Attachment 1: Description of Emission Reduction Measure Form

Please fill out one form for each emission reduction measure. See instructions in Attachment 2.

Title: Heavy-Duty Vehicle Speed Reduction

Type of Measure (check all that apply):

- [x] Direct Regulation
- [ ] Market-Based Compliance
- [ ] Monetary Incentive
- [ ] Non-Monetary Incentive
- [ ] Voluntary
- [ ] Alternative Compliance Mechanism
- [ ] Other Describe: **Enforcement**

Responsible Agency: ARB and Legislature

Sector:

- [x] Transportation
- [ ] Electricity Generation
- [ ] Other Industrial
- [ ] Refineries
- [ ] Agriculture
- [ ] Cement
- [ ] Sequestration
- [ ] Other Describe:

2020 Baseline Emissions Assumed (MMT CO2E): CO2 emissions of Heavy Duty Class 8 long-haul combination trucks in 2020 when operating at highway speeds are estimated to be 13 MMTCO2E

Percent Reduction in 2020: Reducing speeds from 65 mph to 60 mph could result in a savings of approximately 8.5%, or 1.1 MMTCO2E

Cost-Effectiveness ($/metric ton CO2E) in 2020: The cost is likely to be negative given the fuel savings associated with reduced highway speeds. However, cost to improve enforcement or compliance with possible regulatory measures are not accouted for. Additional analysis is needed to better determine cost efectiveness.

Description:
To reduce CO2 emission from long haul trucks operating in California, the California HIghway Patrol could improve enforcement of the 55 mph speed limit for trucks. In addition, ARB could implement regulatory requirements for trucks in California to be equipped with a speed governor which limits maximum speeds.

California has maintained a 55 mph speed limit for trucks while passenger car limits have increased to 65 or even 70 mph. As is apparent to most motorist traveling highways in California, trucks commonly exceed the 55 mph speed limit. By doing so, fuel efficiency is significantly impacted. Enforcing a 55 mph speed limit on trucks, or requiring speeds to be governed by tamper proof devices on truck operating in CA, significant CO_2 reductions may be achieved.

Emission Reduction Calculations and Assumptions:

Calculation Assumptions:

The following is a description of calculations for estimating the impact of reducing truck highway speeds from 65 mph to 60 mph. These estimates are based on numerous assumptions about average vehicle activity, speeds, and fuel use. A more detailed analysis is needed to determine more accurately the potential benefits of improving enforcement of California 55 mph truck speed limit and the potential benefits of installing speed governors on heavy-duty trucks. The following analysis is a cursory examination of the potential benefits.

Baseline Emissions

Class 8 fuel use by Heavy-Duty Trucks in 2020 was determined by running EMFAC 2007. Fuel use is determined to be 9,484,970 per day for HD Class 8 fuel consumption. Using the CO_2 per gallon of distillate fuel (10,149g of CO_2 per gal of distillate) used in the Draft ARB Greenhouse gas emissions inventory [4], total CO_2 emission from HD trucks in 2020 is projected to be 35 MMT CO2E.

Applicable VMT

Using the national US Census Bureau Vehicle In-Use Survey data from 2002 [3], it was determined that 49 percent of Class 8 VMT is from combination trucks with an operating range more than 200 miles.

These vehicles represent long haul trucks that typically operate the majority of their miles at highway speed.

Percent of time operating at highway speeds

Class 8 combination trucks operating with a range greater than 200 miles operate a large percentage of the time at highway speeds. In DOE 21st Century Truck documentation [2], a heavy-duty drive cycle was used to estimate fuel economy for trucks. This drive cycle contained highway speeds 65 percent of the time. In evaluating fuel economy improvements of heavy-duty trucks, a line-haul drive cycle with approximately 70% of time spent at highway speeds was used by Bachman, et.al [5]. An analysis by ICF consulting [1] uses an estimate of 90% of VMT occurring at highway speeds for class 8 long-haul combination trucks.

Additionally, the speed profiles in EMFAC2007 show that all Class 8 trucks travel at highway speeds anywhere from 14% (during rush hour) to 50% of the time. This includes all class 8 trucks, and not just long-haul combination trucks.

