Proposed Modifications to the Low-Emission Vehicle Program

FACA Subcommittee on Mobile Sources

October 14, 1998
El Monte, California
Steve Albu

California Environmental Protection Agency
Air Resources Board

LEV Program Background

- Adopted in September 1990
- Implementation began in 1994
- Capability of emission control technology has exceeded ARB’s projections
- Has ultimately been shown to be very cost effective

LEV I Standards (g/mi)

<table>
<thead>
<tr>
<th>Category</th>
<th>NMOG*</th>
<th>CO</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier I</td>
<td>0.25</td>
<td>3.4</td>
<td>0.4</td>
</tr>
<tr>
<td>TLEV</td>
<td>0.125</td>
<td>3.4</td>
<td>0.4</td>
</tr>
<tr>
<td>LEV</td>
<td>0.075</td>
<td>3.4</td>
<td>0.2</td>
</tr>
<tr>
<td>ULEV</td>
<td>0.040</td>
<td>1.7</td>
<td>0.2</td>
</tr>
<tr>
<td>ZEV</td>
<td>zero</td>
<td>zero</td>
<td>zero</td>
</tr>
</tbody>
</table>

* Based on conventional gasoline - clean fuel values determined by adjusting for ozone reactivity

LEV I Implementation

- Sales moving to all LEV
  - 1997: 46% LEVs
  - 1998: 70% LEVs
- First ULEV
  - 1998 Accord EX
- ZEV MOA

LEV II Proposal

- New Emission Standards
  - 0.05 g/mi NOx - LEV, ULEV
  - Lower PM standard for diesels
  - New SULEV standard for PCs and LDTs
  - 120,000 mile durability standard
  - Optional 150,000 mile standard
- New light-duty truck category (LDT2)
- New lower fleet averages for PCs and LDTs
- Lower evaporative emissions
- Partial ZEV credits for qualifying technologies

M2 - Advanced Technology for Light-Duty Vehicles

Status
- Regulatory development in progress
- Board hearing 11/98
- M2 calls for 25 tpd emission reduction - target likely to be exceeded

SIP

- ARB
  - Adopt by 2000

LEV ROG + NOx reduced (tpd in 2010)
PROPOSED EMISSION STANDARDS
Passenger Cars and Light-Duty Trucks
0-8500 lbs. GVW

<table>
<thead>
<tr>
<th></th>
<th>NMOG</th>
<th>CO</th>
<th>NOx</th>
<th>PM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLEV 50K</td>
<td>0.125</td>
<td>3.4</td>
<td>0.4</td>
<td>0.04</td>
</tr>
<tr>
<td>120K</td>
<td>0.156</td>
<td>4.2</td>
<td>0.6</td>
<td>0.01</td>
</tr>
<tr>
<td>LEV 50K</td>
<td>0.075</td>
<td>3.4</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>120K</td>
<td>0.090</td>
<td>4.2</td>
<td>0.07</td>
<td>0.01</td>
</tr>
<tr>
<td>ULEV</td>
<td>0.040</td>
<td>1.7</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>120K</td>
<td>0.055</td>
<td>2.1</td>
<td>0.07</td>
<td>0.01</td>
</tr>
<tr>
<td>SULEV 120K</td>
<td>0.010</td>
<td>1.0</td>
<td>0.02</td>
<td>0.01</td>
</tr>
</tbody>
</table>

- Diesel only
- **Proposed standards in bold type

0.05 g/mi NOx
(LEVs, ULEVs)

- LEV II emphasis is on NOx reductions
- Four year phase-in beginning in 2004
- Test program has been conducted to demonstrate low NOx feasibility

Proposed SULEV Standard

- Emission Standards:
  - 0.01 g/mi NMOG;
  - 1.0 g/mi CO;
  - 0.02 g/mi NOx
- 120,000 mile standard

Expanded Light-Duty Truck Category (LDT2)

- Restructured to include heavier light-duty trucks and sport utility vehicles currently used for personal transportation
- LDT2 = 3751 lbs. LVW - 8500 lbs. GVWR
  - Includes vehicles currently in MDV1, MDV2, and MDV3 categories
  - Emission standards same as PC and LDT1
- Slightly higher NOx standard for true work trucks
- ARB test program on LDT2s to demonstrate feasibility of new standards

Comparative Emission Standards
PCs, LDTs, MDVs

ARB Test Vehicles
Advanced Catalyst System

Proposed Fleet Average Requirement

- PCs and LDT 0-3750 lbs.:
  - Decreasing from 0.062 in 2003 to 0.035 in 2010
- LDT2s 3751 lbs LVW - 8500 lbs GVW:
  - Decreasing from 0.093 in 2003 to 0.043 in 2010

Evaporative Requirements

- Lower evaporative standards
- Increased durability: 15 yrs./150K miles
- Applicable to PCs, LDTs, MDVs, and HDVs
- Gasoline-fueled, LPG-fueled, alcohol-fueled, HEVs, and ZEVs with fuel-fired heaters
- Phase-in beginning in 2004 MY
- Optional zero-evaporative standards for SULEVs that receive partial ZEV credit

Partial ZEV Credit Proposal

- Only vehicles that meet all of the following requirements would qualify to receive partial ZEV credit:
  - SULEV standard at 150,000 miles and associated OBD II requirements
  - Zero-fuel evaporative emissions
  - 150,000 mile emission warranty
- Amount of credit is dependent on zero emission VMT, fuel cycle emissions
- Minimum of 40% must be pure ZEVs for large manufacturers

Maximum Partial ZEV Credit

Partial ZEV Credit: Examples

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>ZEV Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline SULEV</td>
<td>0.2</td>
</tr>
<tr>
<td>CNG SULEV</td>
<td>0.4</td>
</tr>
<tr>
<td>Gasoline HEV (20 mile electric range)</td>
<td>0.7*</td>
</tr>
<tr>
<td>Fuel Cell w/methanol reformer</td>
<td>0.7**</td>
</tr>
<tr>
<td>Fuel Cell w/stored hydrogen</td>
<td>1.0</td>
</tr>
</tbody>
</table>

*0.1 credit allowed for HEVs that promote off-board charging
**If fuel cycle emissions equivalent to electric vehicle
$ per Pound of Ozone Precursors

Major Regulations Show Similar Cost Effectiveness

Summary

- Reductions from LEV II are projected to meet SIP measure M2 requirements
- Proposal provides extra emission reductions which would be applied to the “Black Box”
- Proposal is cost effective
- Other potentially very clean technologies also appearing - hybrids, fuel cell vehicles, etc.