

California Global Warming Solutions Act (AB 32)

How Will Heavy Duty Hybrids Factor In?

SCAQMD's Hydraulic Hybrid Vehicle Technology Forum
11/15/2007

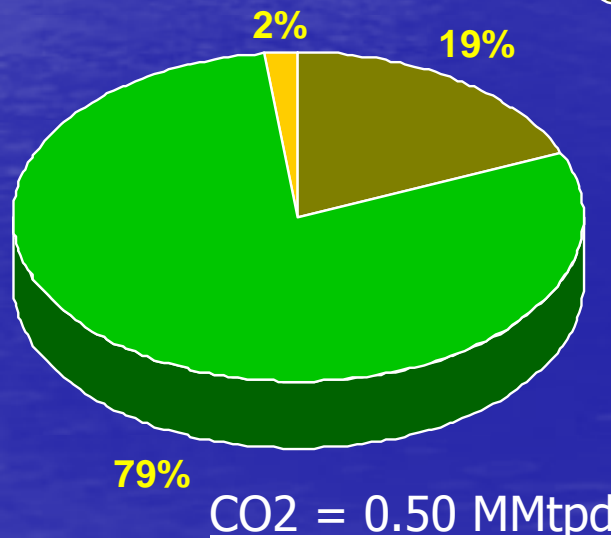
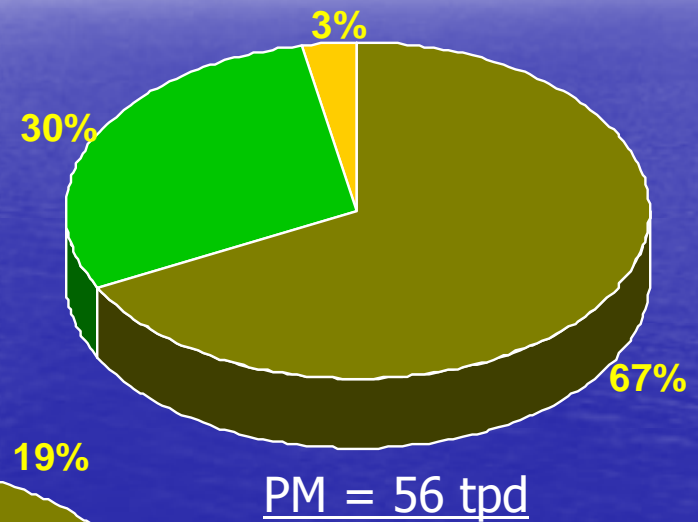
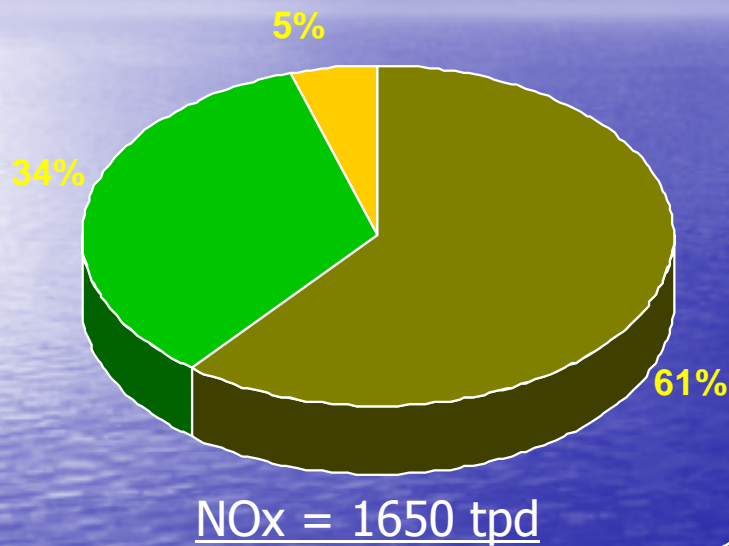
California Air Resources Board
Stephan Lemieux, Manager
On-road Heavy Duty Diesel Section

Overview

- Emissions Impact from Heavy Duty Vehicles (HDVs)
- AB 32 - What is ARB Doing with HDVs?
- HDV Hybrid Benefits and Challenges
- What is the Future of HDV Hybrids?
- Questions?

Heavy Duty Vehicle Emissions

Statewide Emissions Inventory - 2007



Trucks (>10k lbs)

PC & Trucks (≤10k lbs)

All Other On-Road

Source: EMFAC2007 v. 2.3

AB 32 - HDV Control Programs with GHG Benefits

- Adopted Rules
 - HDV Idling
 - No commercial truck idling (2005)
 - New engine shutdown requirements (2008)
 - In-use sleeper cab idling requirements (2008)
- Rules Under Development
 - AB 32 Early Action Report
 - SmartWay truck efficiency (Oct 2008)
 - Hybrid vehicle early adoption incentive (Oct 2008)
 - Anti-idling enforcement (2008)
 - Hybridization of Medium/Heavy Duty Vehicles (2011)



