly all vehicles.

15. Comment: Deterioration of emissions with vehicle use is real but ignored in the rule. The emission factors, in reality, are functions of the odometer reading. Fleet data used by ARB (VIUS data) shows that annual miles and odometer readings are related, and low use vehicles have low odometer readings. Using Table 17 in Appendix G (page 37) from the Staff Report for this rule (Staff Report), the PM emission factors at 207,000-mile odometer (MHD average) and 48,000-mile odometer (10-year rental fleet average) are summarized below. This calculation points out how low use vehicles in general are penalized by the rule and high use vehicles benefit from the rule. Compliance costs are disproportionate shifted to low use fleets that do not produce as much emissions. In reality the low use fleet modeled in the table below produces 10% less NOx and 35% less particulate due to deterioration compared to the average fleet based on the same model year engine emission factors only without any adjustment for mileage.

NOx and PM Emission Factors at two Odometer Readings for MHD Vehicles - Table 17 Appendix G

MY	207,000 miles	48,000-Miles	Ratio
	NOx		
1990	16.3	15.6	0.96
1993	12.6	11.8	0.93
2005	8.9	7.7	0.86
	PM		
1990	1.753	1.213	0.69
1993	1.11	0.695	0.63
2005	0.386	0.258	0.67

This concept can be implemented in a number of ways so that low use fleets of MHD vehicles do not pay significantly higher compliance costs relative to other fleets by:

- Limited use exemption patterned after the agricultural vehicle exemption;
- Adding annual miles traveled into the averaging equation;
- Adding annual miles and odometer reading into averaging.

While adding annual miles and odometer into the averaging model would increase the complexity, it should be emissions neutral if the rule is based upon the proper average vehicle. (ARA1)

Agency Response: Deterioration is not ignored in the emissions analysis or the rule. As described in Appendix G, emission rates are a function of vehicle age and odometer, which vary by inventory category. Further, the analysis accounts for the sale of used vehicles as well as newer vehicles into inventory categories. This is reflected by differing annual mileage accrual and odometer schedules by inventory category that is documented in Appendix G. Our analysis, as described in Appendix G, demonstrates lower use vehicles are older on average than higher use vehicles across inventory categories. Low use vehicles are not penalized by the regulation. They are required to meet emissions standards in accordance with the regulation, which is based on many factors. Depending on the extent of mileage accrual, in many cases lower use vehicles are afforded additional compliance time than other similar vehicles subject to the regulation that drive more miles.

16. **Comment:** Your inventory of on-road equipment is not accurate! Your inventory of miles driven either does not exist or is completely inaccurate. Some companies like ours have two trucks per driver because the trucks are configured differently. This means only one truck is emitting PM or NOX at a time. CARB does not figure this out. (EGI)

17. **Comment:** Your equipment upgrade schedule does not take into account a truck's yearly mileage so therefore does not reflect the truck's contribution to air pollution. For example, three 1993 trucks: one travels 100,000 miles a year, one travels 25,000 and one 12,000. Which harms the air quality the most? The answer is #1 using common sense, but your calculations say all three [are the same]. Some companies like ours have two trucks per driver because the trucks are configured differently. This means only one truck is emitting PM or NOX at a time. CARB does not figure this out. So what does the above mean? We have replaced an older truck with a new 2007 truck but even this truck is facing a limited life. (EGI)

18. **Comment:** You should be able to consider that a truck that gets 1,001 miles is not same as one that gets 120,000 miles a year. Contractors' trucks are support equipment. They go out to the job and park. A parked truck does not emit. I don't care what year it is. It's not emitting. My trucks average eight to 10,000 miles a year. I have six trucks I get 60,000 miles a year. (DCI2)

Agency Response: ARB staff estimated an average of annual mileage accrual by truck age based on the Vehicle Inventory and Use Survey conducted by U.S. Census. There are vehicles that drive significantly more, or less, than the average annual mileage. Ideally, in developing emissions estimates, ARB staff would have access to detailed mileage information on each truck in California. However, in the absence of such information, staff must rely on average annual mileage accrual data from surveys such as VIUS. An older truck without retrofit diesel emission control device could emit 7 times or more diesel PM than one with control device, therefore, a relatively low mileage older vehicle could have much higher annual emissions than a higher mileage vehicle with control device. Balancing the emissions impact and usage, the rule exempts trucks driving less than 1000 miles a year and has replacement exemption for

trucks driving less than 7500 and 5000 miles a year for Class 8 and smaller, respectively.

d) Analysis of Regulatory Alternatives

19. Comment: Appendix N contains the most detailed discussion of the alternatives to the proposed regulation considered by CARB staff. Although it is not clear, it appears that the staff used either the same new methodology used to develop the baseline inventory and emission benefit estimates for the proposed regulation or a similar methodology. In either case, the methodology used by CARB staff to assess regulatory alternatives was not peer reviewed nor has the methodology used been fully disclosed to the public. Given that no peer review has been conducted and a complete review by the public was not possible given the staff's failure to disclose its methodology in a timely manner, the Board cannot rely on the staff's finding that no alternative is superior to the proposed regulation.

