Outline

• A retrospective of California air pollution and the role of motor vehicles
• Global warming and motor vehicles
• Successes and challenges—the role of enforcement
RETROSPECTIVE OF CALIFORNIA AIR POLLUTION AND THE ROLE OF MOTOR VEHICLES
1940s: Los Angeles

County air pollution control districts established

2.8 million vehicles
1950s: Photochemical smog described by Prof. Arie Haagen-Smit

4.5 million vehicles
1960s: automotive emissions controls

- Motor Vehicle Pollution Control Board
- California positive crankcase ventilation (PCV) control
- California authority to set own motor vehicle emission standards
- Tailpipe standards for CO, HC
- California Air Resources Board (CARB)
- Prof. Haagen-Smit first chair (1967)

8 million vehicles
1970s: U. S. Clean Air Act

- U.S. EPA, 1970
- Los Angeles ozone 580 ppb
- CARB automotive NO$_x$ standards, 1971
- National ambient air quality standards, 1971
- 2-way, 3-way automotive catalysts

12 million vehicles
1980s: expanding regulation

- In-use compliance testing
- Low emission vehicle (LEV) standards
- On-board diagnostics (OBD) rule
- Toxic air contaminant bill

17 million vehicles
1990s: tightening standards

- Cleaner burning gasoline program
- Zero emission vehicle (ZEV) program
- California diesel fuel introduction
- Smog check II
- LEV II standards (98+% reduction)
- MTBE ban

23 million vehicles
2000s: climate change

- No Stage 1 smog alerts (200 ppb O$_3$) in South Coast Air Basin
- Diesel risk reduction program
- AB1493 (Pavley) motor vehicle greenhouse gas emissions reduction
- Climate change action plan for California
- AB32 California Global Warming Solutions Act of 2006

26 million vehicles
GLOBAL WARMING
AND
MOTOR VEHICLES
California initiatives

“...the debate is over. We know the science. We see the threat. And we know the time for action is now.”—Gov. Schwarzenegger, 1 June 2005

Proposals include:

- Mandatory greenhouse gas registry
- Greenhouse gas cap and trade
- Alternative transportation fuels
- Low carbon fuel standard
California greenhouse gas emission trends (CEC, 2005)
California greenhouse gas emissions, 2004

- Transportation: 41.2%
- Industry: 22.8%
- Electric power: 19.6%
- Others: 8.4%
- Agriculture and forestry: 8.0%
Light-duty motor vehicle regulation

- Pavley-1 (AB1493)
  - Passed 2002, starting model-year 2009, 30% reduction by 2016
  - Adopted by 18 states, about half U.S. auto sales
  - Court challenges by auto industry (all found in California’s favor)
  - But, USEPA has denied necessary waiver

- Pavley-2
  - Proposed for adoption by ARB under AB32 authority
SUCCESES AND CHALLENGES—
THE ROLE OF ENFORCEMENT
Success: air quality improving

- Lead
- Nitrogen dioxide
- Sulfur dioxide
- Carbon monoxide
- Ozone
- Particulate matter
Success: South Coast ozone falling

South Coast
Peak Ozone Levels

*2004 data are preliminary and reflect data collected through November 30, 2004.
Challenge: continuing growth

- Population
- Motor vehicles
- Motor fuel consumption
- Vehicle miles traveled
- Goods movement
Success: new light duty fleet clean and durable

- Tailpipe emissions
- Evaporative emissions
- On-board diagnostics
- In-use compliance program based on road-side pull-overs
Challenge: older, in-use light duty vehicles

Smog check program
- Pre-1975 and newer than 6 years exempt
- Test only, annual inspection for high emitters

Old vehicle buy-back
Challenge: ZEV program

- Battery electrics
- Fuel cell vehicles
- 2009 ARB will modify rules

Success: ZEV program

- PZEVs
- Hybrids
- SULEVs
Challenge: transportation petroleum use reduction

- Reduce petroleum use 15% by 2020
- Increase alternative fuel use to 20% by 2020
- Focus on renewable, biofuels
- Ethanol: E10 or E85 or both?
- Food vs. motor fuel
Challenge: diesel risk reduction

• Goals set in 2000
  – 75% reduction by 2010
  – 85% reduction by 2020

• Approaches
  – New engine standards
  – In-use compliance (heavy duty I/M)
  – Clean diesel fuel, alternative fuels
  – Retrofit program

• Growth problem
Success: clean light duty diesels

• Will meet California LEV II standards
• Multiple manufacturers are planning to introduce to California
• Fuel economy, performance
• Larger vehicles
Success: heavy duty diesel PM reduction

- On-road evidence
- 2007 trap technology, 98% reduction
- Smoking vehicle citation
Challenge: heavy-duty diesel \(\text{NO}_x\) reduction

- On-road emissions have not matched emission standards
- \(\text{NO}_x\) versus fuel economy trade-off
- 2010 standards, 98% reduction
  - Urea based selective catalytic reduction
- Heavy-duty smog check?