



August 25, 2004: El Monte, California
August 26, 2004: Sacramento, California

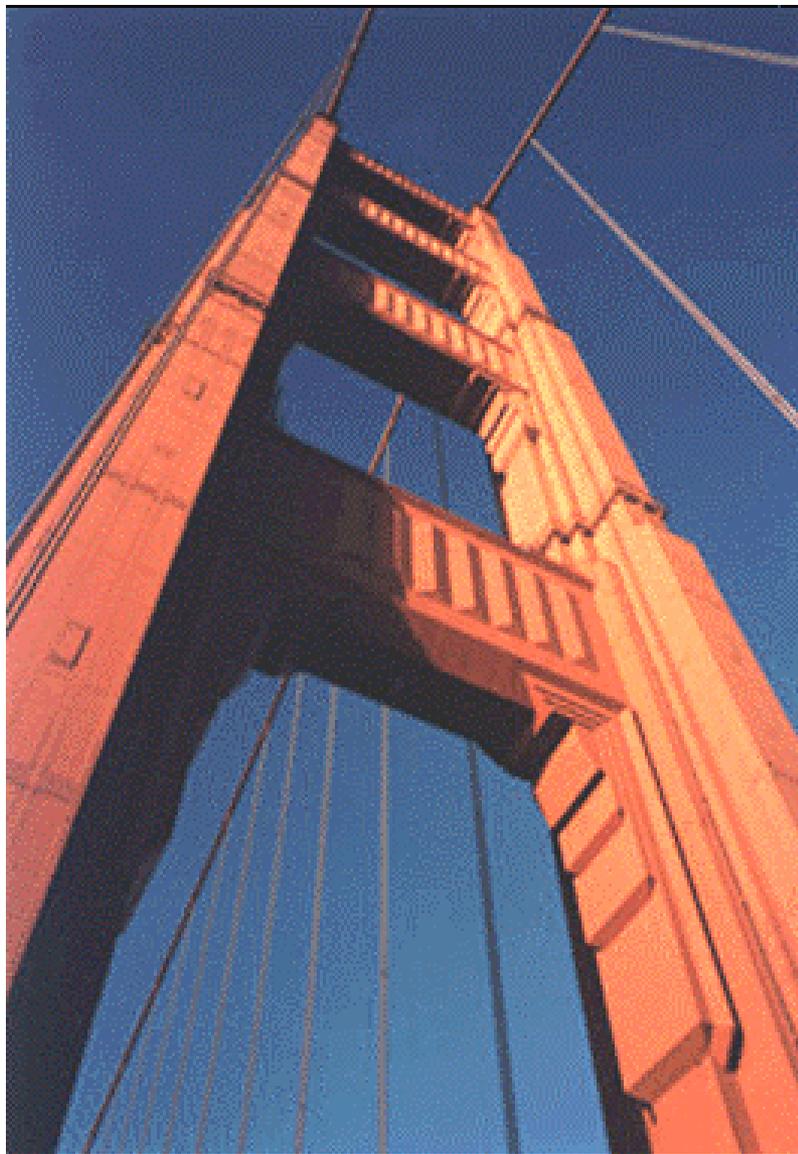
California Environmental Protection Agency



Air Resources Board

Overview

- ◆ Background
- ◆ Regulatory Approach
- ◆ Draft Regulatory Proposal
 - LSI Category
 - User Fleet Average Requirement
 - Manufacturer Lower Emission Standard
 - Draft Retrofit Verification Protocol
- ◆ Issues
- ◆ Upcoming Schedule



