



May 26, 2004
Sacramento, California

California Environmental Protection Agency



Air Resources Board

Overview

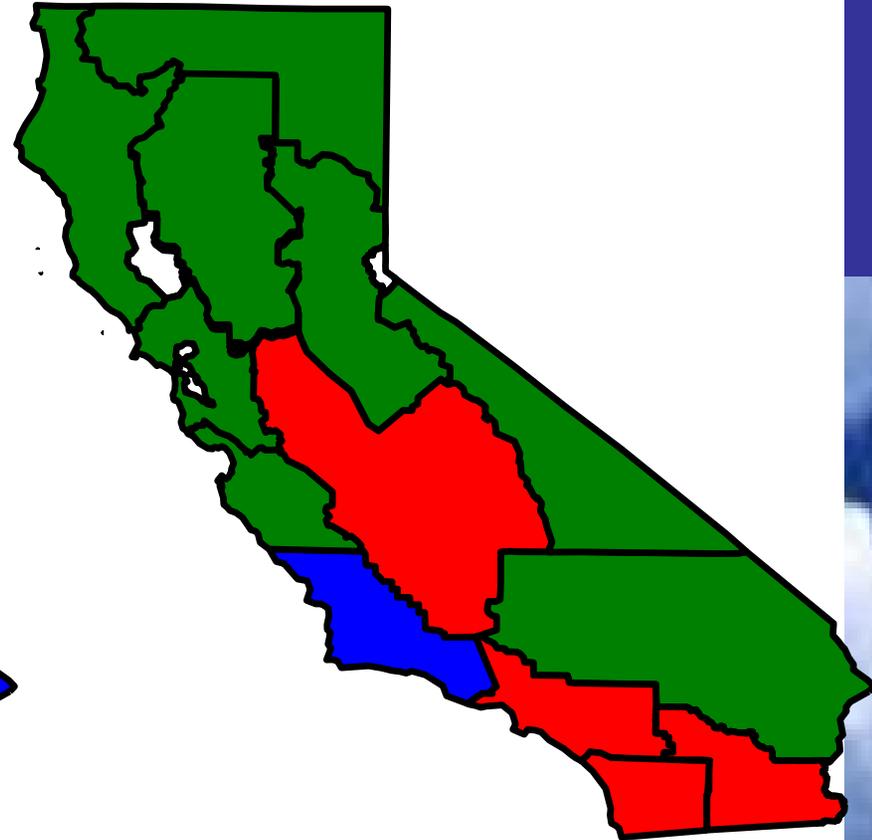
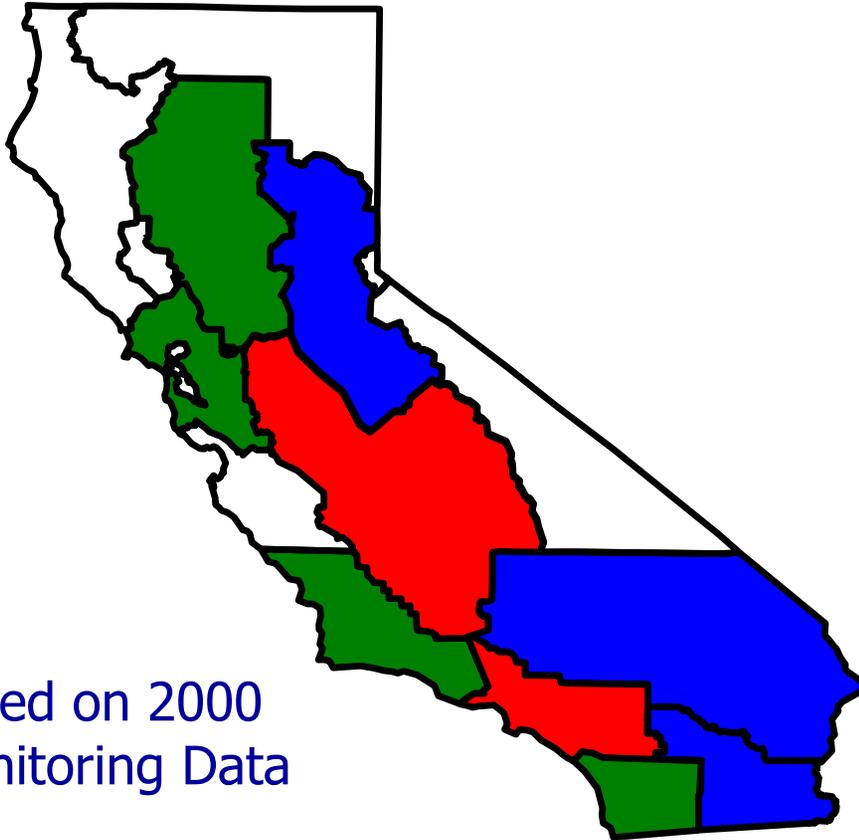
- ◆ The Air Quality Challenge
- ◆ Existing and Pending LSI requirements
- ◆ SIP Commitment
- ◆ Regulatory Approach
 - Goals, Tools, Concepts
- ◆ Regulatory Development Timeline
- ◆ Draft Retrofit Verification Protocol