Further, because the complete methodology used by CARB staff was not disclosed in a timely manner during the 45-day comment period, the public was not given the appropriate opportunity to formulate and consider alternatives as it could not properly gauge the relative impact of any particular proposed change to the proposed regulation. (SRES2)

Agency Response: As noted above, ARB staff met on numerous occasions with interested stakeholders beginning almost two years prior to the Board Hearing. Staff also calculated emissions benefits for a range of scenarios proposed by industry representatives and shared the results of these analyses with stakeholders. Throughout the regulatory development process, ARB staff provided inventory analysis inputs and results to assist stakeholders in estimating benefits of the regulation. See also the agency response to Comments 2 and 7 regarding the 15-day period for comments on the emissions inventory database posted on the ARB's website on November 7, 2009.

e) Economic Forecasts and Impact of the Recession

20. Comment: In Appendix G, "Emissions Inventory and Methodology and Results," the development of two models—one to forecast future nationwide truck travel in units of "vehicle miles travelled" (VMT)[4] and the other to forecast future nationwide truck sales[5] – is described in general terms. The former was reportedly used to validate trucking industry VMT growth rates used by CARB staff in its emissions analysis and the latter was reportedly used to modify future-year heavy-duty diesel vehicle age and VMT distributions. Both trucking industry VMT growth and the modified future-year age and VMT distributions are critical components of the staff's emission inventory and emission benefit analyses.

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[4] See page G-46 and Figure 19

[5] See pages G-47 to G-52

Both the VMT and nationwide truck sales models are described as relying on forecast value of future "nationwide trucking GDP" and "nationwide transportation GDP." Although it cannot be discerned if these two GDP metrics are the same or different, they are reported to be based on the "the employment in the transportation sector predicted in the State of California Economic Forecast for the Sacramento Forecast Project" and "a UCLA business forecast released in July 2007," and references, including internet links that are purported to direct one to the forecast data, are provided.

The link to the "UCLA business forecast" indicates, however, that a minimum fee of $1,500 must be paid to access the forecast.[6] A request to CARB staff for access to view the forecast was reportedly referred to CARB legal staff for review; however, as of this date, access has not been provided. In contrast, neither the link to the Sacramento Forecast Project nor a review of the website performed in December 2008 reveals any data related to "employment in the transportation sector." Again, a request to CARB staff for access to these data was reportedly referred to CARB legal staff, but the data have not been explicitly provided.

To summarize, the economic data used by CARB to forecast both the baseline emission inventory and therefore the benefits of the proposed regulation are not available to the public and therefore can neither be reviewed nor commented on by the public as part of this rulemaking. It is therefore inappropriate for the Board to take action on the proposed regulation until such time all economic data used by CARB staff in its analysis of the proposed regulation have been made available for at least 45 days. (SRES2)

Agency Response: VMT growth rates in the inventory were derived from EMFAC2007 unless indicated otherwise for specific categories (e.g. drayage and agricultural trucks), as described in Appendix G. VMT growth rates were compared to national VMT estimates from the Bureau of Transportation Statistics as described in Appendix G, and the growth rate in California transportation employment as described by the State of California Economic Forecast Project was consistent with what was assumed for the inventory.

As described in Appendix G, the State of California Economic Forecast Project was used to corroborate growth assumptions adopted primarily from EMFAC2007; as such that economic forecast was not used for the inventory analysis. Transportation industry employment forecasts in the UCLA forecast were used to estimate future transportation sector gross domestic product for the pre-buy analysis as described in Appendix G. The UCLA forecast is subscription based and is routinely purchased by the state of California.

Both the State of California Economic Forecast Project and UCLA Forecast information have been made available on request,

[6] See *http://www.uclaforecast.com/contents/membership/membership.asp*

21. Comment: To the extent possible based on the limited information available regarding the new ARB methodology, Sierra Research has examined the potential impact of the current economic recession on future heavy-duty-vehicle emissions on baseline emissions. This analysis indicates that the impacts of the recession on the trucking industry may substantially reduce baseline emissions and calls into question the staff's conclusion that the proposed regulation – as opposed to one of the alternatives, including that proposed by DTCC – should be adopted. (SRES2)

22. Comment: CARB's baseline emission inventory analysis and regulatory benefit estimates do not account for the effects of the current economic recession on the trucking industry. Rather, the staff's analysis, which appears to be based on non-public June 2007 economic forecasts from UCLA, assumes that both heavy-duty diesel vehicle activity and trucking industry revenues will continually increase during the period from 2008 through 2023.[7] Given that this assumption is clearly invalid, it represents a fundamental flaw in CARB staff's analysis of the baseline emission inventory that affects the need for, the benefits of, and the cost and cost-effectiveness of the proposed regulation. In light of this, the Board cannot make an informed decision regarding the adoption of the regulation and should instead defer consideration until such time that CARB staff has performed a proper analysis that reflects current and future economic realities.

In order to demonstrate the possible impact that the current economic recession could have on emissions from on-road, heavy-duty diesel vehicles and the need for the proposed CARB regulation, Sierra Research performed an analysis based on the assumptions outlined below:

(1) Trucking industry revenues fall by 10% in 2008 relative to CARB's estimates and by another 10% in 2009, which, using CARB's methodology, equates to a 7% reduction in VMT relative to CARB's 2008 assumption and a 14% reduction in 2009, again relative to CARB's 2008 assumption.

(2) Trucking industry revenues begin to grow again from 2010 to 2012 such that there is a 1% per year increase in trucking industry VMT, and a 2% per year increase in drayage truck activity in the Los Angeles and San Francisco Bay areas.

