



**Public Symposium on Air Quality Management
Policy in Metropolitan Areas
Seoul, Korea - December 20, 2004**

**California Air Resources Board
Sacramento California**

**Thank you for inviting me to the
symposium.**

Topics to Discuss

- ◆ About ARB
- ◆ Regulatory development disputes
- ◆ LEV/ZEV program
- ◆ Reducing in-use gasoline vehicle emissions
- ◆ Reducing diesel vehicle emissions
- ◆ Impacts of regulations

Topics to Discuss

- ◆ **About ARB**
- ◆ Regulatory development disputes
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- ◆ Reducing in-use gasoline vehicle emissions
- ◆ Reducing diesel vehicle emissions
- ◆ Impacts of regulations

About ARB

Air Quality Agency Relationships

- ◆ **U.S. EPA (Federal)**
 - Sets deadlines for clean air, e.g. Clean Air Act
 - Oversight of state programs
 - Control mobile sources nationally
- ◆ **ARB (State)**
 - Lead air agency in California
 - Control emissions from mobile sources, fuels, and consumer products
- ◆ **Air Districts (County)**
 - Control industrial sources
 - Implement programs at local level

About ARB

State Implementation Plan (SIP)

- ◆ **U.S. EPA (Federal)**
 - Clean Air Act/SIP
 - ◆ Establishes national ambient air quality standards (NAAQS)
 - ◆ Deadlines for SIP attainment based on the severity of the pollution problem
 - Approval of state SIPs
- ◆ **ARB (State)**
 - Develop SIP for California
 - Compilation of federal, state, and local control strategies
- ◆ **Air Districts (County)**
 - Prepare local SIP elements and submit them to ARB for review and approval

About ARB

Primary Legal Mandates

- ❖ Ensure continuous progress toward attaining health-based air quality standards
- ❖ Reduce public exposure to toxic air contaminants

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Regulatory Development Disputes Fulfilling Mandate

- ❖ Established regulatory process in California with proactive mechanisms to address opposition
- ❖ Clearly defined steps for regulatory development
 - Public workshops
 - Technical analysis
 - Economic analysis
 - Public comment period
 - Staff Report
 - Open Board hearing

Regulatory Development Disputes Stakeholder Involvement

- ❖ Identification and involvement of affected parties at the earliest possible point in the regulatory process
- ❖ Understanding of industry operations
- ❖ Environmental groups and other regulatory agencies included
- ❖ Special consideration to small businesses
- ❖ Seek buy-in of all parties

Regulatory Development Disputes Scientific Understanding

- ◆ Problems identified through research, monitoring, surveys, and modeling
- ◆ Solutions
 - Available and emerging technologies
 - Economically and technologically feasible
- ◆ Consequences of no action
 - Costs increase with inaction
 - Impact on living standard
 - Drastic measures may become necessary

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- ◆ **LEV/ZEV program**
- ◆ Reducing in-use gasoline vehicle emissions
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LEV/ZEV Program Goals

- ◆ Goal is near-zero and zero emissions
- ◆ LEV/ZEV provides a mix of technologies
 - Very clean ULEV 2
 - Near-zero emission PZEVs
 - Advanced technology PZEVs (e.g. hybrids)
 - ZEVs (e.g. fuel cells)
- ◆ Lifetime emissions PZEV = 4 kg
 - Cars with no controls = 2000 kg

LEV/ZEV Program Status

- ◆ First PZEVs sold in 2003
 - 200,000 sales this year (2004)
 - Regulation: ~40% of sales by next decade
- ◆ Advanced technology PZEVs
 - Many AT-PZEV models being introduced
 - Regulation: ~10% of sales by 2015
- ◆ ZEVs
 - Small number of fuel cells required
 - ◆ Pre-commercialization through 2012
 - Infrastructure e.g. H₂ Highway; Fuel Cell Partnership

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- ◆ Reducing diesel vehicle emissions
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Reducing Gasoline In-use Vehicle Emissions: Smog Check

