

In-Use Off-road Diesel Vehicle Rule Workshop



February 20, 23, 26, and March 1, 2007
San Diego, Fresno, Sacramento, and Riverside

Heavy-Duty Diesel In-Use Strategies Branch

California Environmental Protection Agency



Air Resources Board

Overview

- Need for emissions reductions
- Proposed rule
- Changes since December 2006 proposal
- Fleet examples
- Fleet financial impact analysis
- Revised benefit and cost estimates
- Outreach and next steps



Need for Emission Reductions



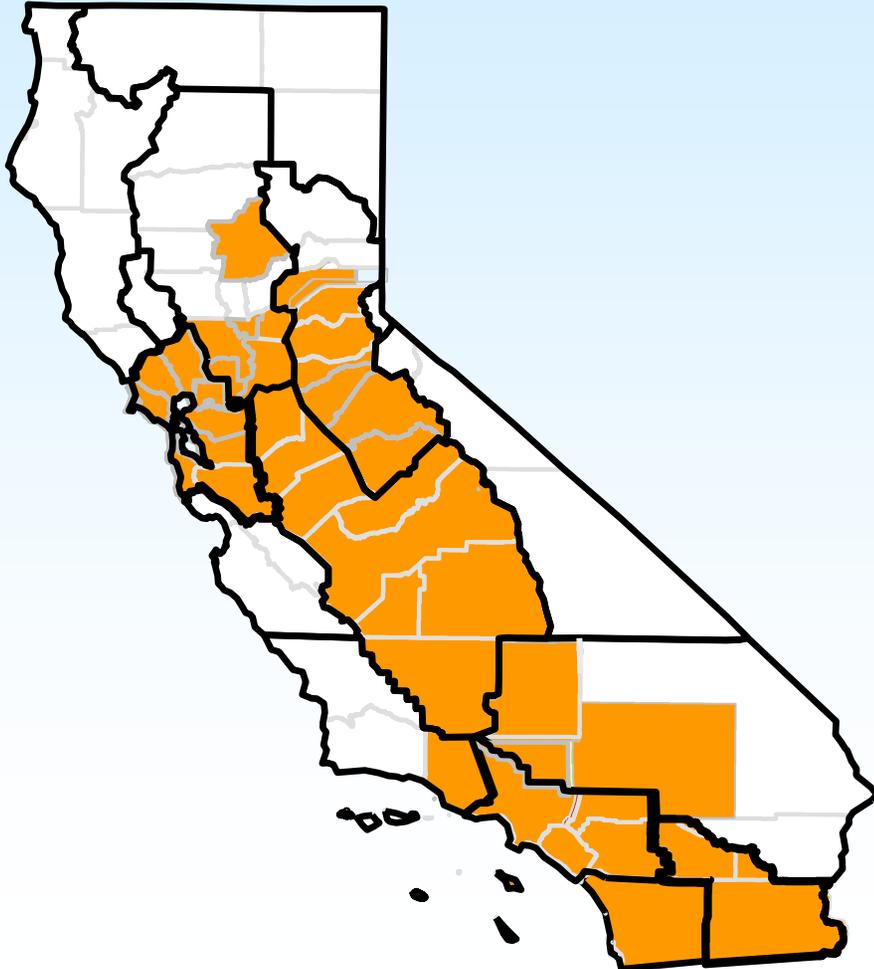
Need for Emission Reductions

- Must reduce Diesel Particulate Matter (PM) to reduce deaths from cancer, heart disease, etc.
 - Diesel PM responsible for 70% of known cancer risk from all air toxics
 - Thousands of deaths per year in California
- Must reduce oxides of nitrogen (NOx)
 - NOx leads to ozone and secondary PM
- Federal law dictates that the state must attain ozone and PM standards by certain deadlines