(3) For 2013 to 2025, trucking industry revenues grow at the same VMT growth rates assumed by CARB as published by CARB in Table 21 of Appendix G.

The actual VMT assumptions used in the analysis are shown in Table 1 as a function of the different vehicle categories embodied in the CARB inventory analysis. Values of 1 across all years in Table 1 indicate that no changes were made to the activity levels assumed by CARB staff for these categories. For example, school bus, other bus, utility vehicle, and agricultural vehicle activity was not assumed to change from CARB staff's estimates in this analysis. It is important to note that the other values indicated in Table 1 are the ratio of VMT in that year

[7] See Appendix G to the CARB Initial Statement of Reasons and Technical Support Document – in particular, pages G-44 to G-46, Table 21, and Figure 19.

relative to CARB staff's 2008 VMT estimate for that category, not the CARB staff estimate for that category in that year.

A comparison of CARB's VMT assumptions for Heavy-Heavy-Duty Diesel Truck (HHDDT) vehicles engaged in line-haul activity versus those assumed in our analysis is shown in Figure 1 below. The values assumed here are labeled as "DTCC." As shown, CARB's VMT levels are higher (and imply far greater trucking industry revenues) relative to the DTCC assumptions. By 2023, CARB assumes that trucking industry activity will have increased by 50% relative to its assumed 2008 levels. In contrast, the DTCC values indicate an increase of about 20% in 2023 relative to CARB staff's assumed 2008 activity level.

With respect to Assumption 1, the exact magnitude of the impact of the current economic recession on the trucking industry is not known nor do there appear to be any detailed estimates that are currently available. However, the limited sources of available data provide support for Assumption 1.

One source of available data is California taxable Diesel fuel sales volumes published by the California Board of Equalization (BOE). The most recent data are through August 2008.[8] The BOE data show that taxable sales of Diesel fuel in California for the period January through August 2008 total 1.89 billion gallons compared to 2.05 billion gallons for the period January through August 2007. This represents a decline of 8% that would be expected to translate directly to 8% lower Diesel vehicle activity in the state. The California Diesel fuel sales drop for the latest month, August, is an even more dramatic 14%. Another source of data are trucking miles logged in California by tractors operated by a major interstate trucking firm, as provided by that firm to the California Trucking Association. For the period from January to October 2008, total California mileage for this firm was approximately 12% lower than for the period from January to October 2007.

These two sources of data independently indicate that there have been substantial reductions in trucking industry activity in California during 2008 and that those reductions are of the same order as those postulated in Assumption 1. In addition, there seems to be little doubt that the current economic recession will deepen and persist well into, if not throughout, 2009, which also supports Assumption 1.

Using the VMT adjustments from Table 1 below, the CARB emission inventory spreadsheet was modified to compute adjusted calendar-year VMT estimates for each vehicle category. These adjusted VMT values were then divided by those assumed by CARB staff for purposes of computing the baseline emission inventory, and the resulting ratio was applied to CARB's estimated baseline NOx and PM emission inventories for each category. These category-specific estimates were then summed for each calendar year to arrive at a total inventory value adjusted to reflect the assumed impact of the current economic recession.

[8] See *http://www.boe.ca.gov/sptaxprog/reports/Diesel_10_Year-Report.pdf*

The results of the current analysis are summarized in Figures 2 through 4 below. First, Figure 2 presents CARB's assumed daily on-road heavy-duty Diesel vehicle VMT as well as that resulting from the DTCC assumptions discussed above. As shown, the CARB assumptions, which do not take into account the current economic recession, show a continuous increase in VMT over the entire period from 2008 through 2023. In contrast, the DTCC assumptions show a downturn in VMT in 2008 and 2009, which then levels off and increases thereafter.

The impact on baseline NOx emissions from substituting the DTCC VMT assumptions can be seen in Figure 3, where the DTCC baseline estimates are compared to both the CARB baseline estimates as well as CARB's estimates of NOx emissions with the proposed regulation in place. Baseline cases are denoted as "no regulation" or "NR" in the figure and the "with regulation" case as "WR."

As shown and expected, the DTCC baseline falls far below the CARB baseline through the period from 2008 to 2023. As is also shown and perhaps less expected, however, the DTCC baseline falls below CARB's with-regulation inventory until 2013, and after that the difference between the DTCC baseline and the CARB with-regulation inventory is on the order of 20 to 40 tons per day in statewide NOx emissions. In contrast, the difference between the CARB baseline and the CARB with-regulation inventory over this period is on the order of 80 to 125 tons per day of NOx emissions. Further, if one compares the changes in NOx emissions over the period from 2008 to 2023 attributed to the proposed CARB regulation to those resulting only from the DTCC baseline adjustment, one finds that the baseline adjustment leads to total NOx emissions that are 92,000 tons lower than with the proposed regulation based on CARB's staff's analysis. In other words, absolute NOx emissions over the period from 2008 to 2023 are lower under the DTCC baseline than CARB staff currently estimates would be the case with the proposed regulation in place.

Figure 4 presents a similar analysis for PM emissions. As shown, emissions for the DTCC baseline case are considerably lower than those associated with the CARB baseline. In this case, however, PM emissions are reduced further relative to the CARB baseline by the CARB regulation than by the DTCC baseline. However, over the period from 2008 to 2023, the DTCC baseline adjustment alone accounts for more than 50% of the emission reductions currently being attributed by CARB staff to the proposed regulation.