- ◆ Inspections every 2 years
- ◆ Dynamometer test (for NO_x)
- ◆ Evaporative system check (pressure)
- ◆ Newer cars exempt (4 years and newer)
- ◆ Inspection ~\$45; Repair averages \$145
- ◆ Strong enforcement needed to reduce fraud
 - Inspections done in private garages
- ◆ Large, cost effective emission reductions

Reducing Gasoline In-use Vehicle Emissions: Scrap

- ◆ Voluntary
- ◆ Limited scale so far
 - Scrapped 55,000 vehicles since 2000
 - Replacement cars average 8 years newer
- ◆ Pay \$500-1000 per vehicle
 - No reuse of engine or emission parts
- ◆ Cost effective

Reducing Gasoline In-use Vehicle Emissions: Reformulated Gasoline

- ◆ Reformulated Gasoline Phase 1 (Jan. 1992)
 - Lowered Reid Vapor Pressure (RVP) and sulfur content
 - Required additives in gasoline
- ◆ Reformulated Gasoline Phase 2 (Mar. 1996)
 - Reduced
 - ◆ benzene
 - ◆ aromatics
 - ◆ olefins
 - ◆ distillation temperatures T50 and T90

Reducing Gasoline In-use Vehicle Emissions: Reformulated Gasoline

- ◆ Reformulated Gasoline Phase 2 continued
 - Lowered previously regulated RVP and sulfur
 - Required the use of oxygenates year-round
- ◆ Reformulated Gasoline Phase 3 (Dec. 2003)
 - Removal of MTBE
 - Refinery limits
 - Cap limits

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- ◆ **Reducing diesel vehicle emissions**
- ◆ Impacts of regulations

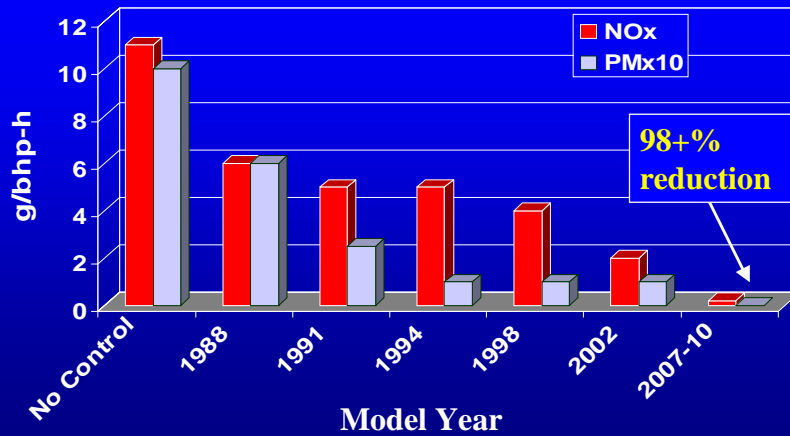
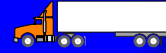
Reducing Diesel Vehicle Emissions Overall Health Impacts

- ❖ **Annual health impacts**
 - 2,900 premature deaths
 - 3,600 hospital admissions
 - 240,000 asthma attacks/respiratory symptoms
 - 600,000 lost days of work
- ❖ **By comparison**
 - 3,700 deaths from car accidents
 - 2,000 homicides

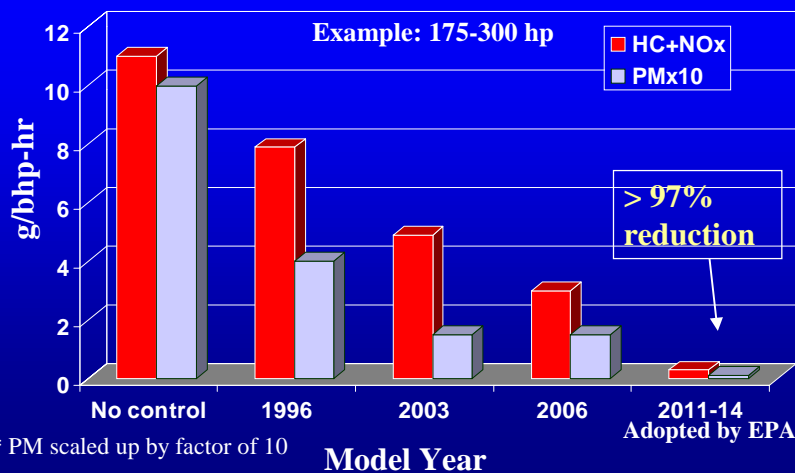
Reducing Diesel Vehicle Emissions General Approach