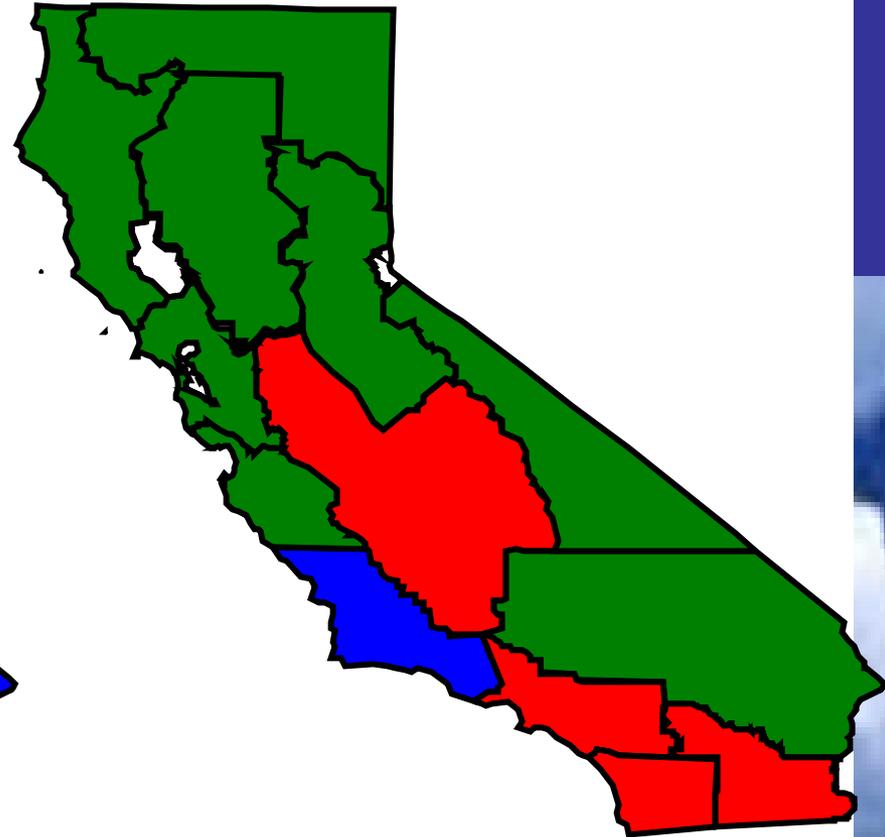
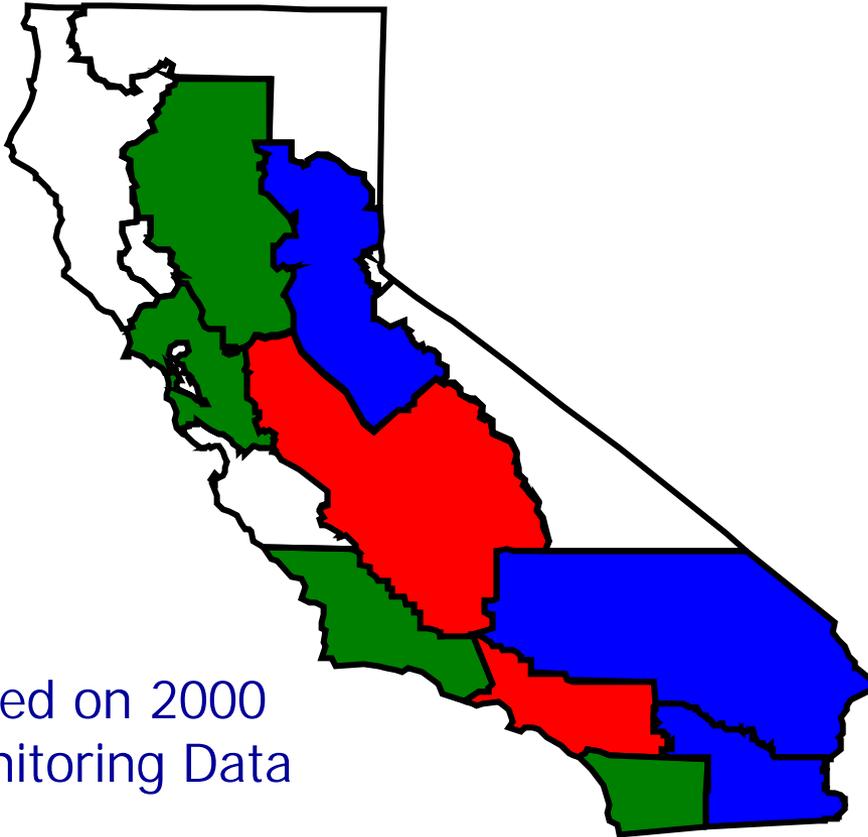
Background

The Air Quality Challenge...