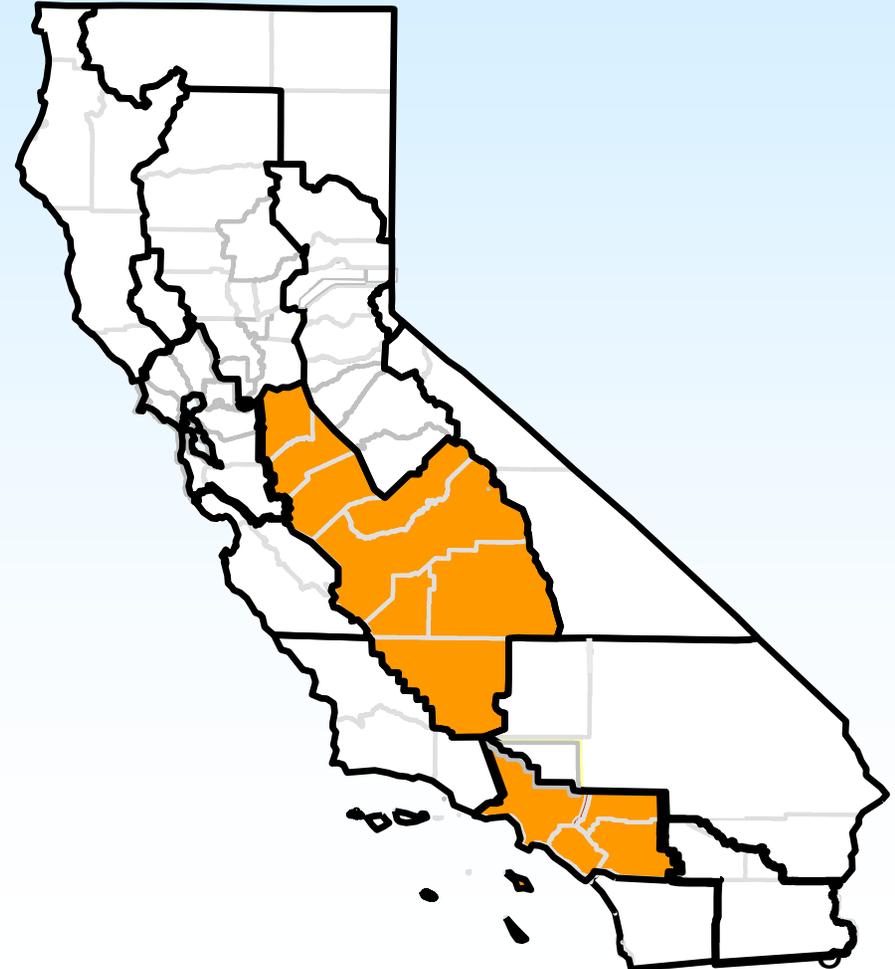


Nonattainment Areas

8-hr Ozone Annual



PM 2.5 Annual



Proposed In-Use Off-road Diesel Vehicle Rule



Rule Scope

- Commercial off-road diesel vehicles
 - 25 horsepower and greater
- Construction, industrial, mining, airport ground support, and other vehicles
- Does not apply to on-road vehicles
 - Are or could be registered and driven safely on-road
- Does not apply to vehicles used primarily for agricultural operations
 - To point of first processing
 - Including forestry

Rule Overview

- **Meet Best Available Control Technology (BACT) requirements**
 - NOx - Turn over engines
(10% of hp per year)
 - PM - Apply PM retrofits (called VDECS)
(20% of hp per year)
- **or**
- **Meet NOx and PM average targets**
 - Fleet average targets decline over time

Rule Overview (Continued)

- Annual reporting begins in 2008
- Idling limits begin in 2008
- Only cleaner vehicles may be added to fleets beginning in 2008
- Requirements vary by fleet size

