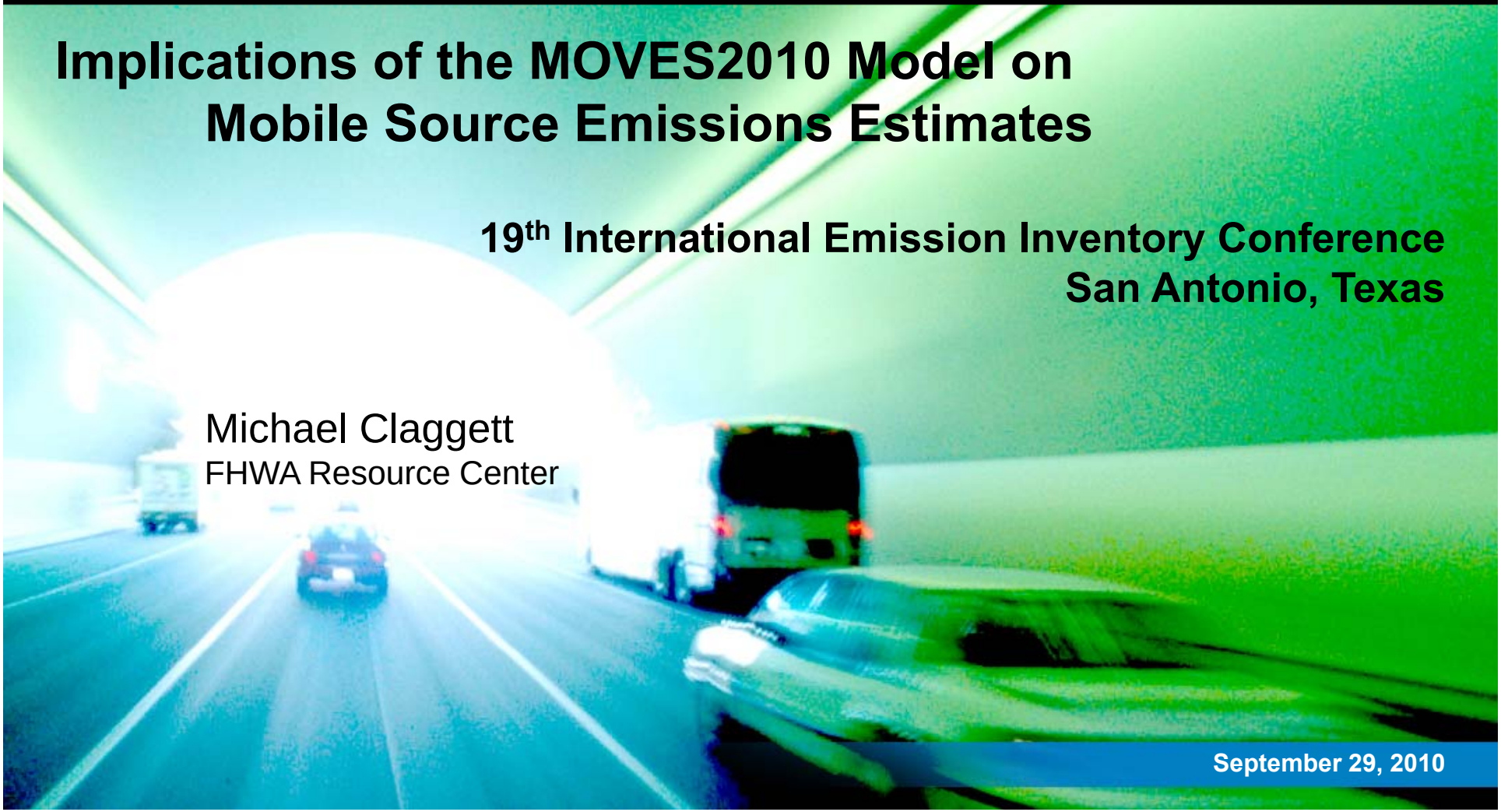
U.S. Department of Transportation
Federal Highway Administration

