Public Meeting
Regulatory and Non-Regulatory Fuels Activities

September 29, 2004
Agenda

✦ Introductions
✦ Implementation Discussions
  – Phase 3 RFG
  – Permeation Study
  – Diesel Fuel Lubricity
✦ Proposed Changes to the CaRFG regulations
✦ Presentations by Others
✦ Open Discussion
✦ Closing Remarks
Implementation of Phase 3 RFG Regulation
Oxygen Range and Oxygenates

- Oxygen Range for 1.8% to 2.2% oxygen content is evaluated at 2.0% and for 2.5% to 2.9% is evaluated at 2.7%.

- Staff has been asked to investigate the practicality of creating a similar procedure for oxygenate content.

- To ensure that there is no loss in benefits, it is necessary to validate the CARBOB Model.

- Several refineries have submitted data for the purpose of validating CARBOB Model.
Permeation Study
Test Vehicle

- Six passengers cars and four trucks selected with different ages and technologies, represent California in-use fleet in 2001.
- Mileage ranged from 15,000 to 143,000.
- The oldest model year is 1978 and the newest is 2001.
- Vehicle were filled up with California Gasoline.
Test Fuels

Three California fuels for the test filled at ChevronTexaco stations:

- Fuel A: MTBE Fuel (10.5 wt.% MTBE or 2 wt.% oxygen)
- Fuel B: Ethanol Fuel (5.7 vol.% ethanol or 2 wt.% oxygen)
- Fuel C: Non-oxygenated Fuel
Hot soak test for 3-hour in steady state 85° and 105°F in Sealed Housing for Evaporative Determination (SHED).

Variable temperature diurnal test in SHED (65° to 105° then to 65° F) (California 2-day diurnal test)
Test Results

- Permeation increased from the MTBE fuel to the ethanol fuel on all 10 vehicles.
- On average, ethanol emission increased permeation emissions compared to:
  - MTBE gasoline: 65%
  - Non-oxygenated gasoline: 45%
- Permeation increase, on average, by 1.4 g/day from MTBE fuel to ethanol fuel, and decrease, by average, by 1.1 g/day from ethanol to non-oxygenated fuel
Emissions

- CRC results do not directly provide the emissions impact of permeation
- To calculate emissions need to consider:
  - Permeation data
  - Diurnal temperature profiles
  - Fleet composition
  - Vehicle activity data
- Vehicle activity data and equipment temperatures must be integrated to provide an appropriate temporal and spatial distribution of emissions.
Possible Next Steps for CRC Test Program

- Test newer technology vehicles LEV II and PZEV and the two newest model years from current test group.
- Fuels: 0%, 2.7%, 10% ethanol and a higher aromatics variant.
Implementation of Diesel Regulation
Implementation of Amendments to the California Diesel Fuel Regulations

- Approved July 24, 2003
- Executive Officer signed on May 10, 2004
- Submitted to OAL on June 1, 2004
- Final rulemaking package approved by OAL and filed with the Secretary of State on July 15, 2004
- Regulation became effective on August 14, 2004
- First round of compliance plans are being submitted in September 2004
Diesel Fuel Lubricity
ARB Diesel Fuel Lubricity Standard Phase I Implementation

- ASTM standard, identical to ARB Phase I standard, to become effective January 1, 2005
- ARB lubricity standard will defer to ASTM standard when DMS adopts and enforces
- Staff will be meeting with refineries and pipeline operators to monitor compliance efforts
Proposed Modifications to the CaRFG Regulations
Proposed Changes to CaRFG Regulations

- Revise requirements for documentation for transfer of denatured ethanol for use in California gasoline

- Revise restriction on blending CARBOB with other products
  - Add provision to allow protocols for blending transmix into CARBOB terminal tanks
  - Add provision to allow blending of limited amounts of California gasoline containing ethanol
  - Add provision to allow protocols for other situations
Proposed Changes to CaRFG Regulations (Continued)

- Revise RVP compliance requirements for CA gasoline transported to South Coast by marine vessel
  - Proposed that the fuel shall be subject to the regulatory control periods for production and import facilities identified in section 2262.4(b)(2)(A)

- Delete CARBOB importer sampling, testing, and record-keeping requirement
Proposed Changes to CaRFG Regulations (Continued)

- Miscellaneous improvements and corrections
  - Clarifying that “import facility” means “storage tank”
  - In footnote 2 of section 2266.5(a)(6)(A) table, replace “December 31, 2004” with “December 31, 2005”
  - In section 2266.5(g)(1)(C), replace H&SC reference “section 43021” with “section 43026”
  - “...Procedures for Evaluating Alternative Specifications...” candidate formulation oxygen range of 3.3-3.7% to be treated as 3.5% in CaRFG3 Predictive Model
  - Other minor changes which improve compliance flexibility
Diesel Fuel for Locomotive and Marine Diesel Engines
Extend CARB Diesel Fuel Standards to Harborcraft and Intrastate Locomotives
Why the proposed regulatory amendments?