Over 90% of Californians Breathe Unhealthy Air at Times

Days Over State
Ozone Standard

Days Over State
PM10 Standard



Based on 2000
Monitoring Data

0-5 Days

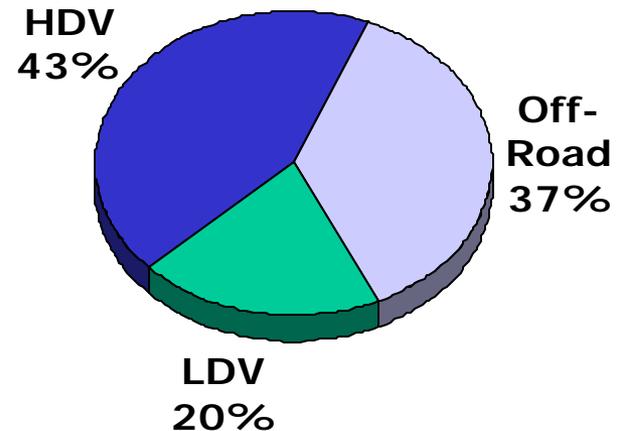
6-50 Days

50-100 Days

>100 Days

Off-Road LSI NOx Emissions

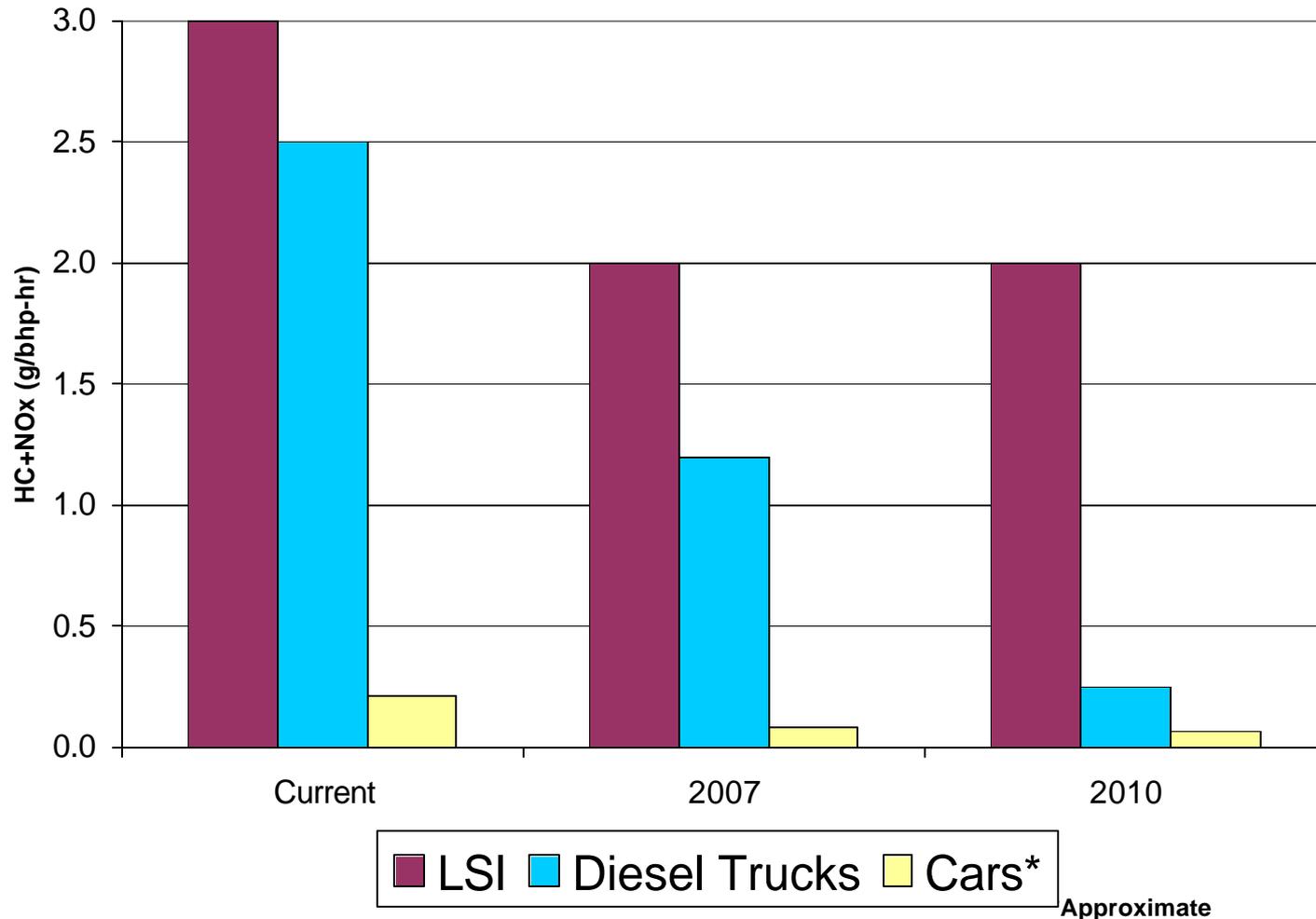
- ◆ The majority of NOx emissions come from mobile sources
- ◆ 37 percent of mobile source emissions are from off-road equipment
- ◆ LSI NOx contribution:
 - about 9 percent - or 60 tons per day - in 2000
 - relative contribution increasing