Federal Highway Administration
RESOURCE CENTER

Implications of the MOVES2010 Model on Mobile Source Emissions Estimates

19th International Emission Inventory Conference
San Antonio, Texas

Michael Claggett
FHWA Resource Center



September 29, 2010

Overview

National Emissions Trends

- MOVES2010 versus MOBILE6.2 Comparisons

Emissions Attributable to Individual Processes

Variability of Emission Factors with Vehicle Speed

- MOVES2010 versus MOBILE6.2 Comparisons

Variability of Emission Factors with Vehicle Congestion

Project-Scale Modal Emission Factors

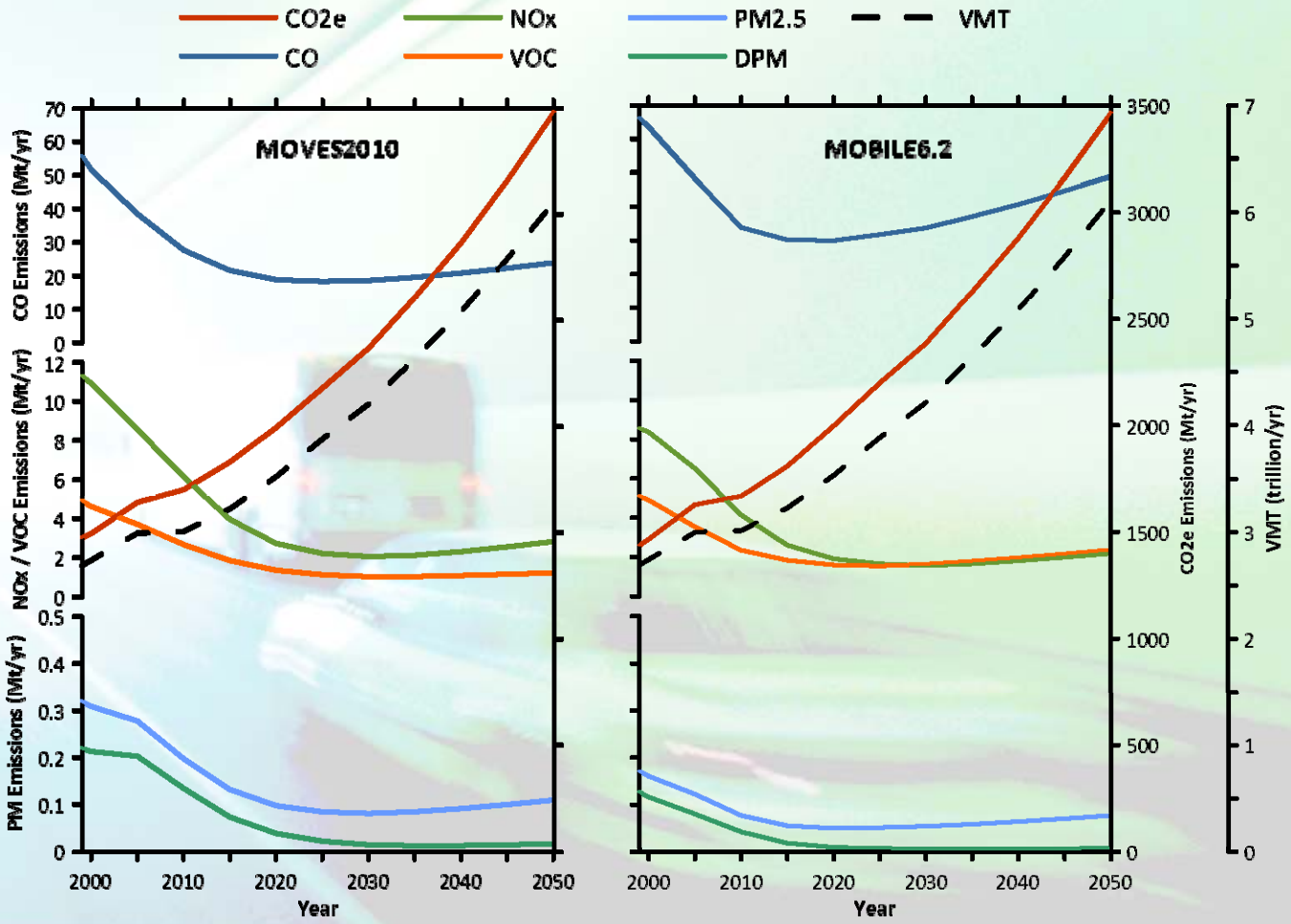
Pollutants Analyzed

Carbon Monoxide (CO)

Nitrogen Oxides (NOx)
Volatile Organic Compounds (VOC)

Particulate Matter of size ≤ 2.5 µm (PM2.5)
Diesel Particulate Matter (Diesel PM)
Benzene
Carbon Dioxide equivalent (CO_2e) greenhouse gases

National Trends in Mobile Source Emissions



Individual Emissions Processes

Running Exhaust
Crankcase Running Exhaust

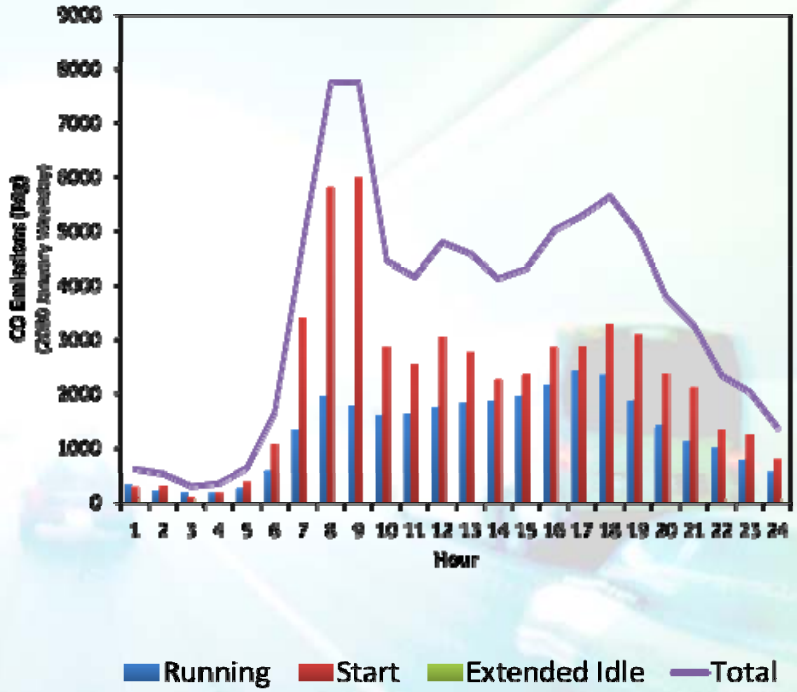
Start Exhaust
Crankcase Start Exhaust

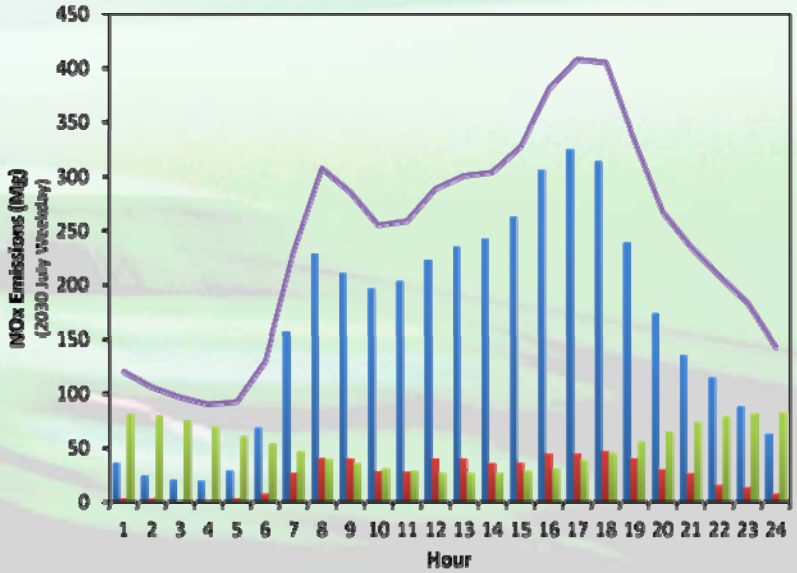
Extended Idle Exhaust
Crankcase Extended Idle Exhaust

