Truck and Bus Regulation and Effect of the Economy on Emissions

Workshop
December 3, 2009

California Environmental Protection Agency
Air Resources Board

Today’s Presentation

• Background
• Truck and Bus regulation summary
• Effect of the Economy on Emissions
• Recap and closing
Background

- Approved by Board December 12, 2008 with changes
- Board directed staff to provide an informational update December 2009
  - Impact of the economy on emissions
  - Other items
- Board meeting December 9 and 10, 2009

Diesel Particulate Matter Exposure

- Diesel vehicles largest source of diesel PM
- 70% of known cancer risk from all air toxics
- Risk is higher if closer to source
- Diesel Risk Reduction Plan adopted in 2000
Effects of Diesel Engine Emissions

• Each year in California, diesel PM contributes to more than 2,000 premature deaths and thousands of hospital admissions.
Regulation Structured to Meet State Implementation Plan (SIP)

- Regulation meets minimum NOx and PM$_{2.5}$ reductions to meet SIP targets for all years
  - South Coast (6 tpd NOx shortfall made up with PM)
  - San Joaquin Valley
- Critical for South Coast and San Joaquin Valley
  - PM and NOx reductions for PM2.5 attainment in 2014
  - NOx reductions for ozone in 2017, 2020, and 2023
- No other measures can achieve same emissions reductions

Overall Benefits

- Provides major health benefits
  - About 9,400 fewer premature deaths
  - 150,000 fewer lower respiratory and asthma-related symptoms
  - 950,000 fewer lost work days
- Value estimated to range from $48 to $68 billion
- Reduces high cancer risk from diesel PM in all communities
Truck and Bus Regulation Requirements Summary

Regulation Overview

- All vehicles must have particulate matter (PM) filters by 2014
  - Phased in starting 2011
- By 2023 all vehicles must have 2010 model year engines or equivalent
  - Phased in starting 2013
- Special provisions, credits
- Fleet calculator available to assist fleets
Option 1 – Best Available Control Technology Schedule
No Reporting Required

- Engines less than 7 years old always ahead of schedule
- Replace with 2010 engine or one with a later compliance date on schedule
  - No action until 2021 with a 2007 MY engine

<table>
<thead>
<tr>
<th>Engine Model Year</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-1994</td>
<td>PM BACT by 2011 and replace by 2015</td>
</tr>
<tr>
<td>1994-1999</td>
<td>Replace by 2013</td>
</tr>
<tr>
<td>2000-2002</td>
<td>Replace by 2014</td>
</tr>
<tr>
<td>2003-2004</td>
<td>PM BACT by 2012 and replace by 2016</td>
</tr>
<tr>
<td>2005-2006</td>
<td>PM BACT by 2013 and replace by 2017</td>
</tr>
<tr>
<td>2007</td>
<td>Replace by 2021</td>
</tr>
<tr>
<td>2008</td>
<td>Replace by 2022</td>
</tr>
<tr>
<td>2009</td>
<td>Replace by 2023</td>
</tr>
</tbody>
</table>

Option 2 - BACT Percentage Limits
Reporting Required

- By 2011 one out of four vehicles need to have a PM filter
- By 2013 one out of four needs to have a 2010 engine

<table>
<thead>
<tr>
<th>January 1st</th>
<th>PM Filter</th>
<th>2010 Engine*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>25%</td>
<td>NA</td>
</tr>
<tr>
<td>2012</td>
<td>50%</td>
<td>NA</td>
</tr>
<tr>
<td>2013</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>2014</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td>60%</td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td>90%</td>
</tr>
<tr>
<td>2021</td>
<td></td>
<td>90%</td>
</tr>
<tr>
<td>2022</td>
<td></td>
<td>90%</td>
</tr>
<tr>
<td>2023</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

*Emissions equivalent to 2010 MY engine
Option 3 – Fleet Averages Reporting Required

- Can be met by any method
- Allows widest variety of engine model years
- Allows widest variety of NOx control options
- Emissions factors specified in regulation
- Fleet emissions targets go down

Fleet Average Emission Factors

By Engine Model Year

Note: For tractors and vehicles with a gross vehicle weight rating (GVWR) greater than 33,000 lbs.
Separate emission factors for smaller vehicles.
Special Provisions Summary

- Small fleets
- Retirement credits
- Low use
- Usage below 7500 miles
- Attainment area operation
- Agricultural vehicles
- Early PM retrofit credits
- Unique vehicles
- PM retrofit safety
- Manufacturer delays
- Certain cab-over engine truck tractors
- Hybrid and alternative fueled vehicles credits
- Three day pass
- School buses
- Motor coaches
- Two engine sweepers

