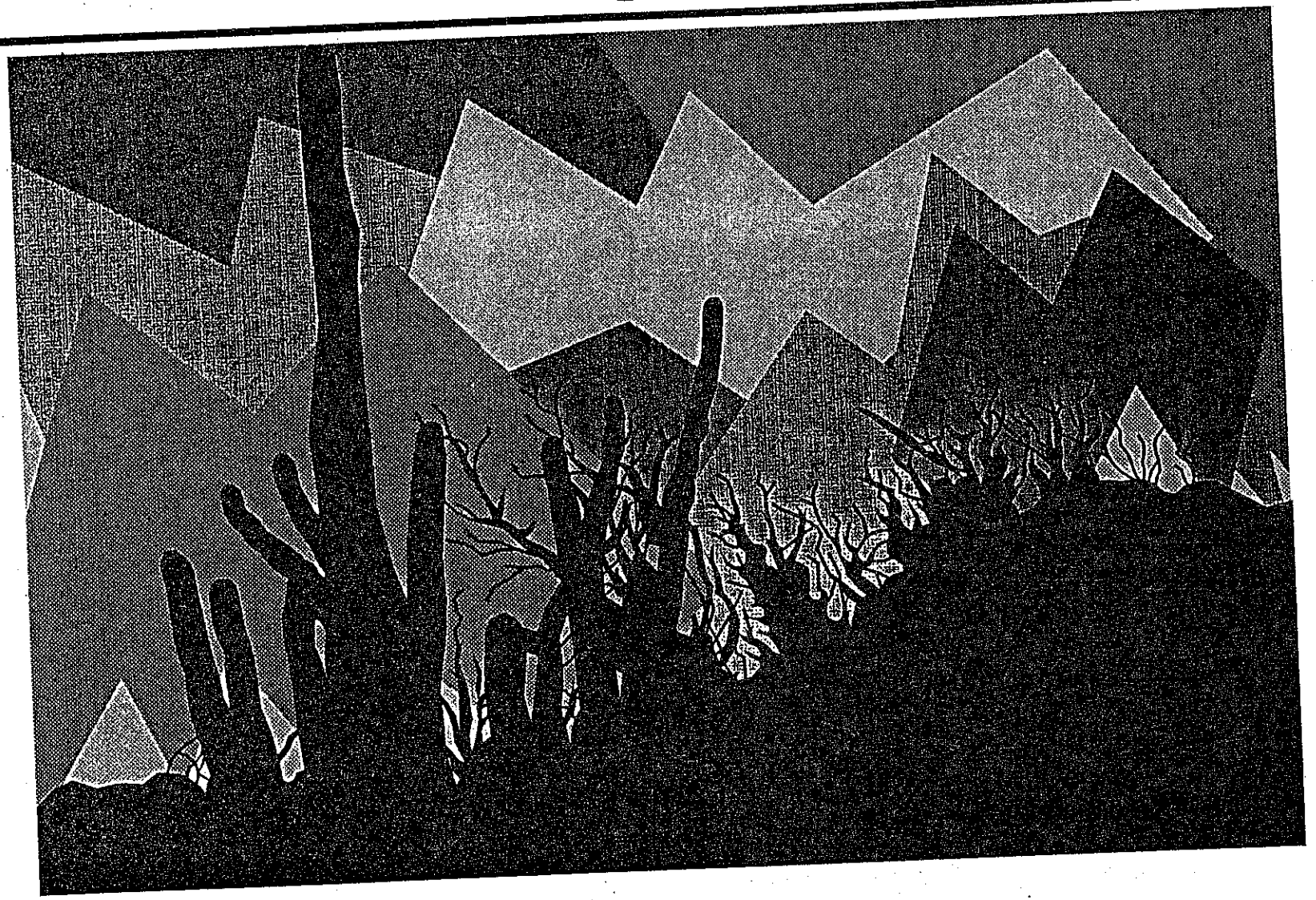
AGENDA ITEM 95-9-1

NOTICE OF PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CERTIFICATION REQUIREMENTS AND PROCEDURES FOR LOW-EMISSION PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES

Copies of the slide presentation which supported the Air Resources Board's oral staff presentation given by Annette Guerrero.

Attachments

Low-Emission Vehicle Program



Support for RAFS

AB234 Advisory Board (1989)

"level playing field"

"air quality based performance standards"

National Academy of Sciences (1991)

"...the studies to date support the use of reactivity scaling."