Evaporation Fuel Vapor Venting
Evaporation Permeation
Evaporation Fuel Leaks

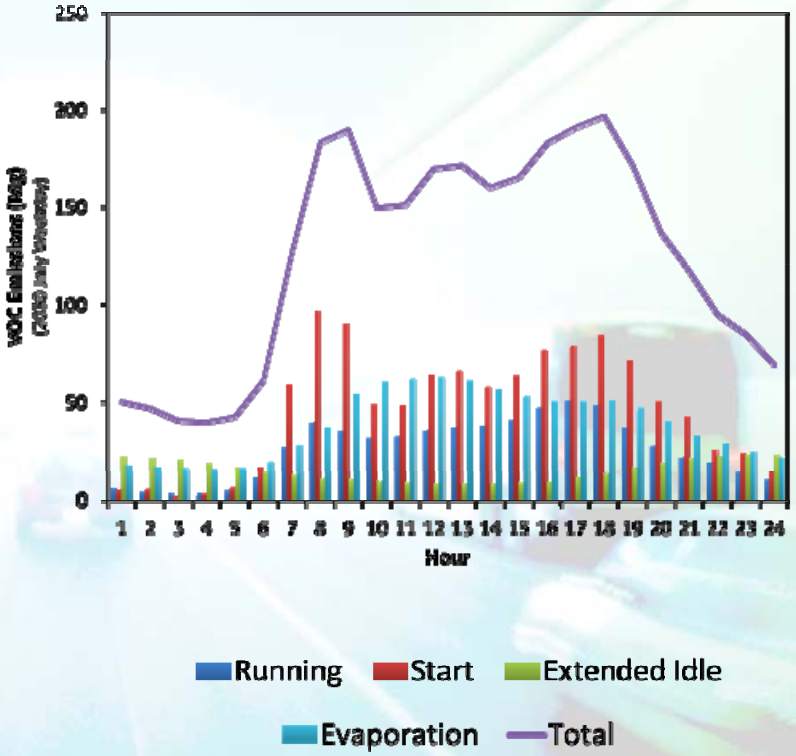
Break Wear
Tire Wear

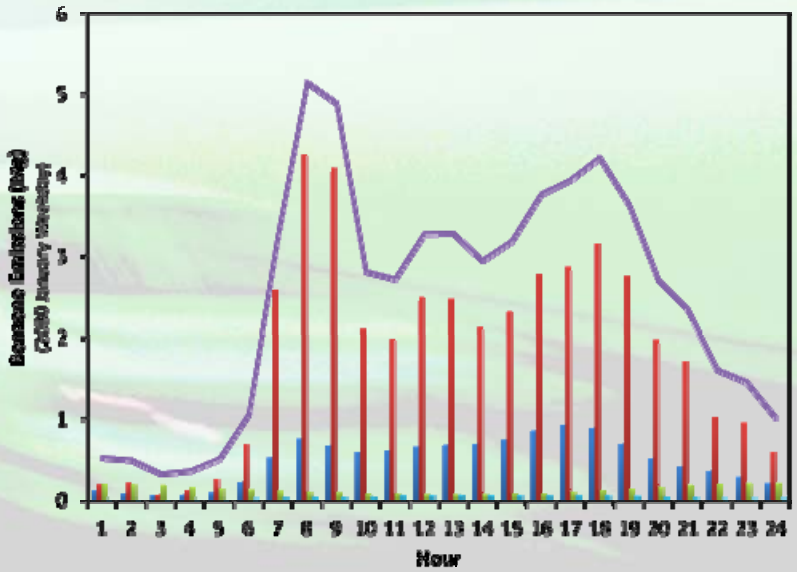
Individual Emissions Processes – 2030



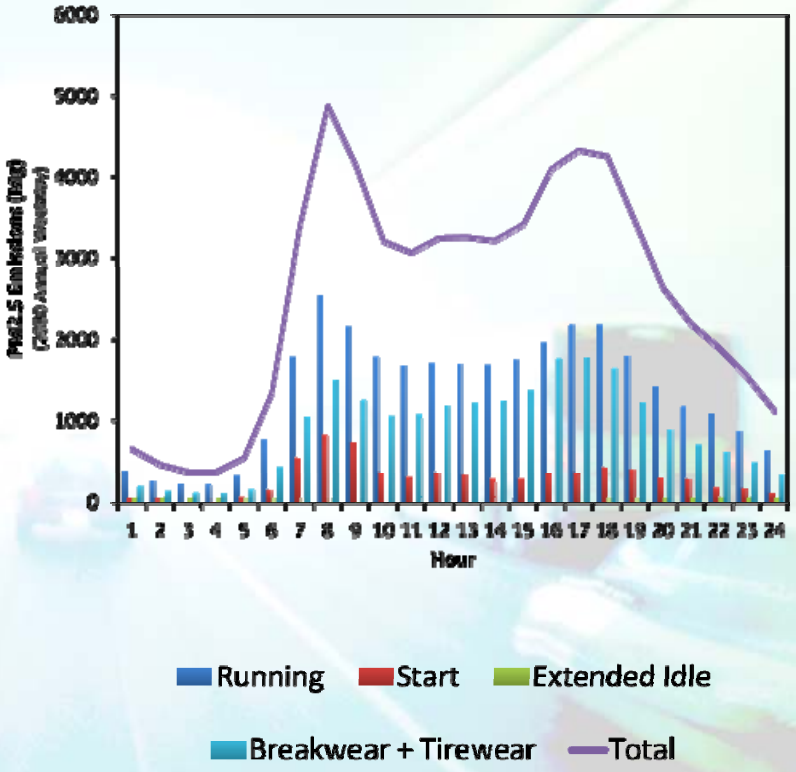