For this analysis, we assume that Class 8 combination trucks with operating ranges greater than 200 miles operate 75% of their VMT (and 75% of fuel consumption occurs) at speeds of 65 mph. More analysis and data collection needs to be done to determine what average HD trucks speeds are during freeway driving and the amount of fuel burned at these speeds to generate a more accurate estimate of fuel consumption and potential benefits.

Fuel Economy benefit of reduced speeds

DOE modeling shows an approximate 10% improvement in fuel efficiency when reducing Class 8 speeds from 70 mph to 65 mph. Modeling in [1] shows about a 9% improvement in fuel economy when reducing speed from 65 to 60 mph.

We assume a 9 percent improvement in fuel economy (or, equivalently, a 8.45 percent reduction in gallons per mile) for reducing highway truck speeds to 60 mph from 65 mph. However, additional analysis and a more thorough review of the literature should be performed to better determine the average improvement in fuel efficiency from reducing highway speeds.

Savings in 2020

To calculate the savings of better enforcement of California's 55 mph truck speed limit, we calculate the amount of fuel burned operating class 8 combination trucks with ranges greater than 200 miles in California. We then apply an 8.45% savings to determine the overall fuel savings from reduced highway speeds. These fuel savings are then converted to equivalent CO2 emissions

Baseline Fuel

Fuel burned at 65 mph = Class 8 Fuel Consumption * Combination Truck VMT * percent at highway speeds

= 9.5 million gallons per day * .49 * .75

= 3.5 million gallons per day

Baseline CO2

=3.5 million gallons per day *365 days/year*10.15kg/gallon distaillate*1 MT/1000 kg * 1/1x10^6

=13 MMTCO2E

Fuel Savings

Fuel Savings = Fuel burned at 65 mph * Percent reduction from reduced speed

= 3.5 million gallons per day * 8.45%

=296,000 gallons fuel saved per day

CO2 Savings

Annual CO2 savings in 2020 = 296,000 gallons per day *365 days/year*10.15kg/gallon distaillate*1 MT/1000 kg * 1/1x10^6

= 1.1 MMTCO2E

Constants:
10,149 g (i.e. 10.15 kg) of CO_2 per gal of Distillate [4]

Sources

[1] Ang-Olson and Schroeer, "Energy Efficiency Strategies for Freight Trucking: Potential Impact on Fuel Use and Greenhouse Gas Emissions".
[2] US Department of Energy, "Technology Roadmap for the 21st Century Truck Program", December 2000.
[3] US Census Bureau, Vehicle In-Use Survey (VIUS), 2002.
[4] CA Air Resources Board, "Draft Documentation of California's Greenhouse Gas Emissions", http://www.arb.ca.gov/cc/ccei/inventory/1A3b_OnRoad_Alldieselvehicles_Fuelcombustion_Distillate_CO2.htm
[5] Bachman, L. Joseph, Anthony Erb and Cheryl Bynum, "Evaluating Real-World Fuel Economy on Heavy-Duty Vehicles using a Portable Emissions Measurement System", 2005. SAE 2006-01-3543
[6] Bachman, L. Joseph, Anthony Erb and Cheryl Bynum, "Effect of Single Wide Tires and Trailer Aerodynamics on Fuel Economy and NOx emissions of Class 8 Line-Haul Tractor-Trailers", 2005. SAE 05CV-45

Cost-Effectiveness Calculation and Assumptions: Given the significant fuel saving from reducing highway speeds, the dollar per ton of CO_2 reduced is expected to be negative. However, the cost of improved speed enforcement or compliance with regulatory requirements will have an associated cost. These cost were not determined as part of this analysis.

Further evaluation is needed to determine the cost-effectiveness of this proposal.

Implementation Barriers and Ways to Overcome Them:

Potential Impact on Criteria and Toxic Pollutants: Results from [6] show that improved fuel economy of heavy-duty trucks is correlated with a reduction in NOx emission rates. It is probable that reduced highwway speeds will have a positive impact on NOx emission rates, but more analysis is needed to quatify these benefits.

Name: Don Anair
Organization: Union of Concerned Scientists
Phone/e-mail: 510-809-1563/danair@ucsusa.org