- ❖ Technology-forcing exhaust after-treatment for new engines: NO_x and PM
- ❖ Clean up current diesels
 - Regulatory
 - Incentives
- ❖ Ultra-low sulfur fuel (<15 ppm S)
 - Enables use of after-treatment

Reducing Diesel Vehicle Emissions New On-Road Engine Standards



Reducing Diesel Vehicle Emissions New Off-Road Engine Standards



Reducing Diesel Vehicle Emissions Schedule for Additional In-use Regulations

- ◆ 2004
 - Public fleets
 - Idling restrictions
 - ◆ School busses effective July 2003
 - ◆ Commercial Motor Vehicles approved July 22, 2004
- ◆ 2005+
 - Private on-road fleets
 - Private off-road fleets
 - Harbor craft

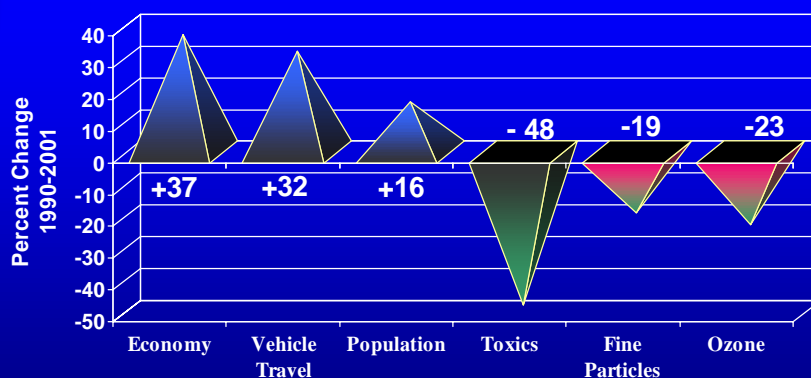
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- ◆ Reducing in-use gasoline vehicle emissions
- ◆ **Impact of regulations**

Impact of Regulations General

- ◆ Strong public support for air pollution control
- ◆ Technology forcing has worked
 - New technologies
 - Costs much lower than expected
- ◆ Industry less resistant now
- ◆ Most difficult are programs that affect public, such as Smog Check, Gas Cans, Motor Vehicle Vapor Recovery

Impact of Regulations Air Quality Is Improving Statewide Average



Impact of Regulations

Economic Benefits Exceed Costs

(benefit to cost ratios)

- ❖ California SIP: \$3 to \$1
- ❖ Clean Air Act: \$4 to \$1
- ❖ Carl Moyer program: \$10 to \$1
- ❖ ARB diesel retrofit rules: \$10-20 to \$1
- ❖ US EPA new diesel rules: \$24 to \$1

Impact of Regulations

The Future

- ❖ Near-zero emission technologies
 - Assures clean air
 - Consistent with growth, sound economy
- ❖ Reduce greenhouse gas emissions
- ❖ Clean, stable, sustainable, economical transportation fuel

Summary

- ❖ The ARB functions at the State level to protect the public health by improving air quality
- ❖ Disputes arising in regulatory development are addressed through a well established process
- ❖ The LEV/ZEV program will reduce vehicular transportation emissions to zero or near-zero
- ❖ Smog Check and Scrap are cost effective for reducing in-use gasoline vehicle emissions
- ❖ There are significant health benefits from reducing diesel vehicle emissions

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- ◆ Smog Check Questions

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- ❖ **ZEV Program Questions**
- ❖ Smog Check Questions

ZEV Program Questions

“What were policy procedures in legislating ZEV goals? (such discussions with auto makers, legislative procedures, etc.)”