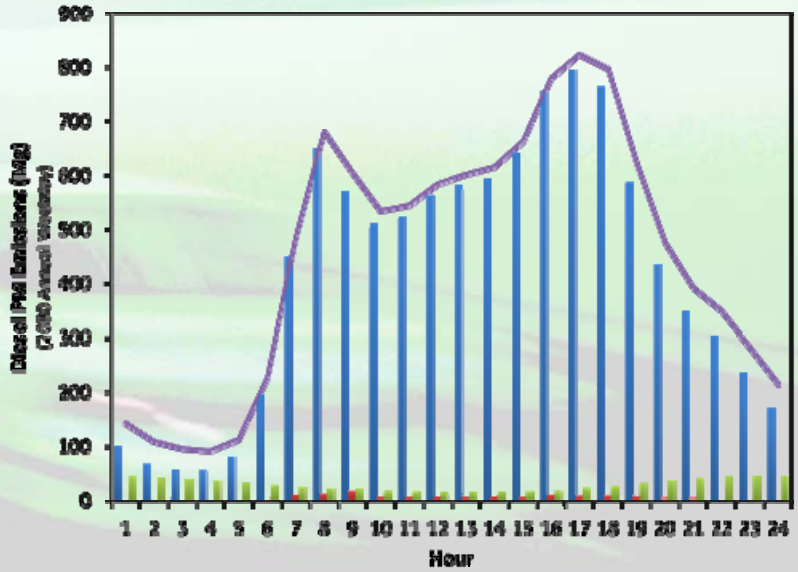
Individual Emissions Processes – 2030



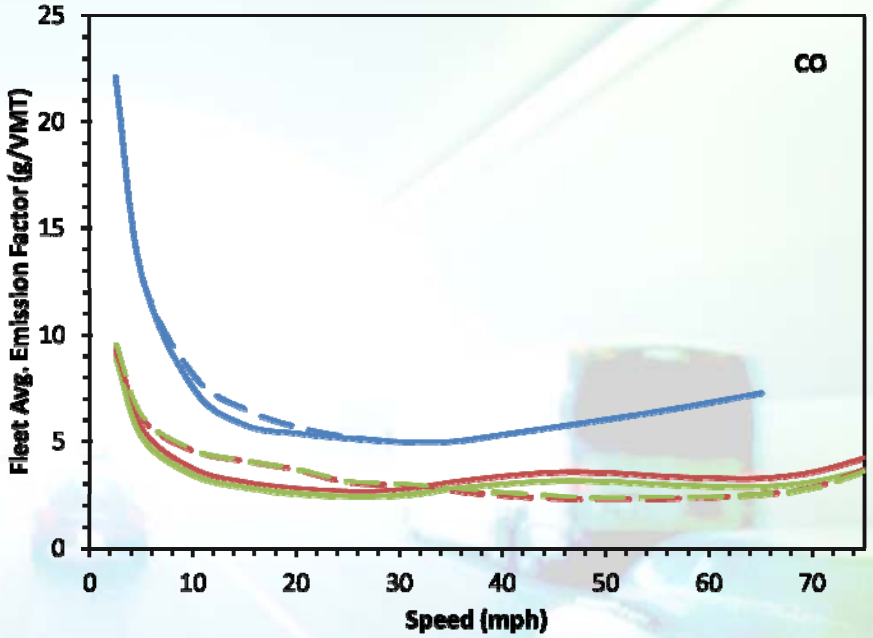


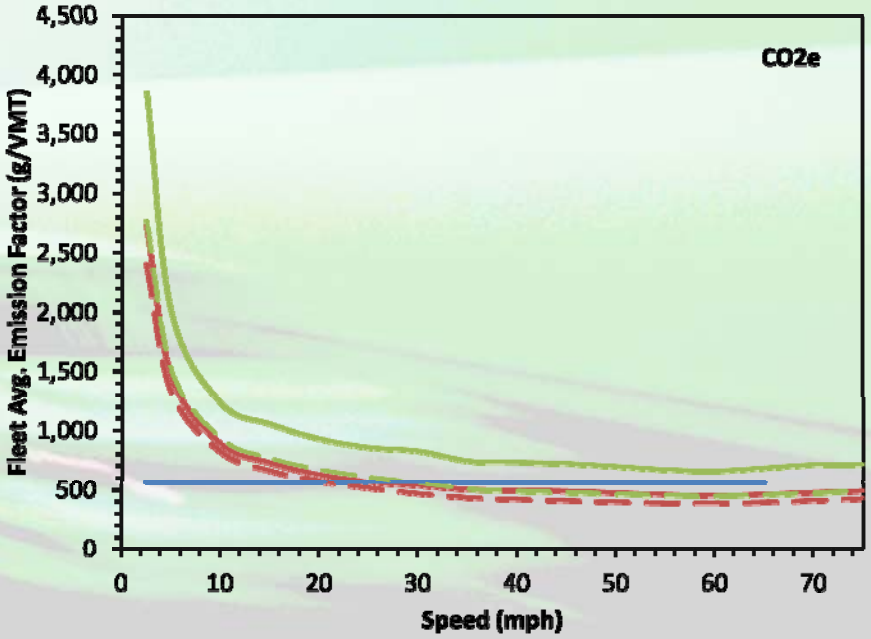
Individual Emissions Processes – 2030





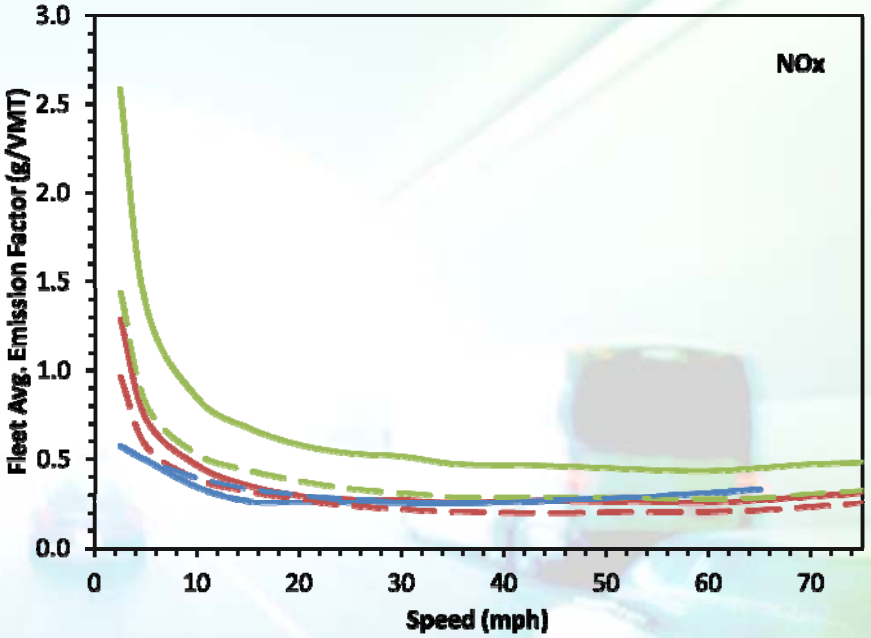
Variability of Emission Factors with Speed – 2030