Existing and Pending Regulations

- ◆ 1998 ARB LSI Rule
 - 3.0 g/bhp-hr HC + NO_x certification level;
 - 2000 -2004 phase in - 25 percent increments
- ◆ 2007 EPA Rule
 - Certification standard of 2.0 g/bhp-hr HC + NO_x
 - Flexible standards (higher CO/lower HC + NO_x)
 - Requires transient test cycle
 - Optional “Blue Sky” standards
 - 0.6 g/bhp-hr HC + NO_x

Comparative Emissions



2003 State Implementation Plan

- ◆ SIP Measure LSI-1
 - harmonize with 2007 EPA rule
- ◆ SIP Measure LSI-2C
 - consolidates two proposals:
 - Existing engines - reduce emissions by 80%
 - Zero - and near zero-emission requirements for new LSI engines
- ◆ LSI Goal - reduce SCAB HC+NOx 6 tpd

Regulatory Approach



Goals

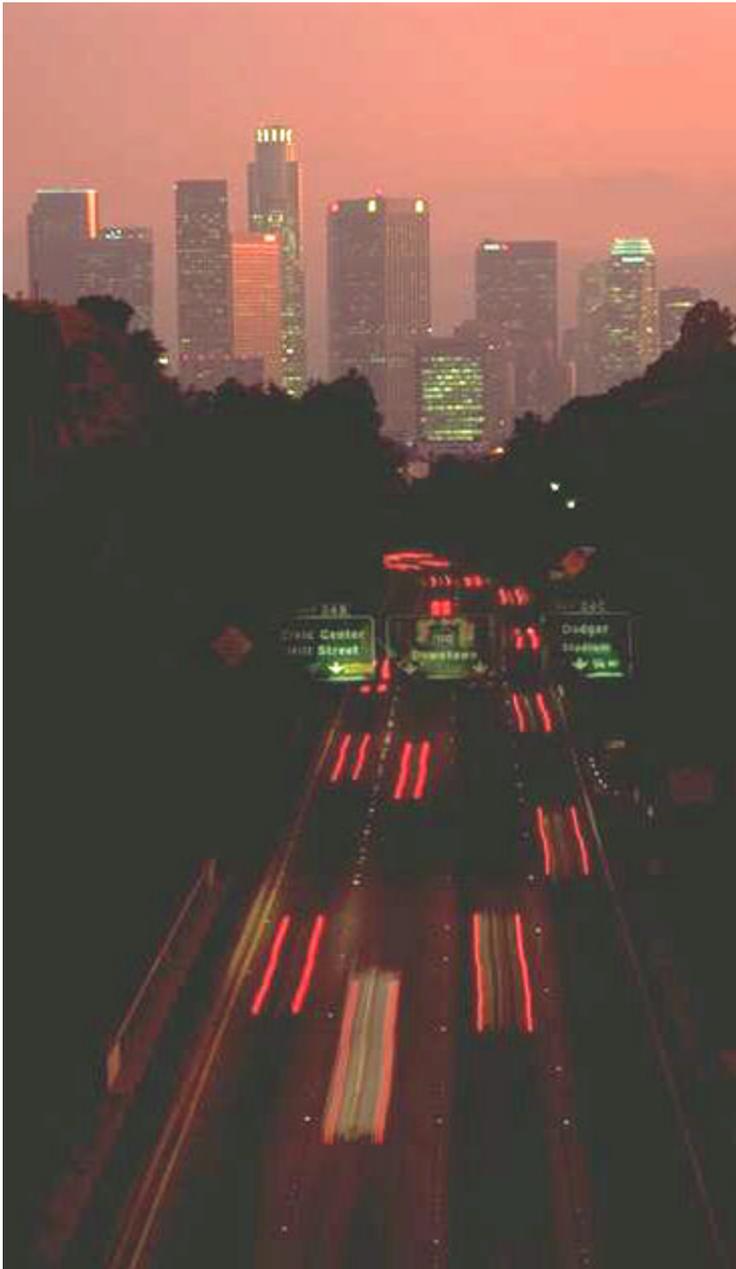
- ◆ **Primary Objectives:**
 - Maximize cost-effective emissions benefits
 - Meet SIP obligations
 - Increase opportunities for zero-emission technology
- ◆ **Additional Goals:**
 - Maximize fleet owner flexibility
 - Ensure that regulations are enforceable
 - Avoid adverse incentives