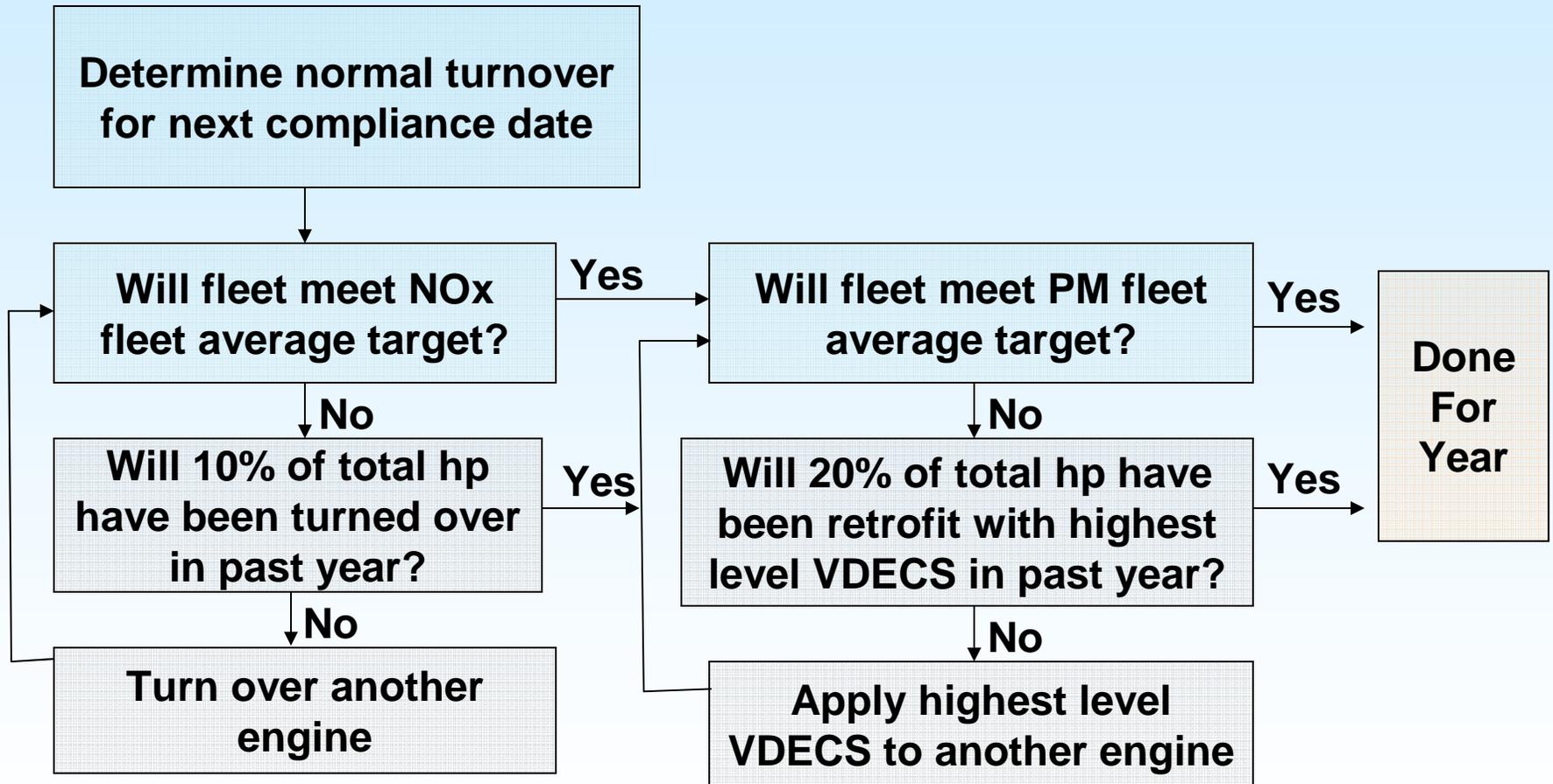
Rule Overview (Continued)

| Fleet Size Category | Description | Compliance Dates |
|---------------------|---|-------------------------|
| Small | <=1,500 hp & small business or municipality or low population county municipality fleet | 2015-2025 PM-only |
| Medium* | 20,000 hp or less and not small California State and US government | 2010-2020 PM and NOx |
| Large* | > 20,000 hp, privately owned | 2009-2020 PM and NOx |

* Same requirements for large and medium fleets, only compliance dates vary.

Annual Compliance Process

Large and Medium Fleets



Note: Turn over means repower with cleaner engine, replace vehicle with used vehicle or new vehicle, designate as low-use, or decrease fleet size.

Exemptions from Engine Turnover Requirements

- Small fleets
- Vehicles less than 10 years old
- Specialty vehicles if certain criteria are met
- Vehicles retrofit with best available VDECS in past 6 years
- Tier 4 and interim Tier 4 engines
 - Available 2008 to 2011 and later, depending on hp



Exemptions from Retrofit Requirements

- Engines in vehicles less than 5 years old
- Engines for which there is no retrofit available or cannot be safely installed
- New engines that come with a diesel particulate filter
- Engines already retrofit with the best available control at time of installation
 - Level 2 or 3



Vehicle Labeling

- All vehicles must be labeled
 - ARB assigns vehicle number after initial reporting
 - Fleets must label vehicles within 30 days
- Number stays with vehicle over its lifetime
- Permanently affix or paint on left side of vehicle
~5 feet above ground



Exemptions and Compliance Extensions

- Exempt from all but recordkeeping/reporting
 - Low-use vehicles
 - Operated less than 100 hours/year
 - Emergency vehicles
 - Dedicated snow removal vehicles
- Compliance extensions
 - Manufacturer delays for retrofits or new engines
 - Delay of Tier 4 interim or final vehicles



Enforcement

- Reporting
 - Initial reporting in 2008
 - Subsequent annual reporting
- Labeling
 - Label with equipment identification number (EIN)
 - EIN allows look-up of model year and control strategy for each engine in each vehicle
- Inspection
 - Fleet audits
 - Facility and construction project inspections
 - Roadside inspections
- ARB requesting additional enforcement staff