ZEV Program Questions

- ◆ ZEV was added to LEV program in 1990 when Automakers began to demonstrate feasibility of battery electric vehicles
 - 10 percent production requirement established as part of LEV to begin the commercialization of zero emitting vehicles
 - Subsequently modified several times in recognition of technology readiness and marketability.
- ◆ Goals of the ZEV Regulation:
 - Achieve significant air quality benefits
 - Push research, development and deployment of zero emission vehicles
 - Encourage ZEV commercialization through introduction of ZEV-enabling technology

ZEV Program Questions

“How did CARB determine ZEV goals? The level of technology and length of development? Was the goal setting based on "scientific" study or a number that was reached through negotiation with auto makers?”

ZEV Program Questions

- ◆ Vehicle production obligations are established through public regulatory process
 - Meetings with Automakers, technology companies, researchers
 - Public Workshops
 - Board Hearing
- ◆ Board has utilized “Expert Panels” to review technology readiness
 - Batteries (1995 and 2000)
 - Fuel Cells (1998)

ZEV Program Questions

“Do you feel that CARB set ZEV goals more aggressive than the technology level of automakers at the time of goal-setting in order to promote the development of clean vehicles?”

ZEV Program Questions

- ◆ To some extent, the ARB set ZEV goals more aggressive than the technology level of automakers at the time of goal-setting in order to promote the development of clean vehicles
 - At time of goal setting, pre-commercial vehicles have been demonstrated
 - Ambitious *commercialization* requirements have been part of ZEV goals
- ◆ Automakers have been innovative in reaching performance and technology goals
 - Internal combustion engine vehicles reaching emissions levels comparable to upstream emissions of battery electric cars in response to ZEV requirement
 - Introduction of hybrid electric vehicles in response to experience with electric drive and batteries.

ZEV Program Questions

“The method for determining the credit system for ZEV? Is there a different weight system for different kinds of vehicles, such as different weights for buses, heavy-duty vehicles, and passenger cars. Or does ZEV program apply only for passenger cars?”

ZEV Program Questions

- ◆ ZEV program applies to
 - passenger cars
 - light duty trucks
 - ◆ smaller pick-up trucks
 - ◆ larger pick-up trucks
 - ◆ SUVs
- ◆ ZEV program does not apply to
 - buses
 - large commercial trucks

ZEV Program Questions

“The method for determining credits among ZEV, AT PZEV, PZEV? Is there any?”

ZEV Program Questions

- ◆ ZEVs
 - Greatest amount of credit awarded to full function, fast refueling ZEVs (Fuel Cell Vehicles) (40 credits)
 - Less credit for Full Function, slow fueling ZEVs (Battery electric vehicles) (12 credits)
 - Less credit for lower performance ZEVs (Neighborhood electric vehicles) (0.625 credits)
- ◆ AT PZEVs (0.2 to 2.5 credits)
 - Credit awarded based on ZEV enabling technology included in the vehicle (electric drive power, voltage, use of compressed gas fuel tanks, zero emissions range capability)
- ◆ PZEVs (0.2 credits)
 - All PZEVs earn the same amount of credit

ZEV Program Questions

“What are the penalties (amount of fine, etc.) for not meeting the goal?”

ZEV Program Questions

- ❖ According to the Motor Vehicle Code, failure to comply with the regulation results in a \$5,000 penalty per vehicle not produced.

ZEV Program Questions

“Mandatory compliance starts from 2005.
How are automaker preparing for 2005.
How does CARB find out the level of
preparation by automakers?”