As noted above, the data presented in Figures 1 through 4 are based on one set of assumptions made by Sierra Research. Clearly, other assumptions could be made that could lead to different results. However, it is unlikely that any set of reasonable assumptions would lead to a conclusion different from the one reached by Sierra Research, i.e., that the current economic recession will lead to a baseline heavy-duty Diesel emission inventory that is lower than that contained in the regulatory documents.

First, it must be noted that VMT for any given group of vehicles is determined by the number of vehicles in the group and the number of miles travelled by each individual vehicle. Therefore, a reduction in VMT implies either a reduction in the

number of vehicles operating or a reduction in the number of miles travelled by each vehicle, or both. Conversely, an increase in VMT implies either an increase in the number of vehicles in operation, an increase in the number of miles traveled, or both.

As shown above, the available data indicate that the recession is causing a drop in trucking VMT but it is not clear whether one or both of these factors is responsible. Because CARB staff did not release the methodology used to develop the baseline inventory in a timely manner, Sierra has been forced to assume that there is a uniform percentage reduction in VMT across all model years of trucks. This has several implications, the most important of which is that it is likely to disproportionately reduce the VMT attributed to the newest, lowest- emitting vehicles in the trucking industry, which means that the Sierra analysis likely underestimates the impact of the recession on the trucking industry. In actual practice, it is likely that VMT reductions would preferentially occur in the older, higher-emitting portion of the trucking fleet. Furthermore, once the recession ends and VMT begins to increase, it is likely that the increase will occur through the purchase and operation of new, low-emitting, trucks, rather than through an increase in the use of older trucks. Unfortunately, because of CARB staff's failure to release information related to its emission methodology in a timely manner, neither effect could be modeled by Sierra.

In order for the impact of the recession to lead to higher emissions than CARB staff has modeled for the baseline inventory, either VMT or the average emission rate associated with trucking industry, or both, would have to ultimately increase from the baseline due to the effects of the recession. Why either would be expected is not clear and has not been established, although, as discussed above, there is already evidence that the recession is causing a reduction in trucking VMT. (SRES2)

Table 1 - VMT Adjustment Factors Used in DTCC Analysis (See Text for Explanation)

CARB Vehicle Category	YEAR															
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other Buses	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Power Take Off	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
School Bus	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MHDDT Agriculture	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MHDDT CA International Registration Plan	0.93	0.86	0.87	0.88	0.89	0.90	0.91	0.93	0.94	0.96	0.98	0.99	1.01	1.02	1.04	1.06
MHDDT Instate	0.93	0.86	0.87	0.88	0.89	0.90	0.91	0.93	0.94	0.96	0.98	0.99	1.01	1.02	1.04	1.06
MHDDT Out-of-state	0.93	0.86	0.87	0.88	0.89	0.90	0.91	0.93	0.94	0.96	0.98	0.99	1.01	1.02	1.04	1.06
MHDDT Utility	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
HHDDT Agriculture	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
HHDDT CA International Registration Plan	0.93	0.86	0.87	0.88	0.89	0.91	0.93	0.96	0.98	1.01	1.04	1.06	1.09	1.12	1.15	1.18
HHDDT Non-neighboring Out-of-state	0.93	0.86	0.87	0.88	0.89	0.91	0.93	0.96	0.98	1.01	1.04	1.06	1.09	1.12	1.15	1.18
HHDDT Neighboring Out-of-state	0.93	0.86	0.87	0.88	0.89	0.91	0.93	0.96	0.98	1.01	1.04	1.06	1.09	1.12	1.15	1.18
HHDDT Drayage at Other Facilities	0.93	0.86	0.87	0.88	0.89	0.90	0.91	0.93	0.94	0.96	0.97	0.99	1.00	1.02	1.04	1.05
HHDDT Drayage in Bay Area	0.93	0.86	0.88	0.89	0.91	0.96	1.01	1.07	1.13	1.19	1.25	1.32	1.39	1.46	1.54	1.62
HHDDT Drayage near South Coast	0.93	0.86	0.88	0.89	0.91	0.96	1.00	1.05	1.11	1.16	1.22	1.28	1.34	1.41	1.48	1.55
HHDDT Singleunit	0.93	0.86	0.87	0.88	0.89	0.91	0.93	0.96	0.98	1.01	1.04	1.06	1.09	1.12	1.15	1.18
HHDDT Tractor	0.93	0.86	0.87	0.88	0.89	0.91	0.93	0.96	0.98	1.01	1.04	1.06	1.09	1.12	1.15	1.18
HHDDT Utility	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Figure 1