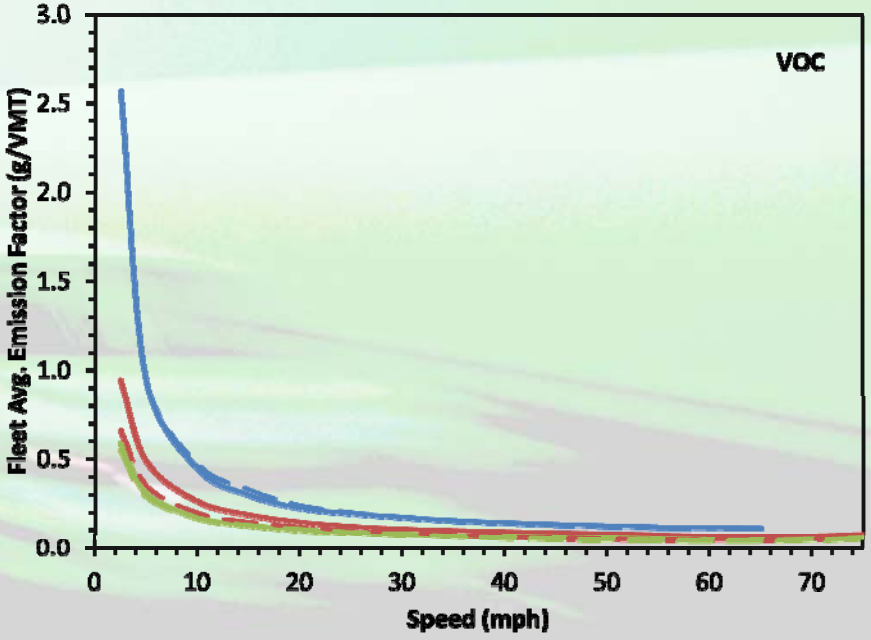




MOBILE6.2 Freeway
MOBILE6.2 Arterial
Rural Restricted Access
Rural Unrestricted Access
Urban Restricted Access
Urban Unrestricted Access

Variability of Emission Factors with Speed – 2030





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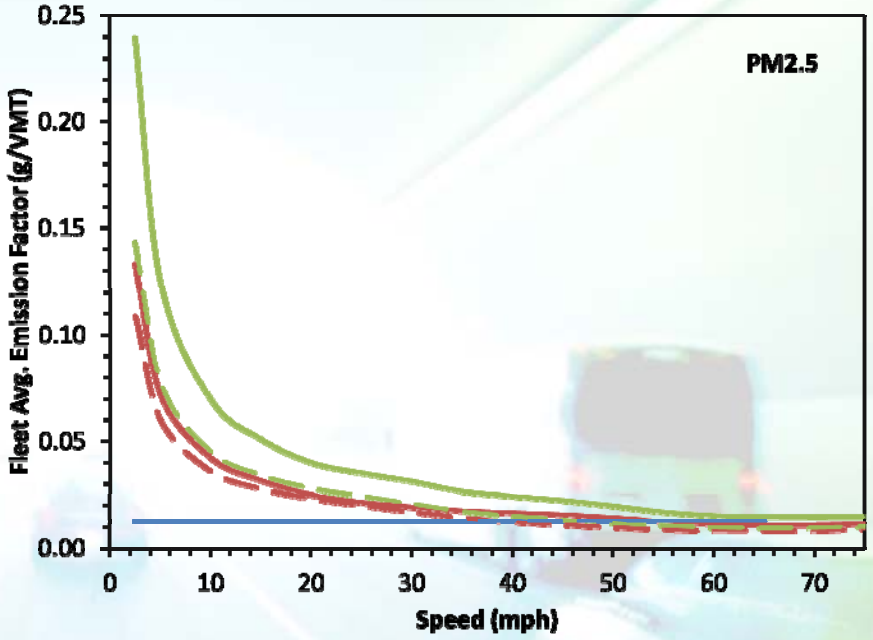
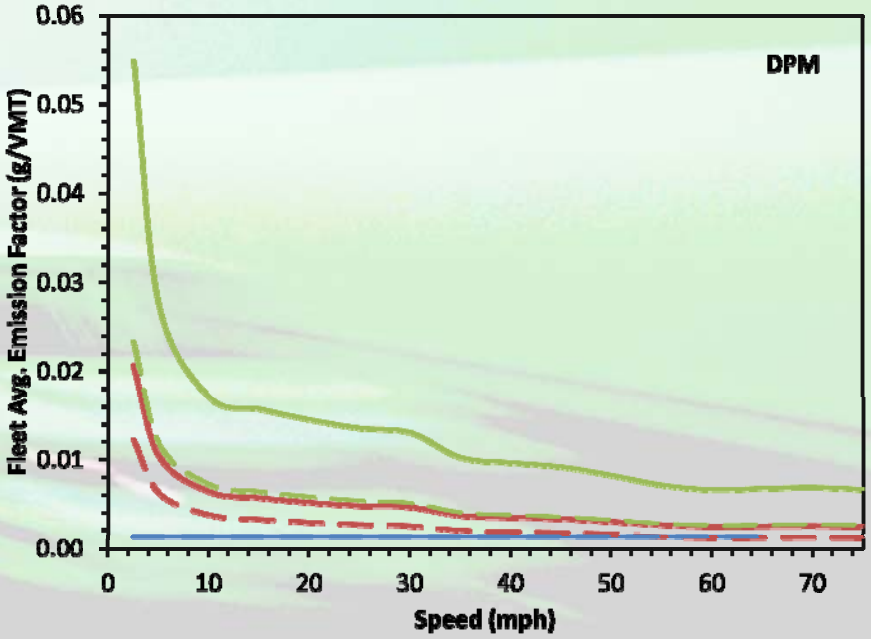
Variability of Emission Factors with Speed – 2030





