Proposed Statewide Diesel Truck and Bus Regulation

Workshop Series, 2008
January 28 – Sacramento (day)
January 30 – Fresno (day and evening)
January 31 – El Monte (day)
February 4 – San Diego (day)
February 4 – El Centro (evening)
February 6 – Redding (day and evening)
February 11 – Berkeley (day and evening)

Need for Emissions Reductions

◆ Reduce Diesel Particulate Matter (PM)
  ◆ Diesel PM responsible for 70% of known cancer risk from all air toxics
◆ Reduce oxides of nitrogen (NOx)
  ◆ NOx leads to ozone and secondary PM
◆ Attain health based 8-hour ozone and PM2.5 standards
◆ Federal Clean Air Act
◆ State Implementation Plan (SIP)
◆ Reduce greenhouse gas emissions

Area Designations for National Ambient Air Quality Standards for Ozone and PM2.5

8-Hour Ozone
- 15 areas violate the standard
- 2 areas violate the standard

PM2.5 Annual
- Nonattainment
- Unclassified Attainment

State Implementation Plan (SIP)

◆ SIP is a master plan developed by ARB and districts that identifies how to meet federal clean air deadlines
◆ September 27, 2007 ARB adopted the SIP for South Coast and San Joaquin Valley
◆ Commitment for significant emissions reductions from trucks and buses

Statewide Diesel Mobile Source Emissions (2005)

NOx Emissions
- Off-Road 22%
- Other Off-Road 18%
- Other On-Road 14%
- Marine 14%
- Train 7%

PM Emissions
- Off-Road 24%
- Other Off-Road 15%
- Other On-Road 7%
- Marine 7%
- Train 4%
Proposed Statewide Truck and Bus Regulation Scope

- Diesel vehicles operating in California
- Trucks, buses, yard trucks, other
  - Interstate, intrastate, international, and other
  - Shuttle buses
  - Vehicles greater than 14,000 GVWR
- Any person, business, or government agency who owns or sells a vehicle in California

Examples of Vehicle Types

- Hay Squeeze Water Truck
- Tow Truck
- Fuel Tank Truck
- Passenger Bus
- Concrete Mixer
- Reefer Van
- Dump Truck
- Drill Rig

Overview of Proposed Regulation

- Phase-in 2010-2021
  - 2007 model year engine between 2010 and 2013
  - 2010 model year engine equivalent between 2017 and 2021
- Exhaust retrofits if equivalent emissions
- Certain special provisions
- Compliance options
  - Best available control technology (BACT) schedule, or
  - Fleet average, or
  - Limits on fleet turnover and retrofits

Excluded from Scope of Regulation

- Pickups and other vehicles with GVWR less than 14,000 lbs except shuttle buses
  - Regardless of towing capability or combined weight rating
- Emergency vehicles
- Tactical military vehicles
- Personal use motorhomes

Proposed Compliance Option 1 – Fleet Average

Fleet Averaging NOx and PM

- Allows mix of cleaner and dirtier engines
- All vehicles in fleet regardless of registration
- Subject to reporting requirements
- Maximum portion required to be equivalent to 2007 model year engine by December 31st
  - 2010=25%
  - 2011=50%
  - 2012=75%
  - 2013=100%
- Similar phase-in schedule for Phase 2 (2017-2021)
**Statewide Truck/Bus Proposed Regulation**

### Proposed Compliance Option 1 – Fleet Average

#### Emission Factors Used in Fleet Average

<table>
<thead>
<tr>
<th>Engine Model Year</th>
<th>NOx Emission Factors (g/mile)</th>
<th>PM Emission Factors (g/mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-2004</td>
<td>22.0</td>
<td>12.0</td>
</tr>
<tr>
<td>2004-2006</td>
<td>7.0</td>
<td>10.0</td>
</tr>
<tr>
<td>2007-2009</td>
<td>1.6</td>
<td>5.0</td>
</tr>
<tr>
<td>2010+</td>
<td>0.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