The Air Quality Challenge...

Over 90% of Californians Breathe Unhealthy Air at Times

Days Over State
Ozone Standard

Days Over State
PM10 Standard

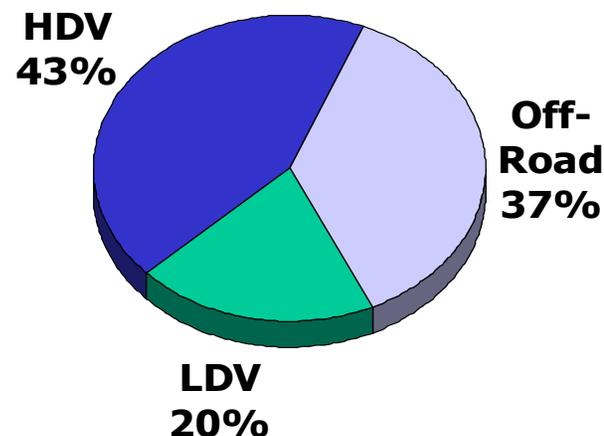


Based on 2000
Monitoring Data



Forklift NOx Emissions

- ◆ The majority of NOx emissions come from mobile sources
- ◆ 37 percent of mobile source emissions are from off-road equipment
- ◆ Forklift NOx contribution:
 - about 6.5 percent - or 45 tons per day - in 2000
 - about 7.5 percent - or 37 tons per day - in 2010