Peer-Reviewed Articles

Journal of the Air & Waste Management Association (1992; 1994a,b)

Environmental Science & Technology (1995a,b,c)

Science (1995)

Null Test

Test of "Level Playing Field"

Airshed Modeling (3 episode × 2 inventories)

Protocol

Established at November 1991 Board Hearing

Followed at January 1993 Board Hearing

Followed for June 1995 mailout

Two Ozone Measures

Basin peak

Population-weighted ozone exposure > 0.09 ppm

Ozone Episode	EI	Null Test*					
		CNG		LPG		RFG	
		Peak	Exp.	Peak	Exp.	Peak	Exp.
Jun '87	1987	1.16	0.96	1.31	1.03	1.02	0.99
Jun '87	2010	1.12	0.97	1.28	1.05	1.02	0.99
Aug '87	1987	1.15	1.01	1.33	1.00	1.02	1.00
Aug '87	2010	1.12	0.90	1.26	1.03	1.02	0.98
Sep '82	1987	1.00	0.89	1.05	0.97	0.98	0.92
Sep '82	2010	1.04	0.96	1.15	1.06	1.00	0.99
Average		1.10	0.95	1.23	1.02	1.01	0.98
		1.02		**1.13**		**0.99**	

* Null test results of 1.00 imply "level playing field".

Shadow - Ratio of two small numbers.

Summary of LEV Program Milestones

Status of Implementation

- June 1992
- May 1994

Regulatory Review

- November 1991
- January 1993
- September 1995

Staff Presentation

- Regulatory Amendments
- Medium-Duty Vehicle SIP Proposal
- Reactivity Adjustment Factors