#### Fleet Average Emission Targets

<table>
<thead>
<tr>
<th>End of Calendar Year</th>
<th>NOx</th>
<th>PM x10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td></td>
<td>4.0</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td>6.5</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td>9.0</td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td>11.5</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td>14.0</td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td>16.5</td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td>19.0</td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td>21.5</td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td>24.0</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td>26.5</td>
</tr>
<tr>
<td>2021</td>
<td></td>
<td>29.0</td>
</tr>
</tbody>
</table>

### Phase 1 Compliance Schedule for Small Fleets

<table>
<thead>
<tr>
<th>Fleet Size</th>
<th>Upgrade to 2007 Equivalent by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Vehicle</td>
<td>2012</td>
</tr>
<tr>
<td>2 Vehicles</td>
<td>2011 and 2013</td>
</tr>
<tr>
<td>3 Vehicles</td>
<td>2010, 2012 and 2013</td>
</tr>
</tbody>
</table>

- Subject to reporting requirements

### Proposed Compliance Option 2 – BACT Schedule

#### BACT Phase 1 (2010-2013)

- NOx exhaust emissions less than or equal to a 2007 model year engine standard
- Pre-2004 model year emissions with ≥ 70% NOx reduction
- 2004-2006 model year emissions with ≥ 40% NOx reduction
- Highest level PM control technology
- No reporting requirements

<table>
<thead>
<tr>
<th>Engine Model Year</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997 &amp; older</td>
<td>December 31, 2010</td>
</tr>
<tr>
<td>2005 &amp; newer</td>
<td>December 31, 2013</td>
</tr>
</tbody>
</table>

#### BACT Phase 2 (2017-2021)

- NOx exhaust emissions equivalent to 2010 model year engine
- 2004-2006 model year emissions with ≥ 85% NOx reduction
- 2007 model year emissions with ≥ 70% NOx reduction
- Highest level PM control technology
- No reporting requirements

<table>
<thead>
<tr>
<th>Engine Model Year</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre – 2004</td>
<td>December 31, 2017</td>
</tr>
<tr>
<td>2004 – 2006</td>
<td>December 31, 2018</td>
</tr>
<tr>
<td>2007</td>
<td>December 31, 2019</td>
</tr>
<tr>
<td>2008</td>
<td>December 31, 2020</td>
</tr>
<tr>
<td>2009</td>
<td>December 31, 2021</td>
</tr>
</tbody>
</table>

#### Special Provisions

- Vehicles used fewer than 1,000 miles exempt from all clean up requirements
- Delay turnover for vehicles with highest level PM control installed by December 31, 2009
- No further action until 2013
- Class 8 vehicles operating less than 7,500 miles exempt from turnover
- Remains subject to PM requirements
- Evaluating appropriateness for smaller vehicles
- Subject to reporting requirements
Special Provisions (continued)

- Vehicles operated exclusively outside non-attainment areas regardless of miles travelled exempt from NOx requirements until 2017
- Remain subject to PM retrofit requirements
- Subject to reporting requirements

Phase 1 - Compliance Example Fleet A

- No more than 25% of fleet needs to meet 2007 emissions per year

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>1988</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2007</td>
</tr>
</tbody>
</table>

Phase 1 - Compliance Example Fleet B

- Fleet average provides more flexibility
  - Meets fleet average target each year

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>1994</td>
<td>–</td>
<td>–</td>
<td>2010</td>
<td>2010</td>
</tr>
<tr>
<td>4.</td>
<td>1994</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2010</td>
</tr>
<tr>
<td>5.</td>
<td>2004</td>
<td>–</td>
<td>–</td>
<td>DPF</td>
<td>2004 &amp; DPF</td>
</tr>
<tr>
<td>6.</td>
<td>2004</td>
<td>–</td>
<td>–</td>
<td>DPF</td>
<td>2004 &amp; DPF</td>
</tr>
</tbody>
</table>