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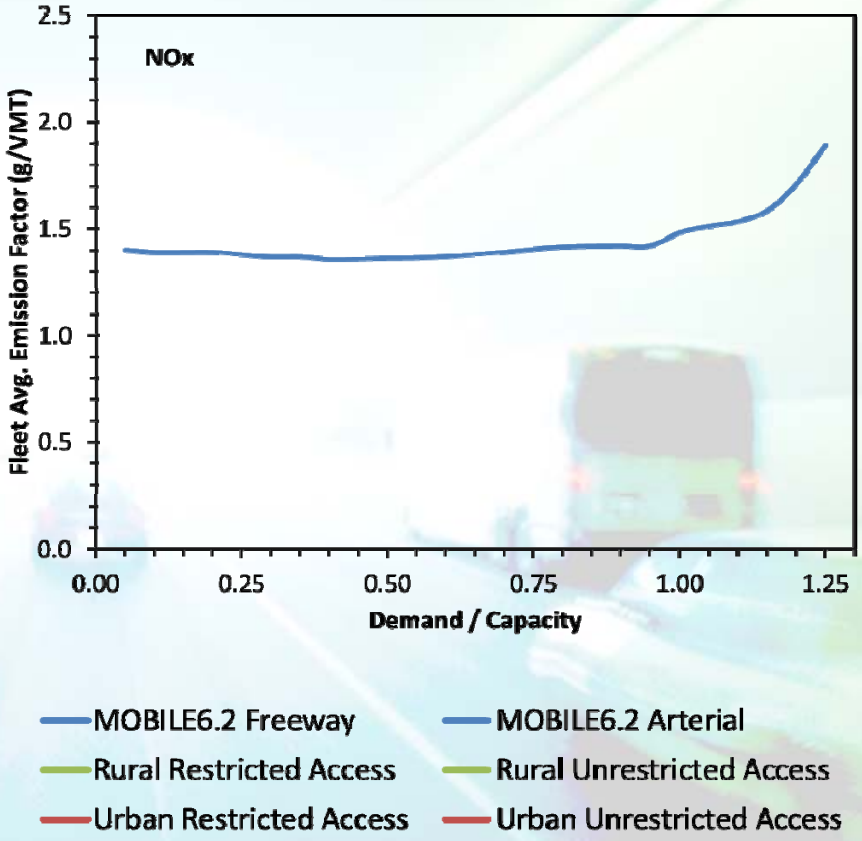
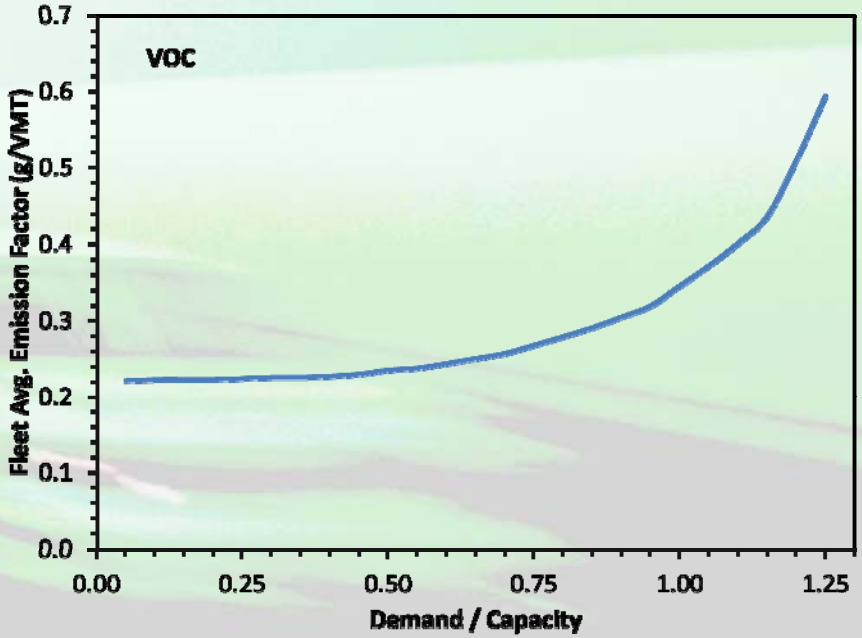
Variability of Emission Factors with Congestion – 2010