HDV Hybrid Benefits

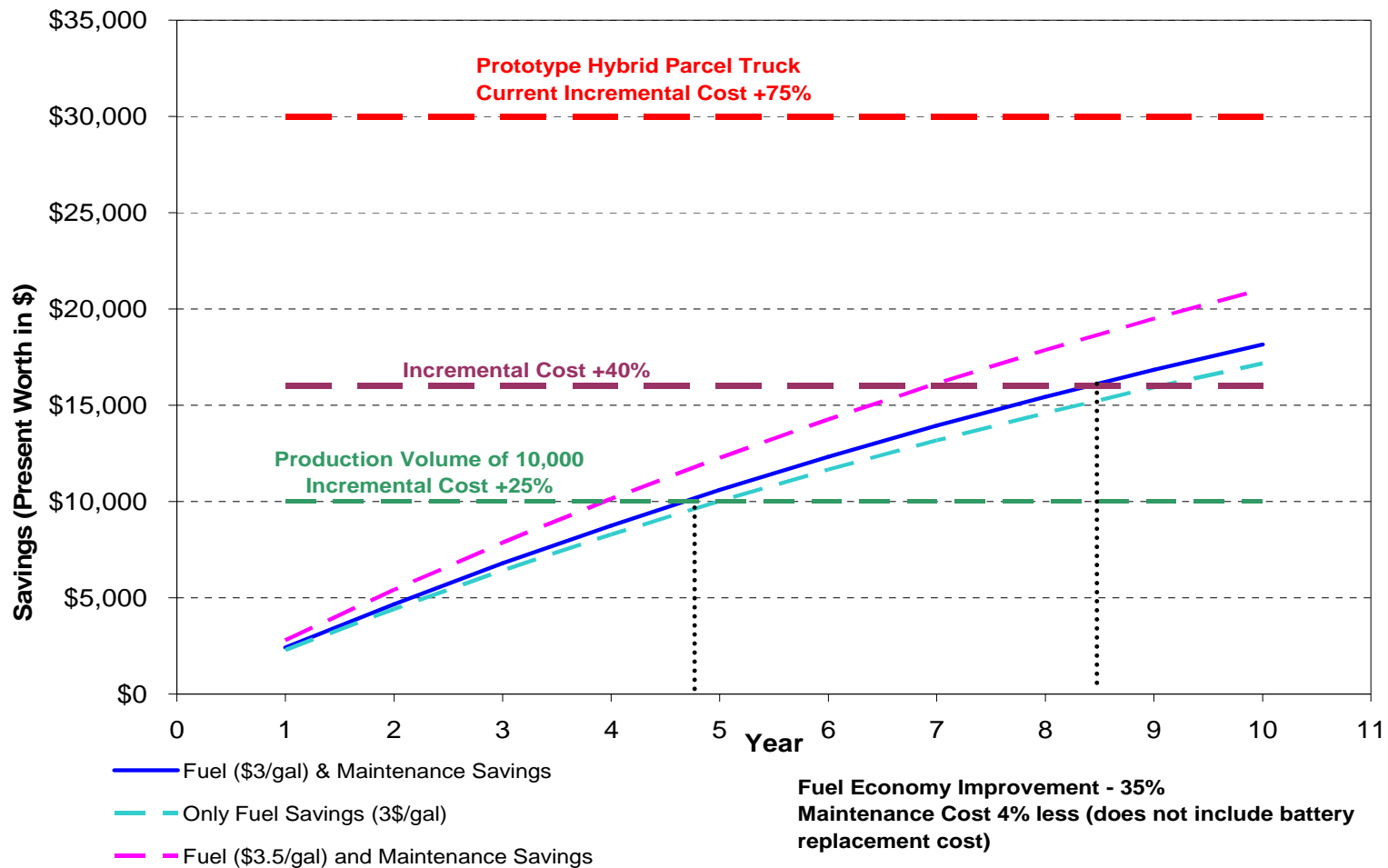
- Can provide substantial GHG and criteria pollutant benefits
 - Efficient use of power and energy recovery
 - 35% improved fuel economy over conventional truck
 - Good performance
- Hybrid products demonstrated and becoming commercially available
 - Urban delivery
 - Utilities
 - Specialty work trucks
- Many entities (government and non-government) are sponsoring research and development



HDV Hybrid Challenges

- Higher incremental cost

HDV Hybrid Parcel Truck Costs



HDV Hybrid Challenges

- Higher incremental cost
 - Manufacturing volume of hybrid components increasing
- Long term reliability, durability and maintenance not firmly established
 - Transitioning from off-the-shelf to design intent components
- Hybrid builders/buyers risk aversion
- Certification test cycles need to be adopted
 - Must be application specific
 - Three chassis test cycles have been adopted for transit bus hybrids
 - Eaton Corp developed a drive cycle for Class 4-6 delivery trucks
 - West Virginia University (Clark, Wayne) has developed a number of application-specific drive cycles
 - U.S. EPA currently working on a test protocol

The Future of HDV Hybrids

- HDV hybridization is a measure ARB has already identified as an GHG early action
- HDV hybrid early adopter incentive program will be incorporated in ARB's Private Fleet Rule
- Many entities are working to make this technology cost effective and viable
- ARB historically sets technology-forcing standards
- ARB typically sets performance-based standards, allowing for manufacturer creativity
- The types of hybrids technology that enters into the marketplace will depend on consumer acceptance and cost-effectiveness



Questions?