Phase 1 - Compliance Example Fleet B – Early PM Credit

- Early PM credit provides more flexibility

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1994 DPF</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2010</td>
</tr>
<tr>
<td>2.</td>
<td>1994 DPF</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2010</td>
</tr>
<tr>
<td>5.</td>
<td>2004 DPF</td>
<td>–</td>
<td>–</td>
<td>DPF</td>
<td>2004 &amp; DPF</td>
</tr>
</tbody>
</table>

Phase 1 - Compliance Example Fleet C – Early PM Credit and NOx Exempt

- Combination of special provisions provides most flexibility

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1994 DPF</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2007</td>
</tr>
<tr>
<td>2.</td>
<td>1998 NOx Exempt</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1998 DPF</td>
</tr>
<tr>
<td>4.</td>
<td>2004 DPF</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2007</td>
</tr>
</tbody>
</table>

Summary of Other Proposed Changes

- Address changes to existing public fleets regulation
- Require utilities to upgrade to 2010 engine emissions in 2017-2021
- Double credit for hybrids
- Expand credit for existing alternative fueled vehicles
- Incorporate all two engine cranes into off-road regulation
- Public and private school buses
  - Subject to PM requirements only
- Drayage trucks subject to Phase 2 requirements
Statewide Truck/Bus Proposed Regulation

Concepts Under Consideration
- Vehicle types and uses under evaluation
  - Cab-over tractors, farm use vehicles, motor coaches, transfer dump trucks, cranes
- Timing of regulatory requirements outside South Coast
- Appropriateness of usage thresholds
  - Medium duty vehicles
  - Existing proposal

Emissions Benefits and Costs

<table>
<thead>
<tr>
<th>Emissions (tons per day)</th>
<th>2014</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>NOx</td>
<td>428</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>274</td>
</tr>
<tr>
<td>With Proposed Regulation</td>
<td>277</td>
<td>5.7</td>
</tr>
<tr>
<td>Net Reduction</td>
<td>151</td>
<td>12.6</td>
</tr>
<tr>
<td>Percent Reduction</td>
<td>35%</td>
<td>69%</td>
</tr>
</tbody>
</table>

Statewide Truck and Bus Emissions

Statewide Cost Analysis Method
(Top Down Approach)
- Provides estimate of overall impact on economy
- Does not predict impact on individual companies or sectors
- Determine vehicle replacement and exhaust retrofit capital costs with regulation
- Characterized broad fleet type categories
- Compare to capital costs with normal replacement
- Costs compared in $2008 equivalent expenditures
**Maximum Number of Affected Engines**

Calendar Year 2014

<table>
<thead>
<tr>
<th>Group</th>
<th>Total Vehicles</th>
<th>Maximum Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>140,819</td>
<td>85,748</td>
</tr>
<tr>
<td>California Interstate</td>
<td>69,454</td>
<td>20,195</td>
</tr>
<tr>
<td>Out of State (Near)</td>
<td>85,832</td>
<td>24,375</td>
</tr>
<tr>
<td>Out of State (Distant)</td>
<td>1,399,342*</td>
<td>185,648*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,693,038</td>
<td>315,966</td>
</tr>
</tbody>
</table>

* Represents nationwide number of vehicles owned by fleets who have at least 1 vehicle operating in California.

<table>
<thead>
<tr>
<th>Group</th>
<th>Total Vehicles</th>
<th>Maximum Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>231,255</td>
<td>104,421</td>
</tr>
<tr>
<td>California Interstate</td>
<td>1,841</td>
<td>441</td>
</tr>
<tr>
<td>Out of State</td>
<td>8,919</td>
<td>1,921</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>241,085</td>
<td>106,783</td>
</tr>
</tbody>
</table>

---

**Example Truck Prices**

Conventional Class 8 Tractor

- **$0** - **$20,000**
- **$20,000** - **$40,000**
- **$40,000** - **$60,000**
- **$60,000** - **$80,000**
- **$80,000** - **$100,000**
- **$100,000** - **$120,000**
- **$120,000** - **$140,000**