Existing and Pending Regulations

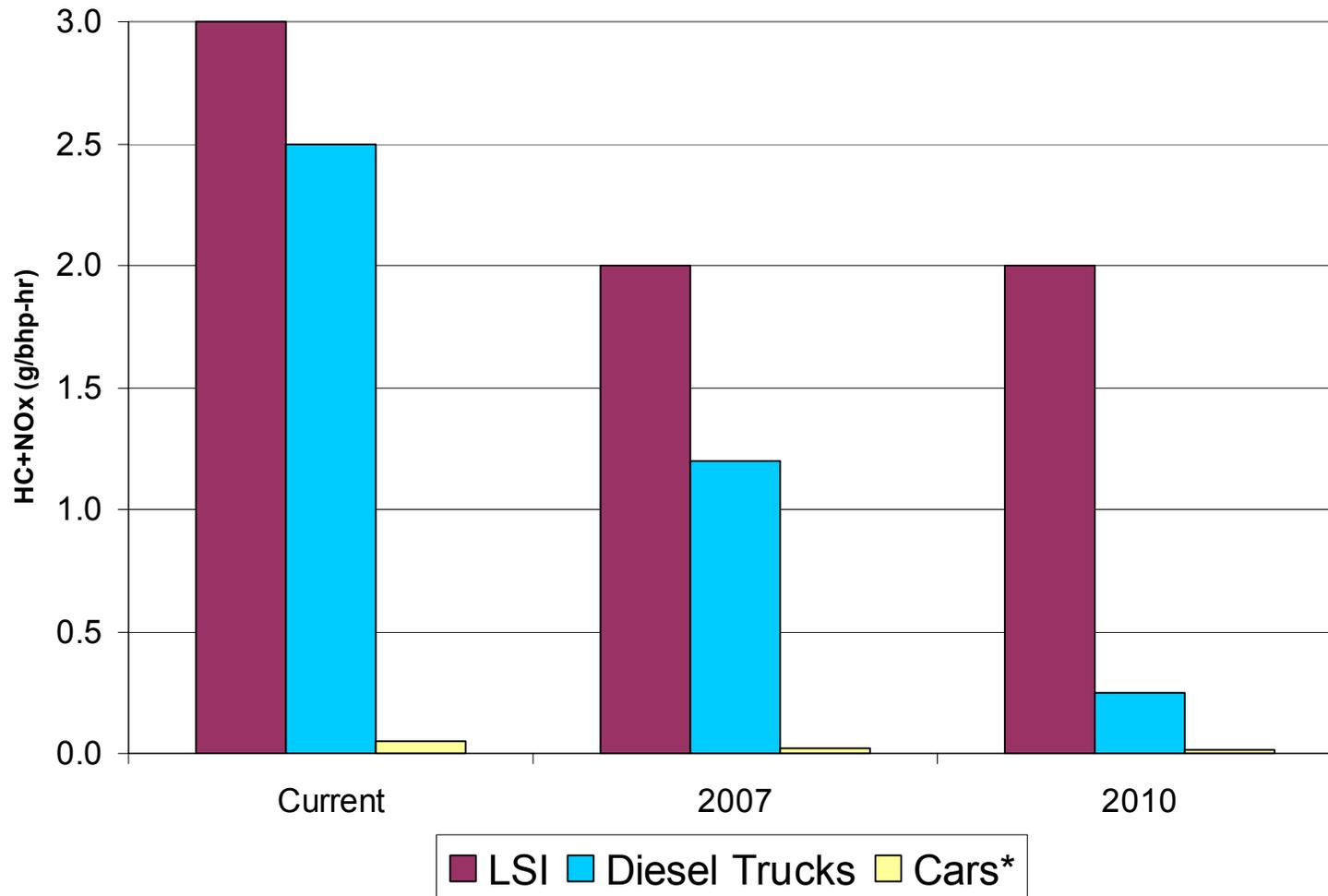
◆ 1998 LSI Rule

- 3.0 g/bhp-hr HC + NO_x certification level;
4.0 g/bhp-hr in-use
- 2001 - 2004 phase in; 25 percent increments

◆ 2007 EPA Rule

- Certification standard of 2.0 g/bhp-hr HC + NO_x
- 2.8 g/bhp-hr in-field test standard
- 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



*Approximate

SIP Commitment

- ◆ 2003 State Implementation Plan
- ◆ LSI Goal to reduce SCAB HC+NOx 6 tpd
 - LSI-1 proposes to harmonize with 2007 EPA
 - LSI-2C consolidates two proposals:
 - existing LSI engine emissions reduced by 80 percent or to a 3.0 gram/brake horsepower-hour verification level
 - zero- and near zero-emission standards for new LSI engines

Regulatory Approach

- ◆ Goals
- ◆ Emission Reduction Tools
- ◆ Proposed Regulatory Concepts

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

Emission Reduction Tools

	Engine Manufacturer	Equipment Manufacturer	Owner/ User
Lower Emission Standard	X		
Fleet Average Standard	X	X	X
Percent Near-Zero Requirement	X		
Percent Zero-Emission Requirement		X	X
Scrappage Requirement	X		
In-Use Requirement (Retrofit/Repower)			X
Advanced Technology Demonstration		X	

Tool - In Use Requirement

- ◆ Extremely High Emissions from Uncontrolled Equipment
 - Four times greater than controlled
 - all pre-2001 and about half of 2001-2003 engines
- ◆ A single uncontrolled engine operating just three shifts produces approximately the same emissions as a new car certified to a PZEV emission level over its entire life

Tool - In Use Requirement (continued)

- ◆ Level 1 Emission Reduction:
 - use catalyst or other emission control device
 - attain a 25 percent HC + NO_x emission reduction
 - retire or upgrade to Level 2 within two years
- ◆ Level 2 Emission Reduction:
 - use catalyst or other control device
 - add closed-loop fuel control
 - attain a 75 percent emission reduction or 3.0 g/bhp-hr emission level
 - re-power or retire as necessary