Incentive Funding

- Funding criteria will assume all fleets are on BACT path
- Small fleets
 - Always eligible for grants based only on NO_x and ROG reductions
 - Eligible for PM retrofit projects completed by February 28, 2012
- Fleets exempt from NO_x requirements
 - Always eligible for grants based only on NO_x and ROG reductions
- Large and medium fleets
 - Large applicant buy-in needed to receive funding

Changes to December 2006 Proposed Regulatory Language



Recent Changes

Exemptions and Flexibility

- Exemptions:
 - Vehicles used for noncommercial purposes
 - Dedicated snow removal vehicles
 - Captive attainment area fleets exempt from the NOx fleet averages
 - Tier 1 and higher vehicles exempt from turnover until 2013
- Flexibility:
 - No 2012-2014 fleet average requirements for small fleets
 - Low-use exemption no longer sunsets
 - Sales disclosure only for sales within California

Recent Changes

New Requirements

- Do not add Tier 0 vehicles unless already meet the fleet average targets
- Exhaust retrofits at end of phase in period
 - Excludes Tier 4 and low-use vehicles
- Additional reporting requirements for fleets that bring vehicles in and out of CA and claim them as low-use

Recent Changes

Refinements and Definitions

- Carryover retrofit credit and carryover turnover credit
 - Credit for fleets that turn over $> 10\%$ or retrofit $> 20\%$ in a year
- Executive Officer may issue a delay for a fleet or group of fleets if:
 - Tier 4 interim or final vehicles are delayed
 - No VDECS can be installed safely
- Refined definitions
 - Agricultural operations (forest operations)
 - Redefined California and federal public fleets as medium fleets
 - Maximum power references SAE Method J1349
 - VDECS failure

Fleet Examples



What Rule Will Mean for Fleets

- Newest vehicle fleets
 - No significant impact
- Oldest fleets (large/medium)
 - Accelerate turnover of engines to 10%/yr starting 2008-2009
 - Exhaust retrofit 20%/year starting 2008-2009
 - Possibly turn over oldest engines once exhaust retrofits are older than 6 years
- Typical small fleet
 - Some exhaust retrofits starting 2014
- Oldest small fleets
 - 20%/year exhaust retrofits starting 2014



Compliance for an Example Small Fleet

| Vehicle Type | Model Year | Emission Tier | Horsepower | Exhaust Retrofit |
|--------------|------------|---------------|------------|------------------|
| Paver | 1989 | Tier 0 | 84 | 2015 |
| Dozer | 2000 | Tier 1 | 75 | 2017 |
| Loader | 1986 | Tier 0 | 50 | 2023 |
| Skid Steer | 2004 | Tier 2 | 115 | 2019 |

| Fleet Average (g/bhp-hr) | NOx | PM |
|--------------------------|-----|------|
| Baseline | 8.0 | 0.77 |
| Ending | 8.0 | 0.12 |

Compliance for an Example Medium Fleet

| Vehicle Type | Model Year | Beginning Tier | Horse-power | Turn over to 5 yr old | New Model Year | Ending Tier | Exhaust Retrofit |
|-----------------|------------|----------------|-------------|-----------------------|----------------|-------------|------------------|
| Paver | 2006 | Tier 3 | 240 | | | | 2011 |
| Backhoe | 2005 | Tier 2 | 98 | 2020 | 2015 | Tier 4 | 2010 |
| Loader | 2004 | Tier 2 | 73 | 2020 | 2015 | Tier 4 | 2010 |
| Roller | 2003 | Tier 1 | 46 | 2018 | 2013 | Tier 4 | |
| Paver | 2001 | Tier 1 | 34 | | | | 2021 |
| Paver | 1995 | Tier 0 | 125 | 2019 | 2014 | Tier 4I | 2012* |
| Other | 1999 | Tier 1 | 34 | 2017 | 2012 | Tier 4I | |
| Loader | 1990 | Tier 0 | 60 | 2015 | 2010 | Tier 4I | |
| Grader | 1988 | Tier 0 | 158 | 2016 | 2011 | Tier 3 | 2018 |
| Paver | 1984 | Tier 0 | 70 | 2014 | 2009 | Tier 4I | |
| Roller | 1989 | Tier 0 | 78 | 2013 | 2008 | Tier 3 | 2020 |
| Paver | 1983 | Tier 0 | 163 | 2013 | 2008 | Tier 3 | 2020 |
| Loader | 1985 | Tier 0 | 130 | 2012 | 2007 | Tier 3 | 2012 |
| Other | 1986 | Tier 0 | 175 | 2011, 2018 | 2006,2013 | T3, T4I | 2011, NA |
| Surfacing Equip | 1977 | Tier 0 | 106 | 2012 | 2007 | Tier 3 | 2012 |
| Roller | 1979 | Tier 0 | 78 | 2010 | 2005 | Tier 2 | 2010 |
| Roller | 1962 | Tier 0 | 115 | 2010 | 2005 | Tier 2 | 2010 |

| Fleet Average (g/bhp-hr) | NOx | PM |
|--------------------------|-----|------|
| Baseline | 9.8 | 0.67 |
| Ending | 2.8 | 0.05 |

* PM Retrofit on Tier 0 for 7 years then replaced with Tier 4

How long will my Tier 2 or Tier 3 vehicle be “compliant”?