Small Fleets

- Three or fewer vehicles
- PM and NOx reductions begin 2014
  - One 2004 model year engine and PM filter until 2019
  - Remaining vehicles upgraded 2014-2016
- Cleanest engines by 2023

Number of vehicles registered in California (2006)
Accelerated Replacement Not Required for Every Truck

Number of Different Trucks Operating in California in 2008 = 941,000

Vehicle Retirement Credits

- Change added at board hearing in 2008
- Provides relief for fleets that have downsized compared to July 1, 2008
  - Same as if replacing with a 2010 model year engine
  - Delays NOx and PM requirements for other vehicles
- Expires prior to January 1, 2014
- Must report March 31, 2010
- Results in fewer PM and NOx reductions than original estimate
Existing Relief in Regulation

- Delays until 2014 for small fleets
- Delays until 2012 for large fleets
  - If no engines older than 17 years old
  - 25% of trucks have originally equipped PM filters
- Fleets that have downsized
  - Counts towards percentage requirements or fleet average
  - 25% retired delays PM and NOx by 1 year
- No costs for low use vehicles
  - Fewer than 1000 miles and 100 hours per year
- Delays for qualifying agricultural trucks

Impact of Economy on Emissions
Approach

- Start with 2008 Rule emissions analysis published in staff report
- Effect of recession on emissions
  - Fewer miles traveled
  - Fewer new vehicles operating in California
- Estimate emissions in 2009 using available indicators for trucking activity and vehicle age
- Project emissions into the future

Historical Activity Data Sources Evaluated

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Region</th>
<th>Change 2007-2009</th>
<th>Latest Data Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Fuel Sales</td>
<td>Statewide</td>
<td>-13% to -18%</td>
<td>August 2009</td>
</tr>
<tr>
<td>California PeMS Counts</td>
<td>Statewide</td>
<td>-4% or more</td>
<td>October 2009</td>
</tr>
<tr>
<td>California WIM Counts</td>
<td>Statewide</td>
<td>-10% or more</td>
<td>March 2009</td>
</tr>
<tr>
<td>Port of LA / Long Beach Container Traffic</td>
<td>Los Angeles</td>
<td>-26%</td>
<td>October 2009</td>
</tr>
<tr>
<td>Port of Oakland Container Traffic</td>
<td>Bay Area</td>
<td>-17%</td>
<td>October 2009</td>
</tr>
<tr>
<td>ATA Tonnage Index</td>
<td>Nationwide</td>
<td>-10%</td>
<td>September 2009</td>
</tr>
<tr>
<td>BTS Transportation Services Index</td>
<td>Nationwide</td>
<td>-14%</td>
<td>September 2009</td>
</tr>
</tbody>
</table>
Effect of Recession on Trucking Today

• Overall truck activity in California is down between 10% and 18% since the 2007 peak
• National new truck sales are at their lowest levels in 25 years
• The CA registered truck population
  – Has not grown since 2007
  – Getting older because of fewer replacements
  – Fewer clean trucks than original projection

Vehicle Sales and Registration

• National truck sales are closely correlated with non-drayage truck registration in California.

<table>
<thead>
<tr>
<th>Year</th>
<th>National (^1)</th>
<th>California (^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>+12%</td>
<td>+6%</td>
</tr>
<tr>
<td>2007</td>
<td>-40%</td>
<td>-5%</td>
</tr>
<tr>
<td>2008</td>
<td>-46%</td>
<td>-47%</td>
</tr>
<tr>
<td>2009</td>
<td>-64%</td>
<td>-58%*</td>
</tr>
</tbody>
</table>

\(^1\) WardsAuto national sales database  
\(^2\) Analysis of California DMV new truck registration data  
* Excludes drayage trucks purchased to comply with regulation
National Truck Sales

- Lowest level in 25 years
- High year to year variability and sensitivity to economic trends

DMV Registration

- Analysis of DMV registration database (non-drageage trucks)
- 2007 standard trucks are 70% cleaner for NOx and 85% cleaner for diesel PM than older vehicles
- In absence of requirements, businesses have reduced purchases of clean vehicles in California due to recession

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (thousands) (non-drageage)</th>
<th>Average Age</th>
<th>Percent of New Vehicles in Fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>181</td>
<td>9.1</td>
<td>6.4%</td>
</tr>
<tr>
<td>2006</td>
<td>198</td>
<td>9.1</td>
<td>6.8%</td>
</tr>
<tr>
<td>2007</td>
<td>199</td>
<td>9.2</td>
<td>6.1%</td>
</tr>
<tr>
<td>2008</td>
<td>198</td>
<td>9.6</td>
<td>3.4%</td>
</tr>
<tr>
<td>2009</td>
<td>197</td>
<td>9.9</td>
<td>2.7%*</td>
</tr>
</tbody>
</table>

* Approximately 3000 new drayage trucks were purchased in 2009 to comply with the Drayage Truck Rule. If included, the percentage increases to 3.8%
Revised 2009 Statewide Emissions Estimate
(2009 is prior to Rule phase-in requirements)

![Bar chart showing NOx and PM2.5 emissions](chart.png)

- 2009 emissions are 20% lower than anticipated.