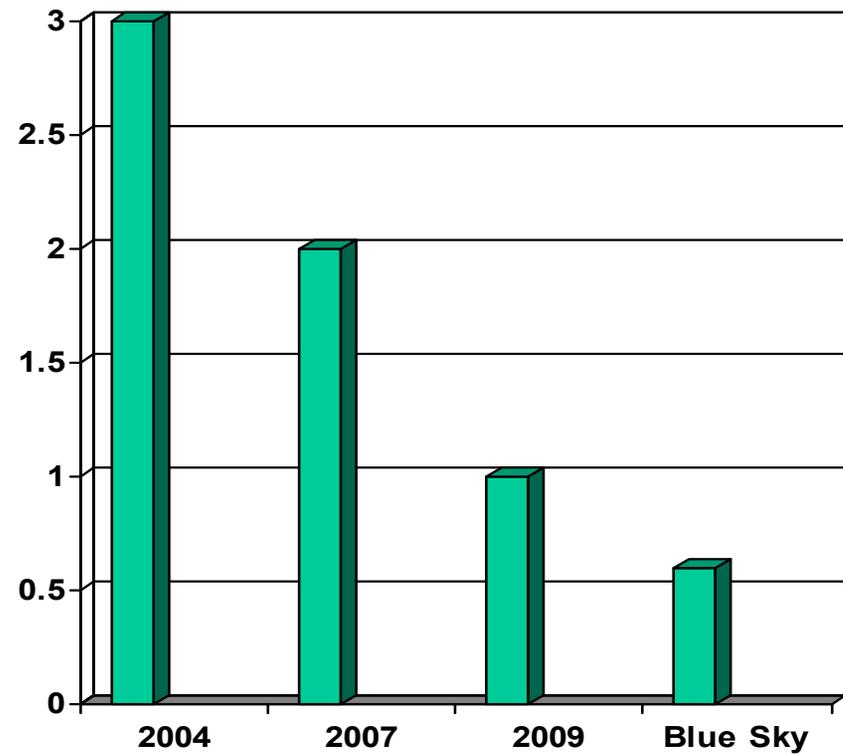
Regulatory Concepts

- ◆ Manufacturer Lower Emission Standard and In-Use Reductions
- ◆ Electric Purchase and In-Use Reductions
- ◆ Owner Fleet Average
- ◆ Additional Requirements

Lower Emission Standard

- ◆ Progressively more stringent standards
- ◆ Harmonize with EPA 2.0 g/bhp-hr rule
- ◆ Adopt 1.0g certification level for 2009, or
- ◆ Adopt optional EPA “Blue Sky” 0.6g

HC + NOx Standards



Lower Emission Standard - In Use requirement

- ◆ Fleets must achieve a Level 2 emission reduction for their uncontrolled LSI engines by the end of 2008 through retrofit, re-power or retirement
- ◆ Small fleets (of 1 to 3 units) are provided until the end of 2010 to achieve a Level 2 emission reduction
- ◆ Fleets may do a Level 1 Emission Reduction if they retire or upgrade to Level 2 within 2 years

Electric Purchase

- ◆ LSI owner requirement
- ◆ Requires fleets to convert a portion of their forklifts to electric:
 - 10 percent electric in 2007
 - 20 percent electric in 2008
 - 30 percent electric in 2009
 - 40 percent electric in 2010 - 2015
 - turnover rate based on 5 year median life
- ◆ Small fleets of 1 to 3 units are exempt

Electric Purchase - In Use Requirement

- ◆ Fleets must achieve a Level 2 emission reduction for their uncontrolled LSI engines by 2008 through retrofit, re-power or retirement
- ◆ Small fleets (of 1 to 3 units) are provided until 2010 to achieve a Level 2 emission reduction
- ◆ Fleets may do a Level 1 Emission Reduction if they retire or upgrade to Level 2 within 2 years

Owner Fleet Average

- ◆ LSI owner requirement
- ◆ Establishes small, intermediate, and large fleets
- ◆ Fleet average based on
 - certification level
 - ARB default emission rate for uncontrolled units
- ◆ Small fleets (1-3 units) are exempt, but:
 - must achieve Level 2 emission reductions for all uncontrolled forklifts by 2010
 - through the use of retrofit, re-power, or retirement mechanism

Owner Fleet Average (continued)

- ◆ Intermediate fleets (4-25 units) must meet:
 - a 3.0 g fleet average emission level in 2007
 - a 2.0 g emission level in 2009
 - a 1.5 g emission level in 2015
- ◆ Large fleets (26+ units) must meet:
 - a 2.5 g emission level in 2007
 - a 1.5 g emission level in 2009
 - a 1.0 g emission level in 2015
- ◆ through any combination of in-use reduction, zero emission technologies and lower emission standards