Comparison of CARB and DTCC VMT Estimates for HHDDT Used in Line-Haul Service

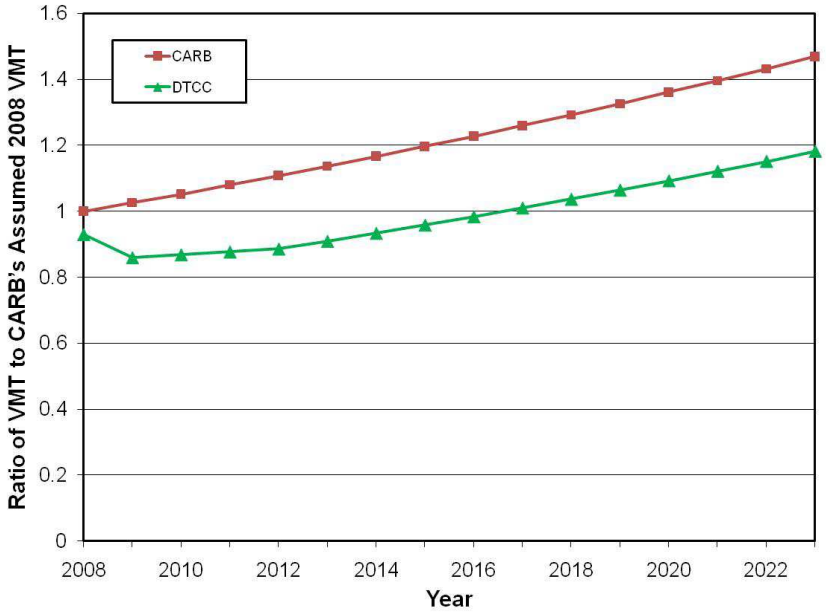


Figure 2

Comparison of CARB and DTCC Baseline California VMT Assumptions for On-Road HDDVs

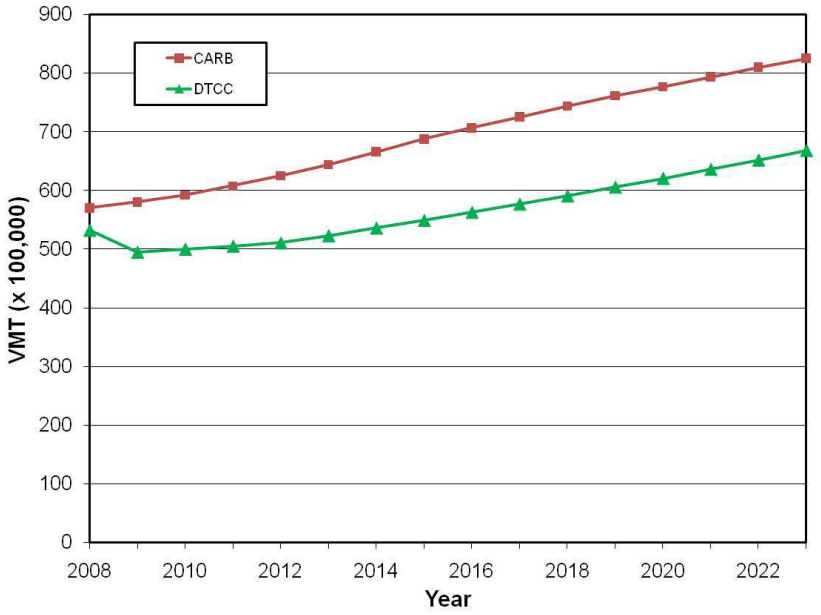


Figure 3

Comparison of Statewide On-Road HDDV NOx Emission Inventories for the CARB Baseline, DTCC Baseline, and CARB With-Regulation Cases

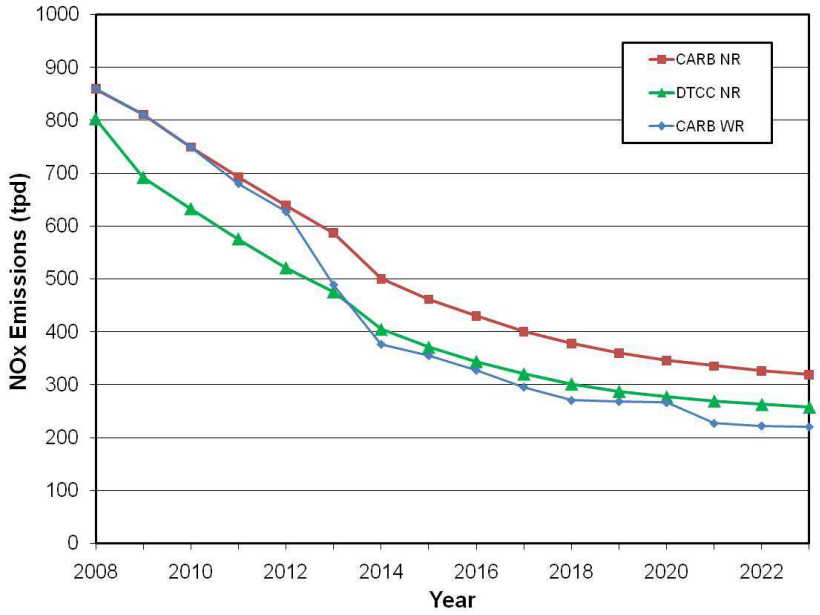
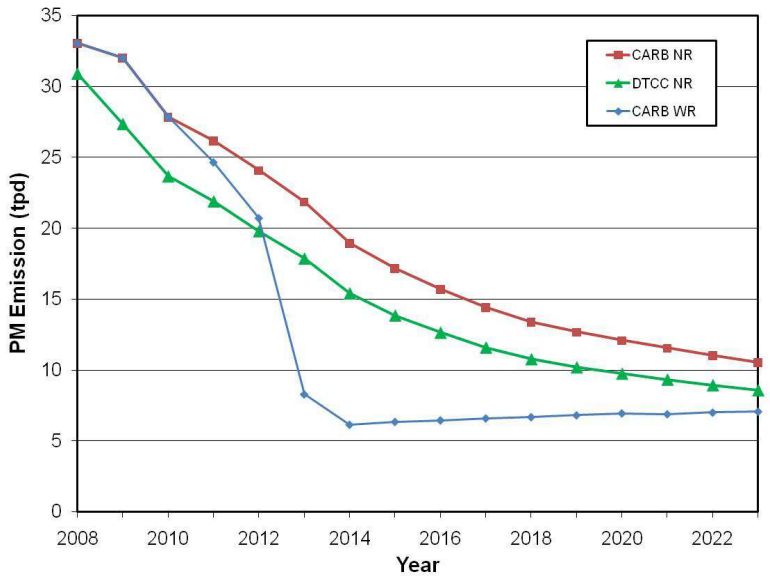