Activities to Date

- ◆ Technical working groups established
 - Includes associations, manufacturers, fleet owners, dealers, and others
- ◆ Evaluated emission reduction potential of several identified tools
- ◆ May 2004 Sacramento workshop
 - Presented multiple concepts

May Workshop

- ◆ Staff proposed three concepts:
 - Manufacturer Lower Emission Standard and In-Use Reductions
 - Electric Purchase and In-Use Reductions
 - Owner Fleet Average
- ◆ Commitment to increase dialog
 - bimonthly technical working group meetings
 - monthly retrofit verification protocol meetings



Draft Regulatory Proposal

LSI Category

- ◆ New and in-use off-road LSI equipment 25 hp and greater, 1 liter displacement and greater
- ◆ Forklifts, scrubber/sweepers, portable generators, specialty vehicles, airport ground support equipment, and more...
- ◆ Final regulation will affect a more narrow subset
- ◆ Minimize or eliminate overlapping regulations

User Fleet Average Requirement

- ◆ Fleet Average Emission Level Requirements
- ◆ Small Fleet Exemption
- ◆ Compliance Strategies
- ◆ Compliance Examples
- ◆ Additional Requirements

User Fleet Average Requirement

- ◆ LSI user
 - possession/use of equipment over 30 days/year
- ◆ Establishes large, intermediate, and small fleets
 - Large fleets = 26 + pieces of equipment:
 - Medium fleets = 4 -25 pieces of equipment
 - Small fleets = 1-3 pieces of equipment
- ◆ Progressively more stringent emission levels for 2009, 2011 and 2013
- ◆ The larger the fleet, the tighter the level

User Fleet Average Emission Requirements

LSI Fleet Type	Number of units	By 2009	By 2011	By 2013
Large fleet – forklift component	26 +	2.3	1.6	0.8
Mid-size fleet – forklift component	4-25	2.5	1.8	1.1
Mid-size or Large Non-forklift fleet	N/A	3.0	2.3	1.7
Small fleet	1-3	N/A	3.0	3.0

Exemptions for Small/Low-use Fleets

- ◆ Small Fleets (1-3 units)
 - Have to meet 3.0 g/bhp-hr emission level only
 - Have until 12/2010 to retrofit, repower or retire old lifts
- ◆ Infrequent Usage Fleet
 - Forklifts used less than 250 hours per year
 - May use lower cost (less effective) retrofit until 2013

Fleet Average Compliance Strategies

Zero Emission Technologies

- ◆ Electric
 - Simplest and most effective way to reduce a fleet's average emission level
 - No exhaust or evaporative emissions and extremely low upstream (power plant) emissions
 - Used in a wide variety of environments
 - Lower life cycle costs than LSI forklifts



Lower Emission Standards

- ◆ Clean LSI equipment
 - Well below 2007 EPA standard of 2.0 g/bhp-hr
 - Incorporates readily available and cost-effective emission control technologies
- ◆ Optional tiered new engine standards
 - 0.1, 0.2, 0.4, 0.6, 1.0, and 1.5 g/bhp-hr

In-Use Emission Reductions

- ◆ Uncontrolled Equipment = High Emissions
 - All pre-2001 and about half of 2001-2003 engines
 - A single uncontrolled engine operating three shifts = a new PZEV certified car over its entire life
- ◆ Retrofits
 - Add-on emission control devices
- ◆ Repowers and Rebuilds
 - Replace or rebuild that engine