Meeting 2007 Standard Large Fleet Average*

- ◆ Using electrics to meet 2.5 g/bhp-hr
 - convert 11 percent of fleet to electric
 - retrofit all uncontrolled engines
- ◆ Using IC engines to meet 2.5 g/bhp-hr
 - meet 2006 2.0 g/bhp standard and
 - purchase 1.5 g/bhp engines in 2007
- ◆ Combinations of electric / lower standards

*Assumes fleet with a 5-year turnover

Meeting 2010 Standard Large Fleet Average

- ◆ Using electrics to meet 1.5 g/bhp
 - 32 percent of fleet electric
- ◆ Using IC engines to meet 1.5 g/bhp-hr
 - purchase 2.0 engines in 2006
 - purchase 1.5 g/bhp engines in 2007-2009
 - purchase 1.0 g/bhp engines in 2010
- ◆ Combinations of electric / lower standards

*Assumes fleet with a 5-year turnover

Meeting 2015 Standard Large Fleet Average

- ◆ Using electrics to meet 1.0 g/bhp-hr
 - 50 percent of fleet electric
 - less if 1.5 g/bhp-hr IC engines purchased after 2010
- ◆ Using IC engines to meet 1.0 g/bhp-hr
 - Purchase 1.0 g/bhp-hr engines from 2011 through 2015
- ◆ Combinations of electric / lower standards

Emission Reduction Benefit

Regulatory Concept	Estimated 2010 HC + NO_x Reduction (tons per day)*
Manufacturer Lower Emission Standard and In-Use	5.8
Electric Purchase and In-Use	6.8
Owner Fleet Average	6.2

*South Coast Air Basin

Additional Requirements

- ◆ Each of the concepts may additionally include:
 - a requirement that diesel forklifts of less than 8,000 pound lift capacity be required to achieve a level 3 PM reduction as specified by the diesel retrofit verification protocol
 - a requirement that engine/equipment manufacturers demonstrate zero- or near-zero emission advanced technologies such as fuel cells or hybrids

Regulatory Development Timeline

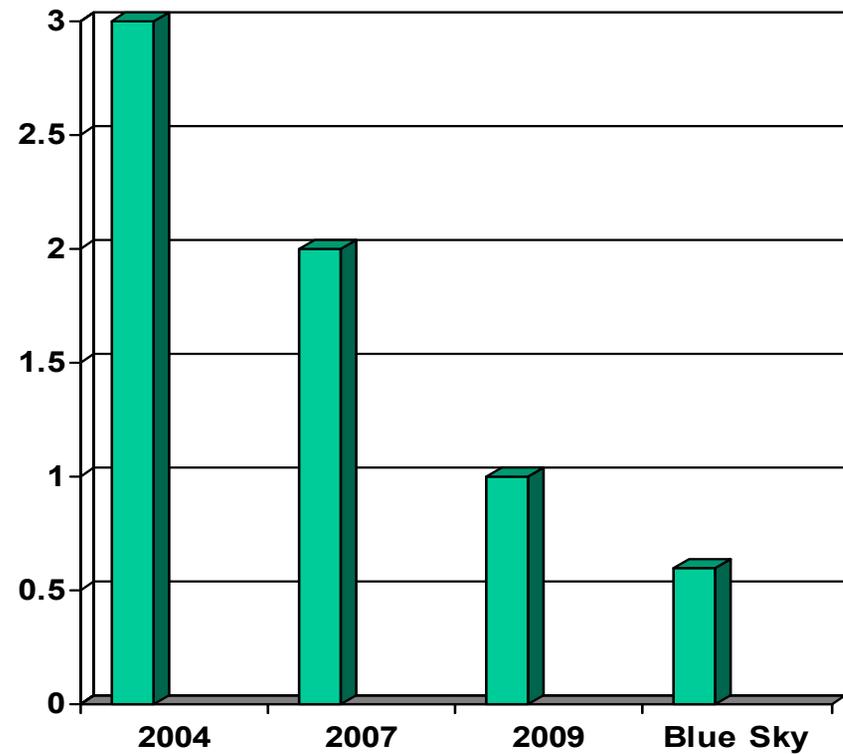
- ◆ June Complete site visits
- ◆ July Compile information/research
- ◆ August Refine proposals, write regulatory language
- ◆ August Final Workshop (week of 8/9)
- ◆ September 24 Release Staff Report
- ◆ November 18 Board Hearing

Discussion

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FOR MORE INFORMATION

LSI Activitiy website address:

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

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End of Presentation