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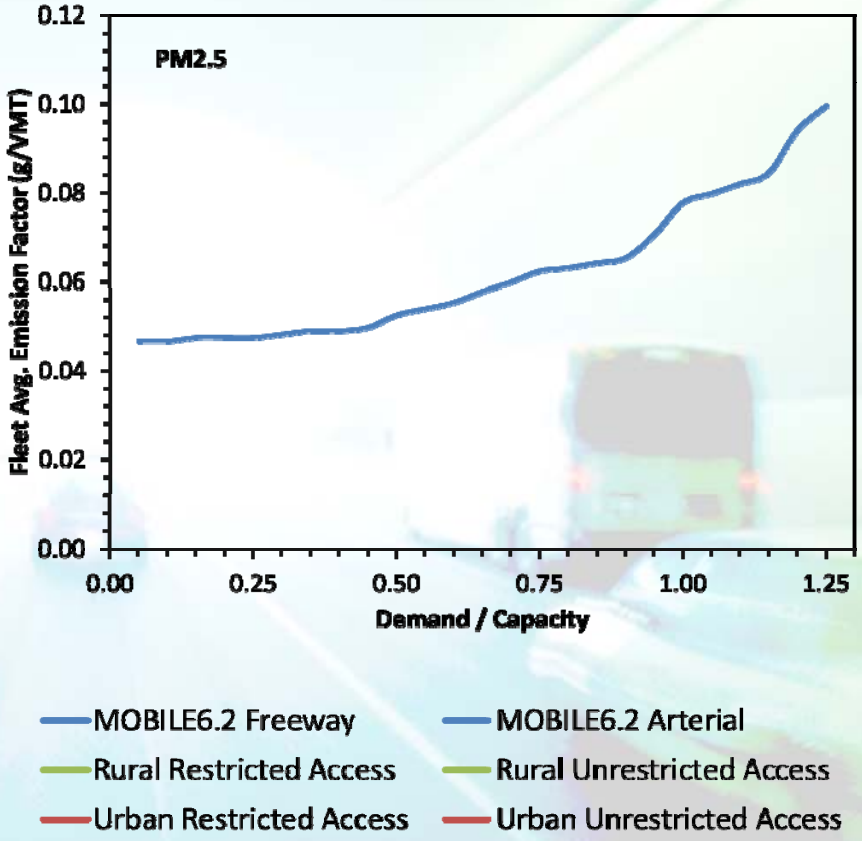
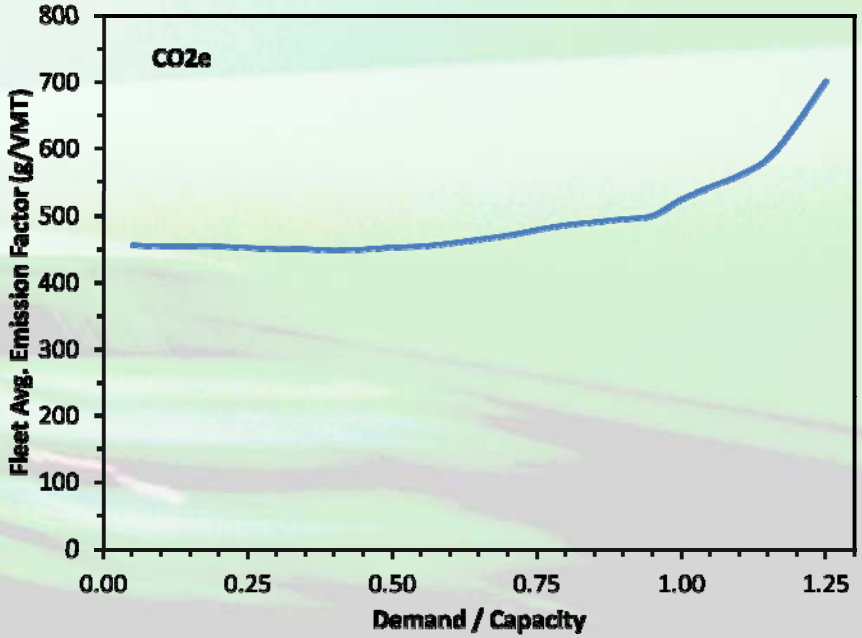
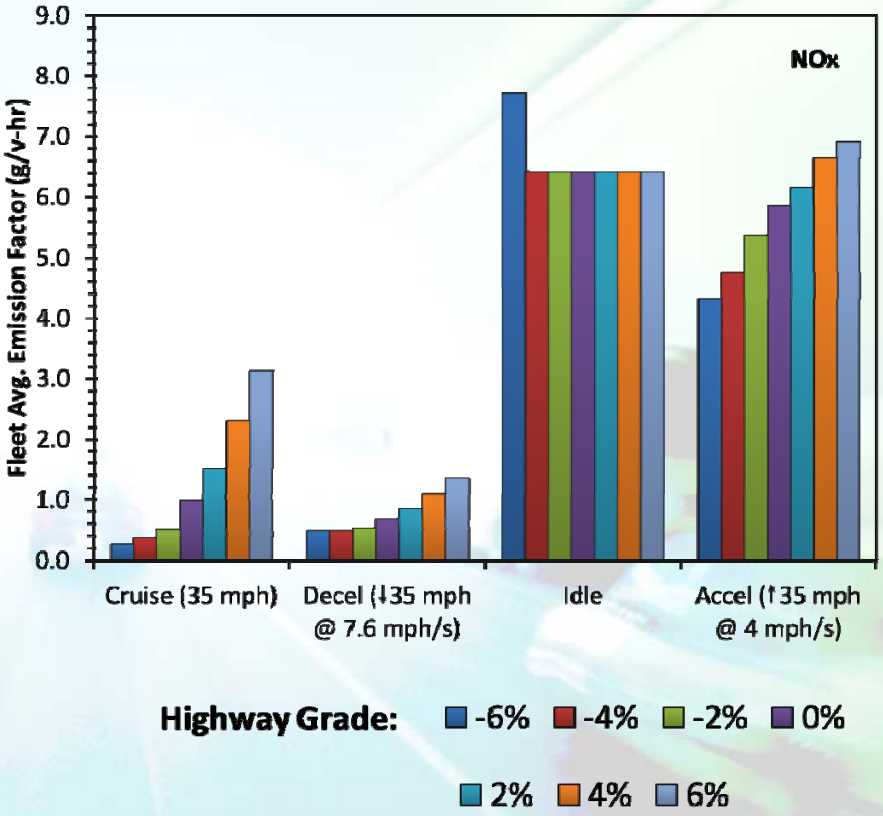
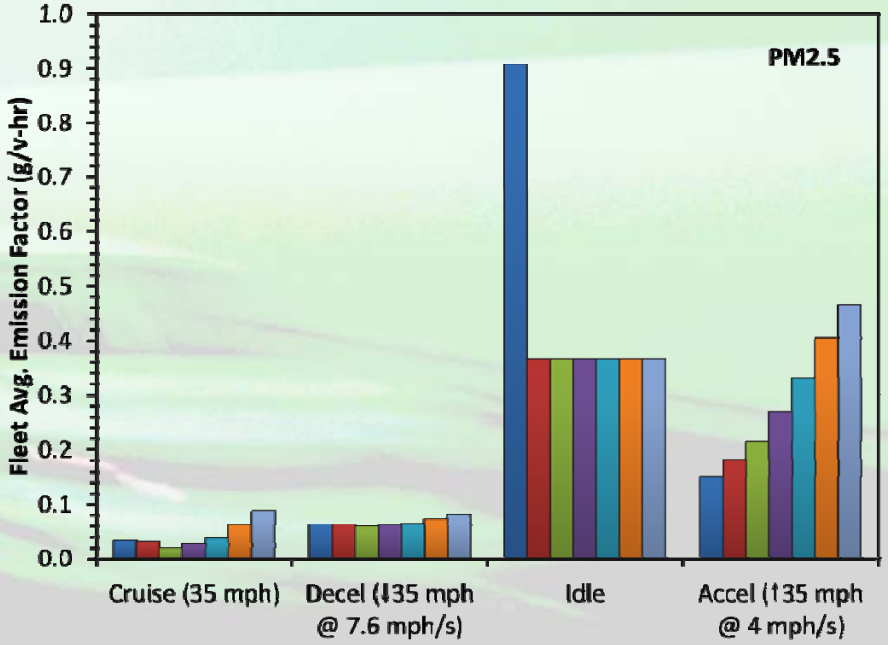