- Rule is a fleet average rule, so no such thing as an individual vehicle being “compliant”
 - Each vehicle moves fleet closer or further from targets
- No turnover required for vehicles < 10 years old
- No retrofits required for vehicles < 5 years old

Emission Benefits and Cost and Fleet Financial Analysis



Magnitude of Costs

- Examined data
 - Fleet and financial data for volunteer fleets
 - Typical industry profits from Construction Financial Management Association survey
- Construction fleet profits typically 2-7% of revenues
- Small increases in revenue (0.1% to 4%) adequate to cover costs of compliance

Example Small Fleet Financial Impacts

| Cash flow (\$/yr) | Fleet A | Fleet B | Fleet C |
|----------------------------|---------------|---------------|---------------|
| Gross revenue before taxes | \$100,000 | \$275,000 | \$175,000 |
| Net profit (if 7%)* | \$7,000 | \$19,250 | \$12,250 |
| Revenue increase needed | \$4,000 4% | \$6,400 2% | \$4,000 2% |

*Average profits assumed = 7% of revenue (CFMA 2006 survey, Specialty Trade Contractors, West)
Tax rate assumed = 21%

Example Medium/Large Fleet Financial Impacts

| Cash flow (\$/yr) | Medium Fleets | | | Large Fleet |
|-------------------------|-------------------|-------------------|-------------------|----------------------|
| | Fleet A | Fleet B | Fleet C | |
| Gross revenue pre-tax | \$7,514,000 | \$3,802,000 | \$77,500,000 | \$41,000,000 |
| Net profit after tax | \$75,551 | \$182,215 | \$1,175,000 | \$822,000 |
| Revenue increase needed | \$22,200 0.30% | \$66,250 1.70% | \$99,900 0.10% | \$1,428,200 3.50% |

Emission Benefits of Regulation

- Emission benefits associated with thousands fewer premature deaths over course of rule

| NOx Emissions | 2010 | 2015 | 2020 |
|----------------------|-------------|-------------|-------------|
| Without Rule (tpd) | 325 | 240 | 162 |
| Benefits Rule (tpd) | 17 | 36 | 37 |
| % Reduction | 5% | 15% | 23% |

| PM Emissions | 2010 | 2015 | 2020 |
|---------------------|-------------|-------------|-------------|
| Without Rule (tpd) | 18.5 | 12.6 | 7.5 |
| Benefits (tpd) | 5.5 | 7.4 | 5.6 |
| % Reduction | 30% | 59% | 75% |

Statewide Cost/Benefits Analysis

- Evaluated costs and benefits for variety of fleets
 - Varying fleet age, size and equipment distribution
 - Varying purchase strategies
- Rule will affect different fleets differently
- Since December workshops, evaluated more sample fleets to refine estimates
 - 16 additional fleets with 6000 vehicles
- Staff running sensitivity analyses, refinements:
 - Post-2020 benefits
 - Change in vehicle value due to rule
 - Various compliance strategies

Cost/Benefits of Regulation

- Cost of regulation ranges from \$2.7 to 3.3 billion
- Anticipated increase of 0.5% per year in statewide construction costs
- Revised cost effectiveness
 - \$27/lb PM
 - \$5.6/lb NO_x
 - Attributes half of cost towards NO_x and half towards PM benefits



Outreach, Next Steps and Contacts



Outreach Efforts to Continue

- Public workshops & workgroup meetings since November 2004
- Regular notices to email lists
- Mailing regarding rule development
 - 79,000+ licensed contractors
 - 4,000+ mining, solid waste, & recycling facilities
- Calls/letters to industry associations
- Equipment dealers and fuel sellers are mailing flyer to customers
- Recent mailing to > 290,000 contractors

Next Steps

- Now thru May 2007
 - Continue outreach and meetings with stakeholders
- February-March 2007
 - Last set of workshops
- April 6, 2007
 - Staff report release
- May 25, 2007
 - Consideration by Board



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Off-Road Regulation - www.arb.ca.gov/msprog/ordiesel/ordiesel.htm

Verified Devices - www.arb.ca.gov/diesel/verdev/verdev.htm