Source: www.truckpaper.com

---

**Costs for Exhaust Retrofits**

<table>
<thead>
<tr>
<th>Control Technology</th>
<th>Installed Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive PM Level 3</td>
<td>$9,000 - $11,000</td>
</tr>
<tr>
<td>25% NOx and 85% PM</td>
<td>$18,000 - $22,000</td>
</tr>
<tr>
<td>Active PM</td>
<td>$11,000 - $20,000</td>
</tr>
</tbody>
</table>

---

**Preliminary Estimate**

Statewide Costs and Benefits

- Preliminary cost estimate ranges from $4 to $6 billion ($2008)
- Cost effectiveness
  - NOx: $5,000 to $7,600 per ton ($3 to $4 per lb)
  - PM: $75,000 to $112,000 per ton ($37 to $56 per lb)
- Greatest uncertainty with estimate of affected interstate fleet population
- Plan future workshop to discuss cost methodology and inputs

---

**Fleet Information Surveys**

- Responses from over 800 companies to date
  - 40,000 vehicles owned
  - 22,000 operate in California
  - Details on over 3,000 vehicles
- More than 50% of respondents have 1 vehicle

<table>
<thead>
<tr>
<th>Class 8 Only</th>
<th>Less than 7500 miles</th>
<th>Total Number Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag. Survey</td>
<td>42%</td>
<td>222</td>
</tr>
<tr>
<td>Dump Truck Survey</td>
<td>4%</td>
<td>365</td>
</tr>
<tr>
<td>Other</td>
<td>15%</td>
<td>1,587</td>
</tr>
<tr>
<td>Overall Average</td>
<td>16%</td>
<td>2,174</td>
</tr>
</tbody>
</table>

- Designed to obtain information about fleet operation, truck age, and vehicle use
- Information can be kept confidential
- Online survey available at www.arb.ca.gov/dieseltruck
Outreach

- Postcard mailer to 280,000 diesel vehicle owners registered in California
- Mailed flyer to about 700 dealers, repair facilities, and western state truck stops
  - English, Spanish, Punjabi versions available
- Over 70 meetings with associations, individual companies, and other affected groups
- Worked with associations to reach their members

ARB Goods Movement Emission Reduction Program

- ARB awards competitive grants to local agencies
- Local agencies competitively fund equipment
- $760 million proposed overall target for trucks
- Truck funds available late 2008
- Up to $50,000 to replace Class 8 truck (new truck in operation at least 3 yrs prior to a compliance date)
- Up to $5,000 to install PM filter (at least 6 months prior to a compliance date)
- Requires CA only operation, legally binding contract
- http://arb.ca.gov/gmbond or (916) 444-6637

Next Steps

- Additional outreach
- Review data in survey
- Workshop on cost methodology and emissions inventory updates
- Additional meetings with stakeholders
- Board consideration October 2008

Statewide Diesel Truck and Bus Regulation Contacts

- Erik White, Chief
  Heavy-Duty Diesel In-Use Strategies Branch
  ewhite@arb.ca.gov
  (916) 322-1017
- Gloria Lindner, Lead
  glindner@arb.ca.gov
  (916) 323-2803
- Jackie Johnson
  jjohnson@arb.ca.gov
  (916) 323-2750
- Tony Brasil, Manager
  In-Use Control Measures Section
  abrasil@arb.ca.gov
  (916) 323-2927
- Ron Nunes
  rnunes@arb.ca.gov
  (916) 327-0376

Emissions Inventory Contacts

- Todd Sax, Manager
  Regulatory Support Section
  tsax@arb.ca.gov
  (916) 322-5474
- Kathy Jaw, Staff
  Regulatory Support Section
  sjaw@arb.ca.gov
  (916) 322-1720

www.arb.ca.gov/msei/onroad/onroad.htm