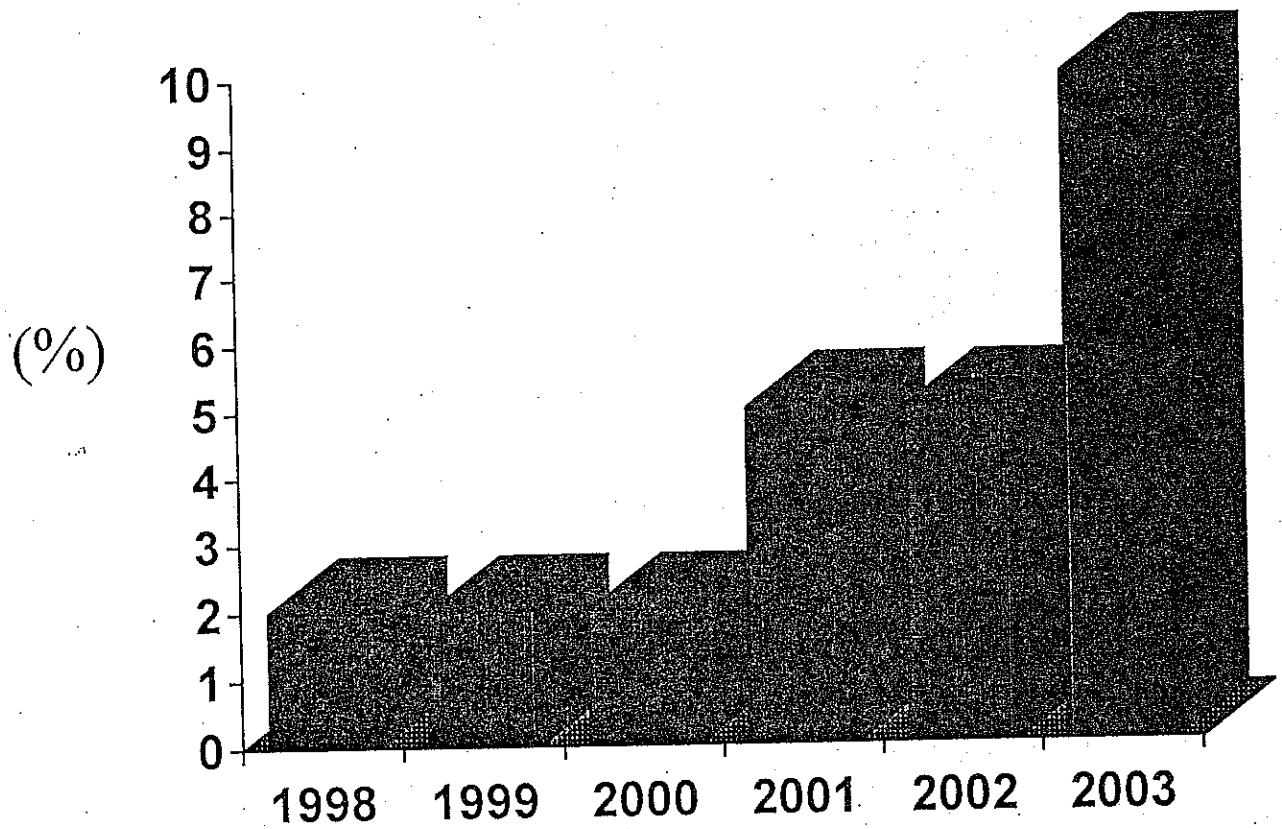
LEV Standards:
% Reduction from Tier 1

Category	NMOG	CO	NOx
TLEV	50%	0%	0%
LEV	67%	0%	50%
ULEV	84%	50%	50%
ZEV	100%	100%	100%

