

**Report to Congress on Tier 2 Light-Duty Standards  
and  
Related Sulfur Issues**

Mobile Source Technical Review Subcommittee

**Richard A. Rykowski**  
Office of Mobile Sources, U.S. EPA

Washington, D.C.  
April 15, 1998

\*\*\*\*\*

**Outline**

- CAA Requirements for Tier 2 Study and Standards
- Tier 2 Study
- Gasoline Sulfur

\*\*\*\*\*

**CAA Requirements and Schedule**

- CAA set Tier 1 standards
- Timing of Tier 2 standards: no sooner than 2004
- Tier 2 study by June 1997; must address 3 issues
  - Air quality need
  - Technical feasibility
  - Cost effectiveness
- Formal findings must be made by rule
- Current schedule
  - Publish draft ~ April 17-20, 1998
  - 30 days for comment
  - Final draft to Congress (with summary of comments) by July 15, 1998
- Concurrent technical paper and workshop on sulfur (more later)
- NPRM by December 31, 1998; FRM by December 31, 1999

## **National LEV (NLEV) and the Tier 2 Standards**

- Agreement recently reached on NLEV program
- Implements current California LEV standards for vehicles under 6000 pounds GVWR
- Duration: agreement ends in 2003 if EPA does not implement Tier 2 standards at least as stringent as NLEV

\*\*\*\*\*

## **Future Ozone, PM and CO Nonattainment Status**

- Ozone
  - OTAG SIP Call (2007 within the OTAG region)
  - Revised NAAQS analysis (2010 nationwide)
- PM10
  - Revised NAAQS analysis (PM10 and PM2.5 in 2010 nationwide)
  - Diesels
  - Secondary nitrate and sulfate PM
- CO
  - No recent projections
  - Cold CO study
- Modifications to MOBILE5
  - 1) Lower deterioration rates
  - 2) Off-cycle operation
  - 3) Sulfur and LEVs
  - 4) LDT characterization
- LDV and LDT emissions higher with Modified MOBILE5b model in 2007 in four typical cities
  - 15-20% of total NMHC inventory
  - 22-31% of total NOx inventory

\*\*\*\*\*

## **Technical Feasibility**

- Tremendous progress in catalyst and air-fuel ratio control
- California LEVs and ULEVs with conventional technology
- Many Tier 1 vehicles and LEVs certified well below standards
- California proposed LEV-II program
  - Further reductions in corporate average NMOG standards
  - 0.05 NOx standard added to LEV and ULEV categories
  - New SULEV category
- Progress in improving vehicle efficiency
  - Gasoline direct injection engine
  - Gasoline-powered fuel cells

## **Regulatory Issues**

- Light-duty trucks
- Fuel neutrality
- Gasoline sulfur

\*\*\*\*\*

### **Light-Duty Trucks**

- LDT sales increasing
- Stringency of current LDV and LDT standards
- NLEV only applies up to 6000 pounds GVWR
- Improvements in thermal durability of catalysts
- California proposing same standards for LDVs and LDTs
  - Expanded LDT category ( $\leq 7000$  lb curb weight)
  - 2-year lag-time for LDT vis-a vis LDV standards

\*\*\*\*\*

### **Fuel Neutral Standards and Diesels**

- Relaxed Tier 1 NO<sub>x</sub> standards for diesels expire in 2004
- Gasoline and diesel engines fulfill same purpose
- PNGV goals same for all powerplants
- Tier 1 particulate standards set on basis of diesels
  - Gasoline vehicles emit order of magnitude less particulate
- More diesels  $\neq$  higher fuel economy  $\neq$  lower CO<sub>2</sub> emissions
  - CAFE standards
  - Carbon per gallon

## Gasoline Sulfur

- LEV emissions sensitive to sulfur
  - 40 → 600 ppm
  - 154% NO<sub>x</sub> increase, 61% NMHC increase
  - Sulfur impact varies by model (See Figures 1 and 2)
- Limited data on reversibility; again variable across models
- Need to understand cause of effect and of variability
  - Impact of future SFTP controls
  - Onboard diagnostic (OBD) system
- Advanced, fuel efficient gasoline powerplants being developed
  - Direct injection, fuel cells
  - Important for climate change benefits
  - Fuel quality should not be a barrier
- Cost of sulfur removal appears to be declining with new technology
- Stakeholder proposals
  - AAMA/AIAM: national 80 ppm cap
  - STAPPA/ALAPCO: ~200 ppm cap in 2001, ≤80 ppm cap in 2005
  - MECA: very similar to STAPPA/ALAPCO
  - API/NPRA: 150 ppm average in OTAG+, 300 ppm average elsewhere
- California and Japan already have very low sulfur gasoline
  - Europe may require 30-50 ppm sulfur in 2005
- Technical paper on sulfur to be published concurrent with Tier 2 Study
  - Identify issues and current state of knowledge
  - Facilitate stakeholder involvement
  - Develop control options for NPRM