Fleet Average Compliance Examples

Fleet Average Emission Level - 2009 Compliance Example

- ◆ A large fleet can attain 2.3 g/bhp-hr level by:
 - incorporating 15% electric equipment, or
 - going to a six-year turn over and purchasing 1.0 g optional low-emission equipment in 2007 & 2008
- ◆ A mid-size fleet can attain 2.5 g/bhp-hr level by:
 - incorporating 8% electric equipment, or
 - maintaining a seven-year turn over and purchasing 1.0 g optional low-emission equipment in 2007 & 2008

Fleet Average Emission Level - 2009 Compliance Example

Emission Level (g/bhp-hr)	Percent of Fleet	Fleet Weighted Emission Level (g/bhp-hr)
12	0	0
3	67	2.01
2	0	0
1	33	.33
0	0	0
Total:		2.34

Fleet Average Emission Level - 2011 Compliance Example

- ◆ A large fleet can attain 1.6 g/bhp-hr level by:
 - incorporating 28% electric equipment, or by
 - maintaining a six-year turn over, continuing the purchase of 1.0 g optional low-emission equipment in 2009, and purchasing 0.6 g low-emission equipment beginning in 2010
- ◆ A mid-size fleet can attain 1.8 g/bhp-hr level by:
 - incorporating 20% electric equipment, or by
 - maintaining a seven-year turn over and continuing the purchase of 1.0 g optional low-emission equipment in 2009, and purchasing 0.6 g equipment beginning in 2010

Additional Requirements

- ◆ Record keeping
 - maintain information on equipment type, make, model, serial number, and emission certification level or retrofit verification level
 - maintain the information on file through 12/ 31/2015
 - rental companies would be considered fleet users for any equipment rented for periods of 30 days or less

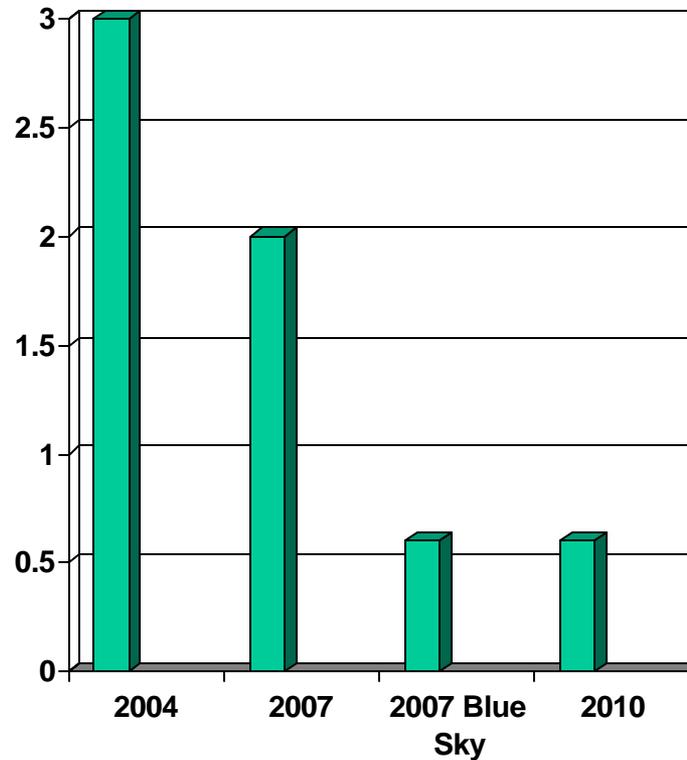
Manufacturer Lower Emission Standard Requirement

- ◆ Manufacturer Lower Emission Standard
- ◆ Optional Tiered Standards
- ◆ Available Technology
- ◆ Technology Comparison

Manufacturer Lower Emission Standard

HC + NO_x Standards

- ◆ Harmonize with EPA 2.0 g/bhp-hr rule
- ◆ Optional EPA 0.6 g “Blue Sky” in 2007
- ◆ Required 0.6 g proposed in 2010
- ◆ Draw upon automotive emission technology