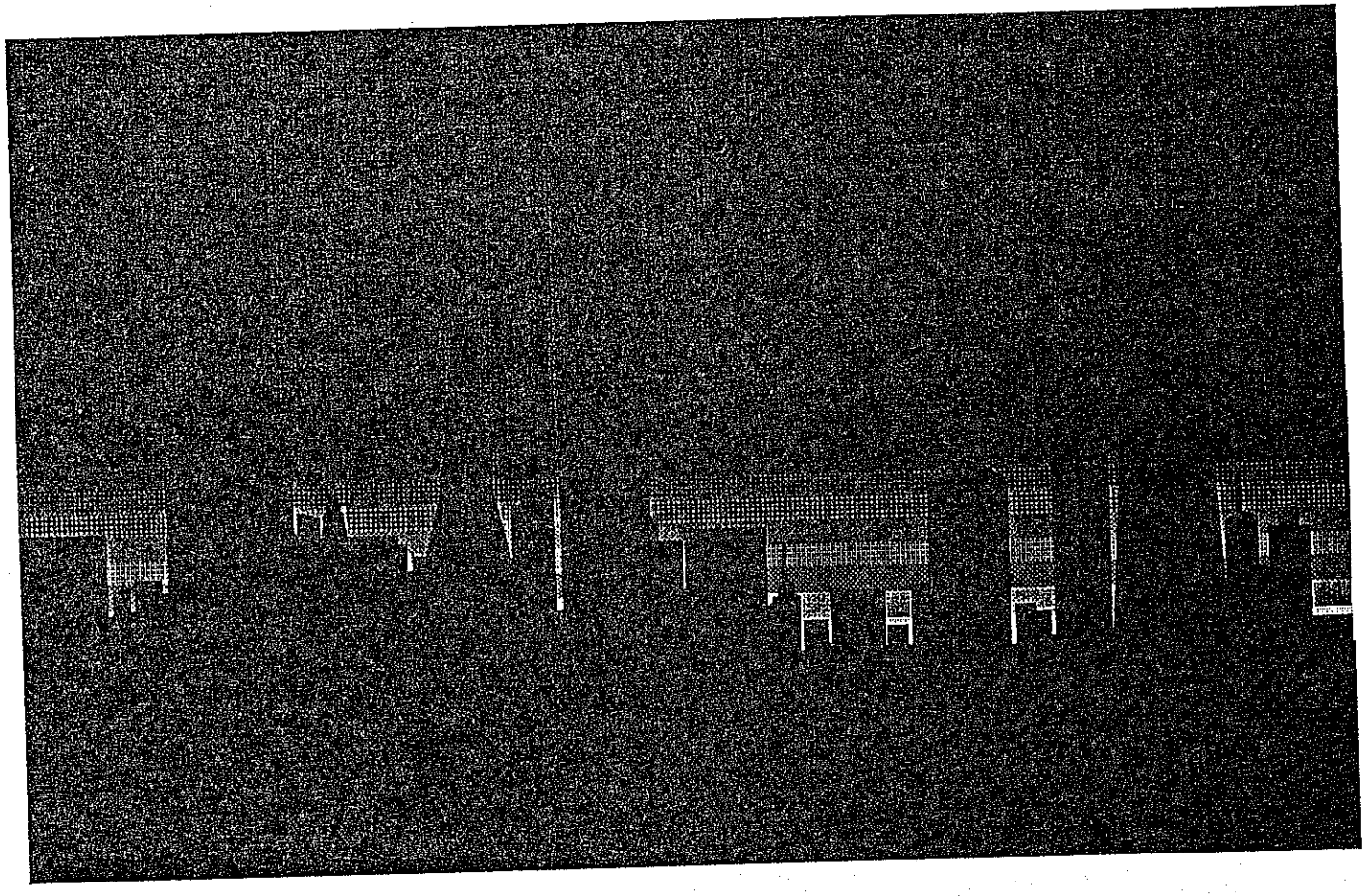
LEV Program Features

- Passenger Cars and Light Trucks
  - Fleet Average Requirement
  - Credit Trading
- Medium Duty Vehicles
  - Phase-In Requirements
  - Marketable Emission Credits

ZEV Requirements



HC + NOx + SUN = SMOG



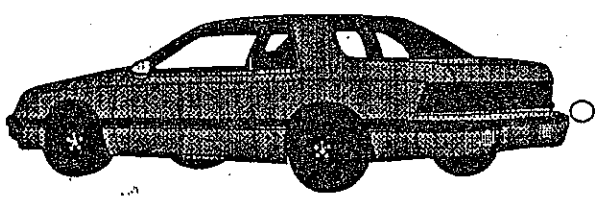
California Environmental Protection Agency

Air Resources Board

Accounting for Reactivity

- NMOG Standard
- Reactivity Adjustment Factor

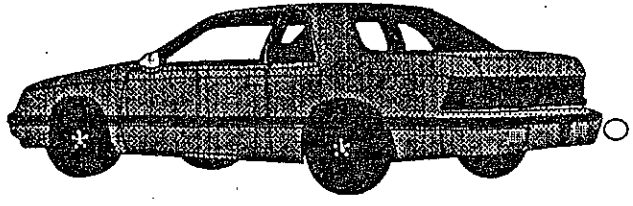
Reactivity



1 lb NMOG

high reactivity →

Ozone



1 lb NMOG

low reactivity →

Ozone

1996 MY Low-Emission Vehicles

	LDV			MDV
Mfr	TLEV-Phase 2 RFG	LEV-RFG	ULEV-CNG	LEV-CNG
GM	1.9L, 2.2L, 2.4L			
Ford	2.0L, 4.0L, 4.6L		4.6L	
Chrysler	2.0L, 3.3L		3.3L	5.2L
Toyota	2.0L, 2.2L			
Honda	1.6L, 2.2L	1.6L		
Mazda	1.5L, 1.6L, 2.0L			
Nissan	1.6, 2.4L			

Staff Presentation

- Regulatory Amendments
- Medium-Duty Vehicle SIP Proposal
- Reactivity Adjustment Factors

Regulatory Amendments

- Remove M100 Luminosity Requirement
- Revise Laboratory Emission Measurement Methods
- Update Assembly-Line and New Vehicle Test Procedures
- Smog Index Window Label

Regulatory Amendments

- Update List of Exhaust Compounds
- Extend In-Use Standards

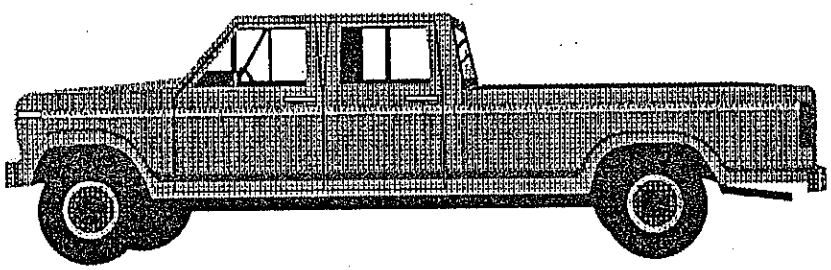
Staff Presentation

- Regulatory Amendments
- Medium-Duty Vehicle SIP Proposal
- Reactivity Adjustment Factors

