

Off-Road Diesel Equipment Emissions

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AGC Sponsored Research

- Replaced survey data for populations, engine power, and age with DOORS data
 - ❖ Results presented to Board in December
- Currently updating previous work to reflect latest DOORS data provided by CARB staff (2/17/10)
- Currently updating to properly account for low-use equipment
- Currently updating to adjust for results of a fuel use based evaluation of the model



CARB OFFROAD2007 Model

- CARB OFFROAD2007 model used by CARB to:
 - ❖ Estimate baseline emission inventory for rule
 - ❖ Estimate emission inventory with rule in place
- OFFROAD2007 Based on:
 - ❖ Survey data for population, power, lifetime, annual hours of operation
 - ❖ Assumptions regarding engine loads
- CARB has never compared OFFROAD2007 model results to estimates based on fuel use records



Fuel-Based Methods

- Compare actual fuel use data to fuel use estimated by OFFROAD2007
- Use actual fuel use data and fuel-based emission factors to compute emissions and compare to OFFROAD2007 emission estimates



Fuel-Based Methods – Cont.

- Comparison of OFFROAD2007 emission estimates with estimates based on fuel use
 - ❖ First done in 2000 by former CARB Chair Robert Sawyer, Andrew Kean, and Robert Harley using EPA version of the model (NONROAD)
- In a 2004 report prepared for CARB, Harley recommends:
 - “Off-road diesel engine activity and emissions in California should be reassessed. California should consider using a fuel-based approach for estimating off-road diesel emissions...”*



Fuel-Based Methods – Cont.

- Millstein and Harley (2009) compare OFFROAD2007 emissions to fuel-based emissions
 - ❖ Finding: *"California's OFFROAD model estimates are 4.5 and 3.1 times greater, for NOx and PM, respectively, than the fuel-based estimates developed here."*

Ratio of OFFROAD2007 to Fuel-Based Method				
Pollutant	LA County	Orange County	Riverside County	San Bernardino County
NOx	6.26	8.84	2.15	3.40
PM _{2.5}	3.89	5.64	1.36	2.16



Implications

- Fuel use methods show OFFROAD2007 baseline inventory to be grossly overestimated.
- Emission benefits estimated by CARB staff for the in-use off-road rule are similarly overestimated.
- Cost-effectiveness ratio for the rule (\$/ton of pollution eliminated) is likely much higher than estimated by CARB staff in 2007.
- Rule provides much less air quality benefit per dollar spent than CARB staff estimated in 2007.



References

- Kean, Sawyer, & Harley, "A Fuel-Based Assessment of Off-Road Diesel Engine Emissions," JAWMA, November 2000.
- Harley, Giddings, & Marr, "Decadal Trends in Air Pollutant Emissions from Motor Vehicles in Central California," Final Report, Contract 00-14CC05, May 2004.
- Millstein & Harley, "Revised Estimates of Construction Activity and Emissions, Effects on Ozone and Elemental Carbon Concentrations in Southern California," Atmospheric Environment, 2009.