Technology Comparison

	2004 Forklift	Best Case Forklift
Fuel System	Carb/TBI	SMPI
Catalyst Volume (% of engine)	40%	80%
Grams of Pt	0.77	> 2
Grams of Rh	0.19	> 0.4
Cert. Emissions (HC+NOx g/bhp-hr)	1	0.28
Emission Std. (HC+NOx g/bhp-hr)	3.0	

Technology Comparison

	2004 Forklift	Best Case Forklift	Typical 2004 Car
Fuel System	Carb/TBI	SMPI	SMPI
Catalyst Volume (% of engine)	40%	80%	100%
Grams of Pt	0.77	> 2	> 2
Grams of Rh	0.19	> 0.4	~ 2
Cert. Emissions (HC+NOx g/bhp-hr)	1	0.28	0.06*
Emission Std. (HC+NOx g/bhp-hr)	3.0	--	0.15*

*Approximate

Optional Manufacturer Lower Emission Standard

- ◆ Optional Tiered Certification
 - Early use of available clean technologies
 - certify to 1.5, 1.0, 0.6, 0.4, 0.2 and 0.1 g/bhp-hr

Draft Retrofit Verification Protocol

Need for Retrofit Verification Protocol

- ◆ Verification needed to ensure emission reductions are real and durable
- ◆ Verification needed to sell/install retrofit emission systems in California
- ◆ Currently - No LSI retrofit verification protocol available

Proposed Protocol Overview

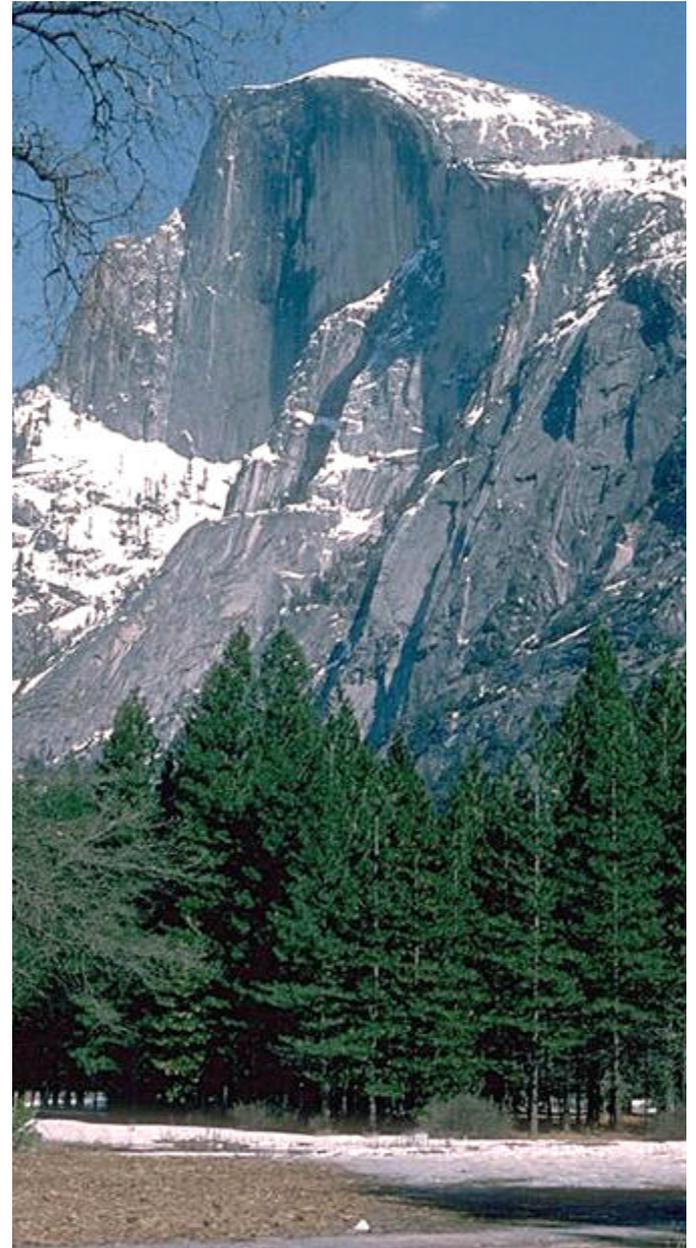
- ◆ Applies to manufacturers of retrofits systems for off-road LSI engines
 - any fuel (LPG, gasoline, CNG...)
- ◆ Sets verification levels - certify to a percent reduction or absolute emission level
- ◆ Protocol includes emission verification testing, in-use compliance, warranty, etc.