Figure 4

Comparison of Statewide On-Road HDDV PM Emission Inventories for the CARB Baseline, DTCC Baseline, and CARB With-Regulation Cases



23. Comment: All of the benefit estimates that have been presented are based on an assumption that we're not undergoing a recession of historic magnitude. The question is how big might the impact of this recession be on emissions from the trucking fleet in California? I've made some assumptions to check this out. I've looked at diesel fuel sales as reported by the Board of Equalization in the State of California. They're down 8 percent so far this year. I assumed they'd be down another 8 percent for next year, there'd be a slow economic recovery thereafter, picking up steam as we move from 2012 onward. This is the NOx emissions inventory The red line at the top is what's in your staff's assessment, the blue line is their assessment of the benefits of the regulation, and the green line is the impact of making these changes in VMT assumptions for the base line that I've just mentioned to you. As you can see, the potential magnitude of the VMT impact is as big as the effect of the regulation. [The graph that the commenter is referring to was submitted during oral testimony. It is identified as Comment 17 of the comments presented on the day of the Board Hearing and is posted on the comments log for this rulemaking at http://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=truckbus08. The graph is not reproduced here since it is the same as Figure 3 above submitted by commenter SRES2.] I've got two points to make here. My analysis has been done based on assumptions. Your staff may have some other assumptions that may not agree with mine. These are all going to be assumptions. There's been no rigorous analysis done of the impact of this economic situation on VMT in the truck industry or emissions. That needs to be done before you adopt a regulation. Therefore, I would urge you to get that assessment - this is a $5 billion regulation that, as you've heard, may affect the livelihoods of thousands of people - before you make that decision. I'm not saying don't adopt a regulation. I'm saying look at the proposed regulation and the alternatives in light of a base line that reflects today's economic reality. (SRES4)

Agency Response: Clearly the economic recession is having a major impact on California's economy and more specifically the trucking industry in California. There is no doubt that economic indicators, economic forecasts, and fuel sales have over the past year shown a downward trend. The extent of the downward trend varies with the indicator, and looking at different indicators can provide insight, but not necessarily a complete answer to how trucking activity and emissions are being affected.

The emissions inventory analysis developed for this rule was never intended to account for economic cycles. The ARB in its emissions forecasts has always relied on generalized average VMT growth estimates which in the case of cars and trucks are provided by local transportation planning agencies to ARB, and integrated into EMFAC when it is updated. Growth estimates used for the Rule emissions analysis came from EMFAC2007, and were updated to provide general growth estimates for selected categories like drayage and agriculture, where more category specific growth rates were available. These growth estimates were designed to reflect long-term average growth across normal fluctuations of the economic cycle. There is no doubt the current

economic recession exceeds recent historical economic fluctuations; however, current economic conditions do not validate or invalidate assumed long-term economic trends.

At the December 2008 Board Hearing, staff were directed by the Board to return in one year and provide an update on the implications of the economic recession for the trucking industry and implementation of the rule. Staff is currently evaluating a variety of additional data sources with the intention of providing an update to the Board in December 2009.

24. **Comment:** High economic uncertainty suggests ARB should revisit emissions forecasts. CTA requests that CARB include in its deliberations a recalibration of its emissions forecasts, including those incorporated in its recent State Implementation Plan. There is no question that the reduced economic activity associated with the current crisis will have an impact on emissions associated with freight movement. What is extremely unclear at this point is the length of time economic activity will be depressed and the extent to which it will be depressed. Given the high amount of uncertainty about the future, CTA requests that CARB consult with independent economic experts and convene a public process to develop a set of agreed-upon alternative future economic scenarios that would bound likely possible futures and use these scenarios to revisit its emission assumptions and its need to impose rules as severe as those currently under consideration. (CTA2)

25. **Comment:** DTCC is very concerned that the baseline emissions inventory data crafted by ARB staff does not adequately consider the impact the current recession on emissions inventory. Sierra Research has undertaken an analysis of the ARB findings at the request of DTCC and found that the recession may have a significant impact on the baseline emissions used to justify the proposed rule. Sierra Research has also raised concerns based on the fact that ARB staff analysis of the baseline emissions, the emission benefits and the economic impacts rely on methodologies that are not available for public review, in addition, the ARB analyses have not been peer reviewed and, as such, provides only limited credibility for adoption of the proposed rule. (DTCC2)

Agency Response: See response to comments 22 and 23.