ZEV Program Questions

- ◆ Substantial production of PZEVs has already begun
 - over 13 models of PZEVs have been certified and are for sale in California
- ◆ A few ATPZEVs already available
 - Three Hybrid EVs (Toyota Prius, Honda Civic and Ford Escape) available for sale in California
 - Honda Compressed Natural Gas Civic also a PZEV
- ◆ ZEV Activity
 - Automakers are members of the California Fuel Cell Partnership and are actively demonstrating Fuel Cell Vehicles which may be used to comply with the ZEV regulation
 - Past battery electric vehicle production has established a bank of credits towards compliance with the regulation which manufacturers may use as the program is implemented.
- ◆ Automakers report production quarterly to ARB

ZEV Program Questions

“MoE plans to introduce emission level rating systems in 2005. (difference between the legal emission standard and the emission level of a particular vehicle) Does CARB have similar program and any suggestions you can provide for our development of this program.”

ZEV Program Questions

- ◆ The ARB does not have a rating system or similar program.
- ◆ Under AB 965, manufacturers certified limited numbers of federal vehicles in California if they could offset the emissions of these vehicles using credits that were calculated from the difference between the emission standard and certification emission levels of their California vehicles.
 - The Corvette of the 1980's is one prime example.
 - This approach eliminated in 2000.
 - Now the credits are required to be earned by exceeding the fleet average requirements for NMOG, and by association, the expected fleet average for NOx.
- ◆ Problems using certification levels to calculate credits
 - Even though they meet the standard, production vehicles may emit well above certification vehicles.
 - This could also be true for any rating system.

Topics to Discuss

- ◆ ZEV Program Questions
- ◆ **Smog Check Questions**

Smog Check Questions

“As I know, Smog-Check is conducted on a regular basis (biannually). Do you have any supplementary system to control vehicle emission during the in-between periods, such as an occasional check program?”

Smog Check Questions

- ◆ **On-Board Diagnostic II (OBD II)**
 - 1996 and newer vehicles equipped with OBD II
 - monitors every emission performance component
 - assists technicians in diagnosing and fixing problems
- ◆ **Remote Sensing Device (RSD)**
 - ARB is currently conducting a RSD Project
 - to identify high emitting vehicles in between regular smog check inspections
- ◆ **Annual Inspection**
 - for both older and high-mileage vehicles
 - in 2004 ARB recommended Legislature modify State law

Smog Check Questions

“As I know, a vehicle model can be subjected to a RECALL if 4% of the total vehicles put in operation fail the emission testing. We would like to find out what determines this percentage that triggers vehicle RECALL.”

Smog Check Questions

- ◆ **4% Recall**
 - Emissions warranty claims based
 - Specific emissions control component exceeds 4% level
 - Manufacturers must report warranty activity at 1% level
- ◆ **ARB In-Use Testing**
 - At ARB facility in El Monte, CA
 - 10 vehicles of a specific engine family
 - Manufacturer is subject to corrective action (recall)
- ◆ **CAP 2000**
 - Manufacturers must test a small sample of its vehicles
 - ◆ 10,000 miles
 - ◆ 50,000 miles
 - ◆ 75,000 miles
 - Report the results to the ARB and the U.S. EPA
 - Comprehensive manufacturer testing program for failure

Smog Check Questions

“What are the efforts made to collect the accurate information on the failures founded in emission-related components during the auto-repairing, and/or inspection?”

Smog Check Questions

- ◆ Bureau of Automotive Repair (BAR) collects all information regarding smog check inspection results
- ◆ Vehicle repair information typed into database by smog check technicians
(<http://www.smogcheck.ca.gov/StdPage.asp?Body=/exsummary/archivescontents.asp>)
- ◆ ARB field staff routinely visit
 - new car dealers
 - smog check stations
 - auto repair facilities
- ◆ ARB reviews the quarterly emission warranty information reports

Summary

- ◆ Automakers have been innovative in reaching ZEV performance and technology goals
- ◆ Production of ZEVs, PZEVs, and AT-PZEVs is already well underway
- ◆ Vehicles equipped with OBD II since 1996
- ◆ ARB currently conducting RSD study
- ◆ Annual Inspection for older and high-mileage vehicles proposed
- ◆ Recall at emissions control component exceeds 4% level
- ◆ Specific engine families tested by ARB In-Use program
- ◆ Manufacturers test Cap 2000 sample of vehicles
- ◆ Accurate failure information collected by ARB and BAR

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