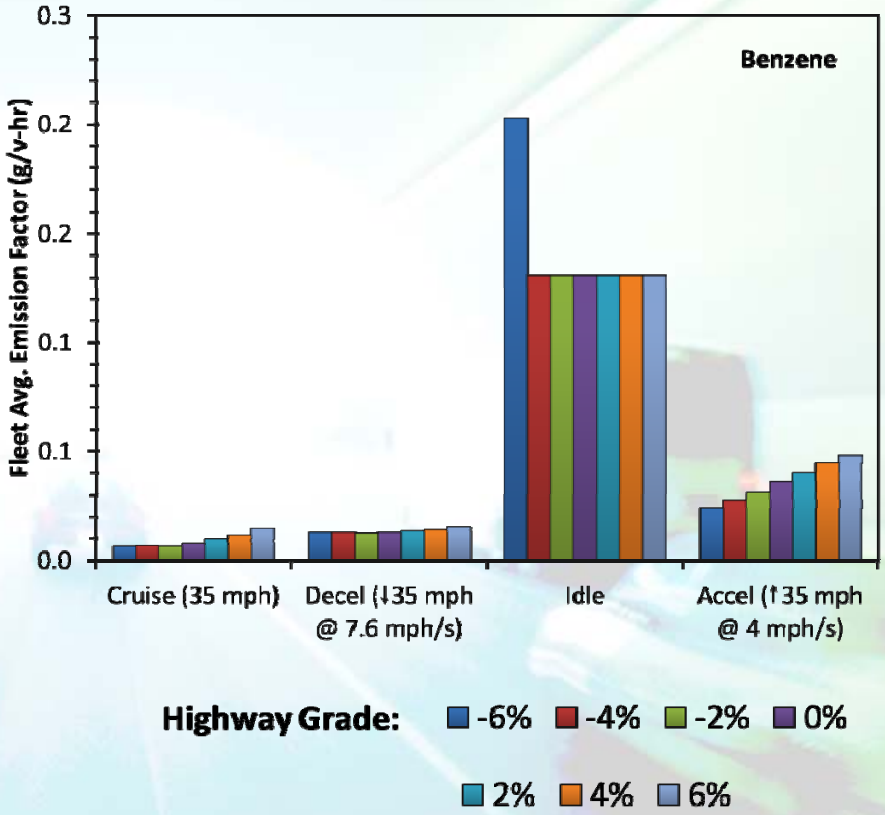
Project-Scale Modal Emission Factors – 2010

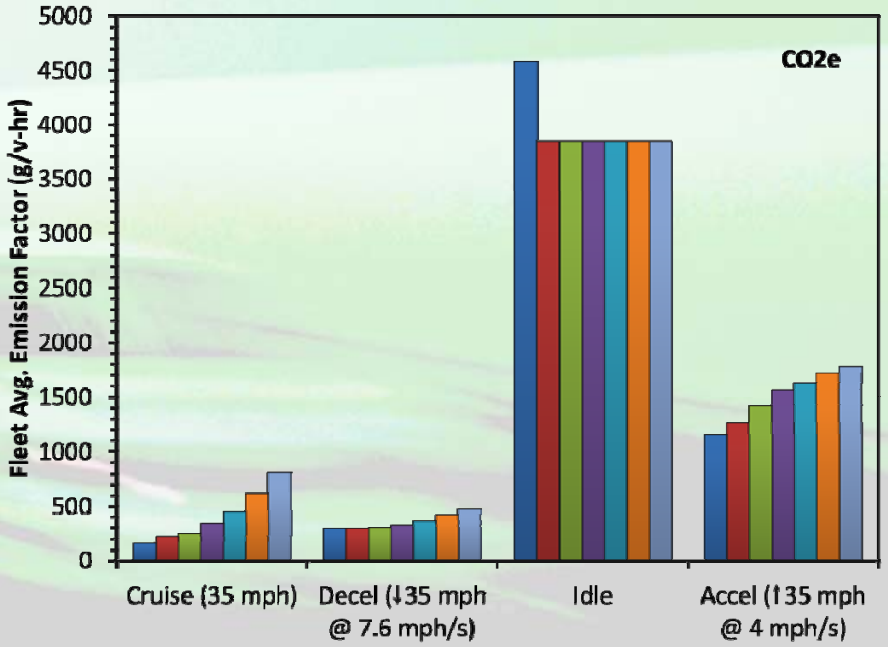


Note: EPA has implemented an improved algorithm for break wear and tire wear in MOVES2010a so PM emissions for these components are always zero at idle. The larger PM emissions for projects with substantial idling on steep grades computed with MOVES2010 has been corrected in MOVES2010a.



Project-Scale Modal Emission Factors – 2010





Implications of MOVES

National Emission Trends

- MOVES2010 and MOBILE6.2 generate comparable national-scale emission inventories

Individual Emission Processes

- Start emissions are a predominant component of CO (winter) and VOC/benzene (winter and summer)
- NOx, PM2.5, and DPM emissions consists largely of running exhaust and running crankcase emissions
- Evaporative emissions are an important component of VOC/benzene emissions during the summertime
- Brake and tire wear are consequential components of PM2.5 emissions

Implications of MOVES

Variability of Emission Factors with Vehicle Speed

- MOVES2010 estimates of CO2e, PM2.5, and DPM emissions are sensitive to changes in vehicle speeds
- For the cases studied, MOVES2010 produces lower emissions for CO and VOC and generally higher emissions for NOx compared with MOBILE6.2
- The distinctions in pollutant emissions among the roadway types in MOVES2010 are largely due to variations in the default vehicle fleet mixes
- Emission factors for freeways and arterials in MOBILE6.2 are generally indistinguishable

Implications of MOVES

Variability of Emission Factors with Vehicle Congestion

- Mitigating congestion on highways where traffic volumes exceed capacity lowers emissions

Project-Scale Emission Trends

- Emissions may be differentiated accounting for the modal operation of vehicles at the project-scale
- Emissions tend to be higher for idling vehicles and vehicles accelerating on uphill (positive) highway grades