26. **Comment:** The cumulative effect of these regulations combined with the economic downturn and subsequent credit crisis is already taking a severe toll on the construction, trucking and other business sectors. In fact, according to Avondale Partners, a record 127,000 heavy-duty tractors have already been removed from trucking fleets across the nation this year, many of these here in California. In addition, through the third quarter of this year, almost 3,000 trucking companies nationwide have declared bankruptcy. During our recent meeting you expressed your interest in working with us to quantify these emissions reductions in California. We also discussed the possibility that these early reductions could be reflected in the baseline calculations for the proposed rule. (DTCC1)

27. Comment: Our company is producing less than half the concrete that it was producing in the past. Emissions have already been drastically reduced because our vehicles usage has been cut in half [due to the bad economy]. (ARMC)

Agency Response: See response to comments 22 and 23.

f) Fuel Economy and Greenhouse Gas Impacts

28. Comment: Actual 2007 model year HHD truck tractors with high horsepower (400-500 hp) engines have shown lower fuel economy than older trucks including pre-1995. Actual fuel economy for 2007 HHD trucks has been measured as low as 4.15 miles/gallon while the remainder of the older trucks in the fleet (1977-2006) averaged 4.7 miles/gallon (personal communication, Ed Walker, Robinson Enterprises, Inc., Nevada City, CA)(PP G-41 through G-43).

According to Sierra Pacific Industries (personal communication), part of the reason for the poor fuel economy on new trucks is due to the DPF. The DPFs that "work" are those found on 2007's with Cummins and Detroit Diesel engines. These engines have passive filters but include a direct diesel fuel line to the filter, an exhaust temperature sensor, and an igniter in the filter. When exhaust temperatures are insufficient for the filter to passively burn off collected soot "on-the-fly", fuel is automatically injected into the filter and ignited to burn off the soot. One 2007 truck, that has 154,000 miles on it, has used 1,200 gallons of diesel that was directly injected into the filter; about 4 percent of total fuel consumption. It's unclear if CARB staff have accounted for this in their fuel economy and emissions calculations. (CFA1)

29. Comment: Replacement trucks will generally be less fuel efficient than the vehicles they replace, increasing our greenhouse gas footprint in California. Furthermore, this rule will redirect capital resources away from a strategy that has resulted in a 20% improvement in the fuel efficiency of our fleet. Finally, replacing trucks prior to the end of their useful life gives rise to avoidable environmental impacts that are associated with the manufacture of new vehicles." (FEDEX)

30. Comment: We track our fuel pretty closely. Our fuel consumption is about 25 percent greater with the new trucks (2007 and newer). This means more carbon in the atmosphere which is in direct conflict with the greenhouse gas measure you passed yesterday. I haven't seen any analysis from staff on what the regulation actually does with greenhouse gas and other things. (KRCORP)

Agency Response: ARB staff did account for the loss of fuel efficiency due to DPFs. In Table 20 of Appendix G, staff estimated and recognized a 3 percent loss in fuel economy. However, the local and immediate benefit of diesel PM reduction outweighed additional carbon dioxide emissions. Staff expect that fuel economy will improve with future model year trucks due to the addition of NOx control technologies, which allow air-fuel ratios to be adjusted for better fuel economy. In addition, staff anticipates that fuel economy will likely increase in the future due to improvements in engine combustion efficiency, drive trains and transmissions, as well as overall vehicle aerodynamics.

31. **Comment:** The owner-operators' newsletter says all the 2007-08 trucks are getting less fuel mileage than the old manual motors. So, I don't know how it's going to help anyone if I have to burn that much more fuel a year to pay for the truck that's going to fall in compliance with your rule. (STRT)

Agency Response: See response to comments 28 to 30. While 2007 technology trucks burn slightly more fuel per mile than most older vehicles, the diesel particulate filter and other engine technology improvements generate very significant reduction of NOx (70% reduction from pre 2004 engines) and PM2.5 (90% reduction from older electronically controlled engines). The regulation will achieve major NOx and PM2.5 emissions reductions from trucks, which will help California to attain federal air quality standards and health risk reduction goals.

32. **Comment:** CARB estimates of CO_2e are strictly based on fuel economy. At least for forestry fleets, 2007 trucks have shown to have up to 10% poorer fuel economy than the older trucks in the fleet. CARB assumes just the opposite (pages G-40 through G-42). CARB also provides no analysis of the fossil fuel energy requirements of producing more new trucks than fleet owners would otherwise purchase if the rule did not exist.

    CARB estimates turnover rates will need to be about 12.5%/year while at least for rural counties, fleet owners historically have turned over trucks at about 4 percent/year. Because California only includes in-State emissions in their annual inventory, the true total fossil fuel energy requirements are distorted because there are no raw material (steel, aluminum, rubber,) manufacturing facilities in California to produce the steel, aluminum, rubber, ... that it takes to manufacture new trucks. (CFA1)

Agency Response: ARB staff analysis recognized the loss in fuel economy due to DPF for 2007 trucks as shown in Table G-20 of Appendix G and discussed above.

The comment is correct in that ARB did not perform a life cycle analysis of producing more trucks. The regulation has provisions that delay replacement of vehicles past 2013, when the NOx requirements begin. Vehicles operating exclusively in the less polluted areas of the state, identified in the regulation as NOx exempt areas, are exempt from the turnover requirements (NOx BACT) until 2021. Also, logging trucks and many others in rural areas will be exempt form any NOx requirements and would not need any replacements until 2021.

