



Heavy-Duty GHG Rule Implementation in MOVES

September 25, 2012

Ed Glover



DRAFT Heavy Duty GHG Rule Implementation in MOVES

- Primarily affects long haul diesel but other heavy-duty source types also affected slightly
- Substantially affects VOC, NO_x, CO, PM, energy and toxic emissions in MOVES
- New emission process – Auxiliary Power Units added to MOVES is the largest effect



Key Elements of the Heavy Duty Rule Implementation in MOVES

- Revised running emission rates for total energy
- New aerodynamic coefficients and weights
- Auxiliary Power Units (APU) added as a new process in MOVES



Revised Vehicle Emission Rates

- Revised running emission rates for total energy
 - Rates drawn from HDGHG Rulemaking modeling
 - Gasoline and diesel vehicles
 - Running, start and extended idle rates
 - 2014 and later model years (MY 2014, 2015, 2016, 2017 and 2018+)
 - Reflects improved technology and performance of the vehicles.
 - Total energy emissions are generally lower by a few percent



New Aerodynamic Coefficients and Weights

- MOVES2010b HD coefficients based on 1997 SAE paper by V.A. Petrushov
- Revised rolling, rotating, drag and inertia terms (i.e., a, b and c) in basic VSP calculation
- Affects combination short and long-haul source types the most (i.e., 10% lower)
- New values for model year 2014 and later. Earlier model years continue to use older data.
- Coefficients are smaller to reflect fuel economy improvements going forward.
- Affects all pollutants
 - Largest effect of a few percent on total energy emissions.



Track Road Load Coefficients in MOVES

Category	rolling term	rolling term	drag term	drag term	mass	mass
	old	new	old	new	old	new
Intercity Bus	1.295	1.230	0.0037	same	19.5937	same
Transit Bus	1.094	1.040	0.0036	same	16.5560	same
School Bus	0.747	0.709	0.0022	same	9.0699	same
Refuse Truck	1.417	1.346	0.0036	same	20.6845	same
Single Unit Short Haul	0.562	0.534	0.0016	same	7.6416	same
Combination Short Haul	1.964	1.826	0.0040	0.0038	29.3275	29.1819
Combination Long Haul	2.081	1.881	0.0042	0.0037	31.4038	31.2224



Auxiliary Power Units Added

- New MOVES process APU has been added
- Applies only to the heavy-duty truck source type
- APU emission rates consistent with HDGHG Rulemaking, and drawn from the NONROAD model.
 - Tier 4, less-than-8 kW nonroad compression-ignition engine exhaust emissions standards assumed for APUs
- Assume 30 percent penetration of 2010-2014 model years and 100 percent penetration of 2014 and later model years.
 - Lower extended idle before rulemaking period.
- Applies to diesel vehicle “hotelling”. Other types of operation possible (i.e., fuel operated heater, battery).
- Effect in CY 2030: APU emissions largely replace extended idle emissions.



APU Emission Rates in MOVES

Pollutant	Rates	Units
CO	36	g/hr
NOx	26.88	g/hr
THC	6.72	g/hr
NMHC	6.72	g/hr
VOC	6.72	g/hr
CH4	0.3	% of THC
PM2.5	1.8	g/hr
OC	1.35	g/hr
EC	0.45	g/hr
SO2	0.0188	g/hr
CO2	10.18	kg CO2 / gal diesel
Fuel consumption	0.2	gallons/ hr
Total Energy	27430	KJ/hr
Split into EC and OC using the same split as the regular extended idle.		
10 ppm sulfur fuel		