Retrofit System Verification Levels

Proposed LSI Engine Retrofit System Verification Levels

Classification	Percentage Reduction (HC+NO _x) (Verified in 5% increments)	Absolute Emission Level (HC+NO _x) (Verified in 0.5 g/bhp-hr increments)
LSI Level 1	≥ 25%	Not Applicable
LSI Level 2	≥ 75%	3.0 g/bhp-hr
LSI Level 3a	≥ 85%	0.5, 1.0, 1.5, 2.0, 2.5 g/bhp-hr
LSI Level 3b	Not Applicable	0.5, 1.0, 1.5, 2.0 g/bhp-hr

Estimated Benefits of the Proposal



Emission Reduction Benefit

- ◆ May 2004 Fleet Average Proposal = 6.2 tons of HC + NO_x per day in the South Coast Air Basin
- ◆ Delayed implementation = lower benefit
- ◆ Actual benefit still being calculated

Issues

- ◆ Applicability
- ◆ Extend the forklift fleet average to other LSI equipment
- ◆ Impact of leases on compliance dates
- ◆ Fuel Quality

Upcoming Schedule

- ◆ August/Sept Fleet Oriented workshops
- ◆ November Release Staff Report
- ◆ January, 2005 Board Hearing
- ◆ December, 2007 Implementation begins

FOR MORE INFORMATION

LSI Activity website address:

<http://www.arb.ca.gov/msprog/offroad/orspark/wrkgroup/wrkgroup.htm>

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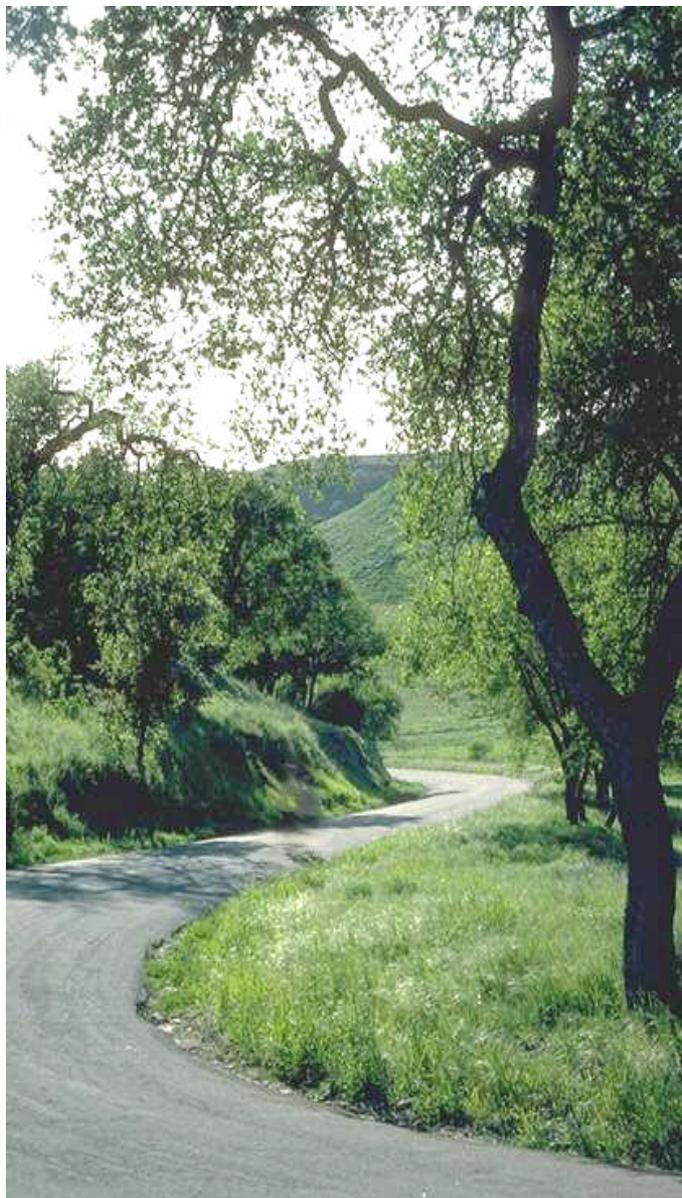
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Discussion