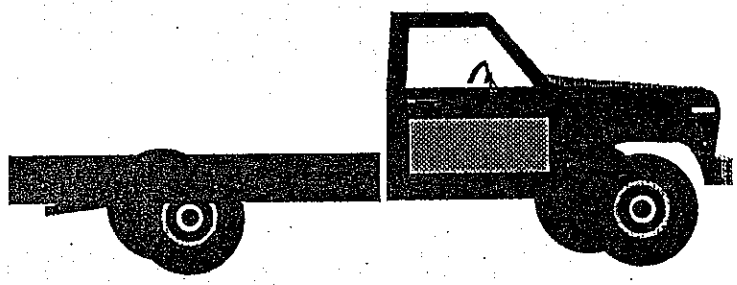
Medium-Duty Vehicle SIP Proposal

- Technological Feasibility
- Proposed Phase-In Requirements
- Cost Analysis

What is a Medium Duty Vehicle?



Complete



Incomplete

MDV Gasoline Technology

- Engine Improvements
- Improved Fuel Control
- Efficient, Durable Catalysts

MDV Diesel Technology

- Combustion Chamber Improvements
- Turbochargers
- Ignition Timing
- Fuel Injection
- Exhaust Gas Recirculation

MDV SIP Proposal

Model Year	Complete Vehicle (%)		Incomplete Vehicle (%)	
	LEV	ULEV	LEV	ULEV
2001	80	20	0	0
2002	70	30	100	0
2003	60	40	100	0
2004	60	40	0	100

Amendments to Emission Standards- Complete Vehicles

- Reduce LEV NOx to ULEV Levels
- Extend Intermediate Standards
- Increase CO Standards
- Super Low-Emission Vehicle Category (SLEVs)

Amendments to Emission Standards- Incomplete Vehicles

- Align with Federal Standard
  - 2.5 g/bhp-hr NMHC + NOx

    or

  - 2.4 g/bhp-hr NMHC + NOx
- Adjust Phase-In, CO and PM Requirements

MDV Inventory Analysis

	ROG (tpd)	NOx (tpd)
Original SIP Proposal	4	32
Adjusted Inventory	3.8	23.5
Staff's Proposal	2.0	23.9

Cost-Effectiveness of MDVs

Gasoline	< $0.50/lb
Diesel	< $1.50/lb

Staff Presentation

- Regulatory Amendments
- Medium-Duty Vehicle SIP Proposal
- Reactivity Adjustment Factors

RAF Calculation

$$RAF = \frac{\text{Reactivity of low-emission vehicles on clean fuel}}{\text{Reactivity of low-emission vehicles on conventional gasoline}}$$

Phase 2 LEV RAF

Generic RAF

0.94 = 2.94 / 3.13

Engine Family Specific RAF

0.88 = 2.75 / 3.13

Compliance with Standard

$$RAF \times NMOG \leq Standard$$

$$0.50 \times 0.100 \leq 0.075$$

Adopted RAFs

	Light-Duty			MDV	
Fuel	TLEV	LEV	ULEV	LEV	ULEV
	Baseline Reactivity				
Conventional Gasoline	3.42	3.13	3.13		
	RAF Values				
Phase 2	0.98	0.94			
M85	0.41				
CNG					
LPG					

Proposed RAFs

	Light-Duty			MDV	
Fuel	TLEV	LEV	ULEV	LEV	ULEV
	Baseline Reactivity				
Conventional Gasoline	3.42	3.13	3.13	3.13	3.13
	RAF Factors				
Phase 2	0.98	0.94			
M85	0.41				
CNG		0.43	0.43		
LPG		0.50	0.50		

Interim RAFs

	Light-Duty			MDV	
Fuel	TLEV	LEV	ULEV	LEV	ULEV
	Baseline Reactivity				
Conventional Gasoline	3.42	3.13	3.13	3.13	3.13
	RAF Factors				
Phase 2	0.98	0.94	0.94	0.94	0.94
M85	0.41	0.41	0.41	0.41	0.41
CNG	1.0	0.43	0.43	0.43	0.43
LPG	1.0	0.50	0.50	0.50	0.50

15-day Changes

- In-Use Standards for SLEVs and Incomplete MDVs
- 50° F Multiplier of 2.0 for LEVs and ULEVs
- Smog Index Window Label Amendments

Recommended Action

- Adopt Regulatory Amendments
- Adopt MDV SIP Proposal
- Adopt Interim RAFs
- Adopt 15-day Changes