We do not expect the turnover rate due to the regulation to result in a significant difference in the number of trucks operating in the U.S. and consequently, we do not expect the replacement of vehicles to comply with the regulation to result in life cycle greenhouse gas emissions significantly above that expected with normal turnover. As stated in Chapter VIII Section C of the TSD, between 2010 and 2014 when demand will be highest, the number of vehicles purchased annually as a result of the regulation is expected to be about, 7,000 new and 13,000 near-new used vehicles having engines that are 5 years old or newer. Compared to the 350,000 new medium and heavy

heavy-duty vehicles sold annually in the U.S., 7,000 is a small number and the effect on supply and demand and prices in the market would be small. As a result of the California used trucks being made available, other fleets would be expected to delay new truck purchases. We expect that the vehicles sold out of California will continue to operate for their remaining useful lives. Only to the extent that vehicles are scrapped early would there be an increase in the number of trucks needed. This is expected to be a negligible effect.

33. Comment: The other thing is that you need to consider is the synergistic effect with AB32. And that's not evident in the document on the diesel in-use rule. You need to take into account the effects of VMT and changes in fuel composition from AB32. (AEG2)

Agency Response: ARB staff recognizes the need to account for the effect of AB32 in implementing the statewide truck rule and is doing so as specific GHG emission reduction measures are developed. For example, the rule as proposed quantifies the GHG emission reductions associated with the statewide truck and bus rule, as well as the related rule to reduce GHG emissions from heavy-duty trucks through aerodynamic and other improvements.. As other ARB rules and measures related to AB32 are developed, ARB staff will consider their impacts on the statewide truck and bus rule.

g) General

34. Comment: Emission benefits are being given away for "low use" interstate trucks. We believe that providing low mileage exemptions for trucks whose primary business is interstate is not warranted. In fact, it is hard to envision IRP trucks that are economically viable that travel under 7500 miles per year. Such a finding should not violate the spirit of the Interstate Commerce Clause because local trucks like most MHD and short use HHD trucks do not compete with interstate or even in-state motor freight carriers. (ARA1)

Agency Response: The NOx exemption provision for heavy-heavy duty trucks which operate less than 7,500 miles per year applies equally to California registered and out-of-state registered trucks to ensure a fair playing field under the regulation.

35. Comment: We have one truck and cover all 48 states. We have been caught in rush hour in various California cities where every vehicle in sight has its engine running just like the trucks do. Are you telling me that the only vehicles that emit toxins are trucks? (NBUT)

Agency Response: All vehicles emit toxins, whether they are cars or trucks, but the magnitude of their emissions is significantly different. Unlike cars which have aftertreatment devices such as catalytic converters to reduce NOx and other associated pollutants from their engines, heavy duty trucks are not currently well controlled. This makes trucks much more polluting on a per vehicle basis than cars; with trucks the largest single source category of NOx emissions and the most important contributor to diesel particulate related health risk in California. Of the more than 200 compounds considered to be air toxics, diesel particulate accounts for more than 70% of the health

risk in California. The majority of cars are gasoline fueled while most trucks are diesel fueled. For this reason alone, trucks are a disproportionately greater health risk.

36. Comment: I run a diesel repair shop and see everyday how clean we can get these trucks to run to reduce PM levels. As for NOx, technology has not come out yet for this reduction so how can you reduce it? Cars are just as much to blame as trucks specially because there are 10 times the cars on the road than trucks. Thirty percent of cars are pre 1995 but the ARB denies this. (MFLE1)

Agency Response: The 2007 truck technology is 70% cleaner for NOx and 90% cleaner for PM than an uncontrolled truck engine (pre-1994 model year). The 2010 truck technology is more than 90% cleaner for NOx than an uncontrolled engine. The adopted rule will require more rapid penetration of these technologies into California's truck fleet, which will lead to major emissions reductions. ARB's emissions inventory indicates that trucks are the largest single source category of NOx in California, and the largest single source category contributor to diesel health risk. Even though there are many more cars on the road than trucks, emissions from trucks are higher than cars in the aggregate, especially when weighted for health risk. This is because cars have been regulated for more than three decades, leading to highly efficient and effective emissions control equipment that has led to drastic emissions reductions from cars over the past two decades. In addition, the particles emitted by passenger cars are in general significantly less toxic than those emitted by trucks since most cars are gasoline, rather than diesel, fueled. The Truck and Bus Rule is necessary because trucks have a much longer lifetime than cars, and a complete fleet turnover to the 2010 technology trucks in the absence of regulation could take 20 years or more. See also the responses to Comments 1 through 8 in the section "Need for Emissions Reductions" where we discuss the need to reduce risk from diesel PM emissions and the need to meet ambient air quality standards.

37. Comment: The serious fires in California this past summer created more pollution in a few months than all of our trucks will, left as they are over the next 10 to 20 years. (RWT)

Agency Response: There is no doubt that wildfires are a significant source of air pollutant emissions. When fires occur they cause dramatic, most often localized, shorter term impacts to air quality. The Air Resources Board is working with other state agencies to reduce emissions from all sources of air pollution, including wildfires and controlled fires. However, to meet air quality goals, all sources of emissions, both natural and manmade, must be controlled to the extent possible.

Trucks and buses are the single largest source of NOx emissions both statewide and regionally in California, and is the largest source of diesel particulate matter health risk. These emissions impact public health in California every day and are a significant, consistent contributor to degraded air quality. To meet air quality standards, controlling these vehicles in paramount.