Projecting Emissions

- Two inventory inputs:
  - Activity growth projections
  - Vehicle sales projections
- Methodology
  - Evaluate economic and fuel consumption forecasts
  - Develop two bounding scenarios
Projecting Activity and Emissions

• California specific forecasts generally do not project more than a few years into the future
• Projections differ by source
• No forecasts project future truck activity and emissions in California
• Original estimate based on long term trend in vehicle activity based on regional travel models
• Update relies on existing economic forecast data to bound potential emissions projections

Available Economic Forecasts

• California Specific
  – California Department of Finance (to 2011)
  – California Legislative Analyst’s Office (to 2015)
  – California Energy Commission (to 2030)
  – UCLA Anderson School (to 2011)
  – Beacon Economics (to 2013)
  – University of the Pacific (to 2014)
• Nationwide
  – Congressional Budget Office (to 2019)
  – Energy Information Agency (to 2030)
Truck Activity Growth Recovery

- Multiple economic forecasts were used to bound quick and slow growth scenarios
- Quick recovery growth scenario
  - California economy begins to recover in 2010
  - Economy returns to long-term trend in about 8 years
    - Two years after national economy returns to trend
- Slow growth scenario
  - California economy begins recovery in 2011
  - Growth rate after 2011 at historical average
  - Does not return to pre-recession trend in foreseeable future

New Truck Sales Recovery

- Recovery in forecasted sales were bounded to give two scenarios
- New sales sensitive to economic trends
- Quick growth scenario assumes:
  - Recovery begins in 2010
  - Sales rebound strongly 2010 and 2011 (36%/year)
  - 2012 and future sales increase (5%/year) through 2015
- Slow growth scenario assumes:
  - Recovery begins in 2012
  - Sales rebound (11%/year) through 2017 but do not return to pre-recession trend in foreseeable future
Analysis

- Projected vehicle activity and truck sales were used to project future truck emissions
- Estimated emissions were compared to emissions reductions resulting from the rule as adopted

Projected Emissions Compared to Rule Reductions

- PM$_{2.5}$
  - In 2011 the recession results in lower emissions than in the Rule (as published in the staff report)
  - After 2011, the Rule results in lower emissions than the recession
  - After 2012 the Rule results in much lower emissions than the recession
- NOx
  - Rule phase-in starts in 2013
  - The Rule results in lower emissions than the recession
PM$_{2.5}$ Emissions Projection

- Quick Recovery Without Regulation
- Slow Recovery Without Regulation
- Staff Report Projection With Regulation

NOx Emissions Projection

- Quick Recovery Without Regulation
- Slow Recovery Without Regulation
- Staff Report Projection With Regulation
Emissions and 2014 SIP Targets

• The rule was designed to provide emissions reductions to meet SIP targets
• In either scenario, the Rule is still necessary to meet the 2014 target
• Depending on how the economy grows, emissions may or may not be below the 2014 target

Projected 2014 PM$_{2.5}$ Emissions

In a quick recovery, 2014 emissions are essentially the same as in the staff report.
In a slow recovery, the Rule could generate ~1 ton more PM$_{2.5}$ tons per day than anticipated in the staff report.

Reduction level to meet SIP target
Projected 2014 NOx Emissions

- In a quick recovery, 2014 emissions are the same as in the staff report.
- In a slow recovery, the rule could generate ~30 more NOx tons per day than anticipated in the staff report.

Consequences of Not Securing the Reductions Relied Upon in the Regulation

- Diminished public health benefits
- A need to make up shortfall with other regulations by 2014
- A possible disapproval of the SIP leading to:
  - Freezing of transportation funds
  - A federal implementation plan to address the shortfall
- Failure to attain the PM$_{2.5}$ standard resulting in new planning requirements
Conclusions

• The recession has resulted in reduced emissions today
• Projections suggest emissions in 2011 will be lower than the Rule was designed to achieve
• After 2012 the Rule will result in lower emissions than the recession alone
• The Rule is necessary to meet SIP targets in 2014 established to meet Federal air quality standards under the Clean Air Act and to protect public health