- California needs the NOx and PM emission reductions to attain NAAQS and SAAQS
- ARB Board direction
- Diesel Risk Reduction Plan (DRRP)
- State Implementation Plan (SIP)
- Governor’s Action Plan
What are the proposed regulatory amendments?

- CARB diesel fuel required for intrastate locomotives and harborcraft
- January 1, 2006: SCAQMD harborcraft only.
- January 1, 2007: Statewide harborcraft and intrastate locomotives
- Alternative Emission Control Plan (AECP) for intrastate locomotives
What are the proposed definitions?

- **Harborcraft:**
  - No foreign trade “registry”
  - < 400 feet in length
  - < 10,000 gross tons
  - < 30 liters per-cylinder displacement

- **Intrastate Diesel-Electric Locomotives:**
  - Operate 90% or more within California
  - Fuel consumption, Annual Miles, & Annual Hours
  - Provides up to 36 days per year for out-of-state activities
  - Does not include interstate line-haul locomotives
What are the alternatives to proposed regulatory amendments?

- No CARB diesel fuel required for intrastate locomotives and harborcraft
- Class III railroads exempted
- Certain Class III railroads exempted
- Requiring both harborcraft and intrastate locomotives in the SCAQMD on Jan. 1, 2006 and the rest of the state on Jan. 1, 2007.
- Requiring all interstate and intrastate locomotives comply with CARB diesel
Types of Railroads

- Surface Transportation Board (STB)
  - Defines size of railroads (49 CFR Part 1201) based on three year average of annual operating revenues.
  - STB thresholds adjusted annually based on rate of inflation.
- Class I Railroads (> $250 million)
- Class II Railroad ($20-$250 million)
- Class III Railroads (<$20 million)
California’s Intrastate Railroads

- **Class I Railroads (UP and BNSF)**
  - Nearly 400 intrastate locomotives
  - Average 2,400 horsepower (1,500-4000 hp)
  - Average about 15 years old.
  - Average about 60,000 gallons per loco per year.

- **Passenger Trains**
  - 111 intrastate locomotives (2 switchers also)
  - Average 3,100 horsepower
  - Average age about 10 years old.
  - Average about 180,000 gallons per loco per year.
California’s Intrastate Railroads

✧ Class III Railroads (20 with intrastate locos)
  – About 120 intrastate locomotives
  – Average 1,640 horsepower (150-3,000 hp)
  – Average about 40 years old.
  – Average about 28,000 gallons per loco per year.

✧ Industrial and Military Locomotives
  – About 120 intrastate locomotives
  – Average 1,000 horsepower
  – Average age about 50 years old.
  – Average about 10-30k gallons per loco per year.
California’s Harborcraft

- ARB Commercial Harborcraft Survey of 2002
- About an estimated 4,000 CHC statewide.
- Primary engines range up to 3,600 hp.
- Auxiliary engines range up to 400 hp.
- Average about 30 years old.
- Commercial fishing boats (2,520) 64% of total number of CHC.
- Ferries consumed largest portion of diesel fuel (36%) and commercial fishing boats (20%)
## U.S. EPA Diesel Fuel Standards

<table>
<thead>
<tr>
<th>Applicability (Year of Implementation)</th>
<th>Maximum Sulfur Level (ppmw)</th>
<th>Maximum Aromatics (% by volume)</th>
<th>Minimum Cetane Index</th>
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<tr>
<td>Onroad (1993)</td>
<td>500</td>
<td>35</td>
<td>40</td>
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<tr>
<td>Onroad (2006)</td>
<td>15</td>
<td>35</td>
<td>40</td>
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<tr>
<td>Nonroad (1993)</td>
<td>5,000</td>
<td>35</td>
<td>40</td>
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<tr>
<td>Nonroad (2007)</td>
<td>500</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>Nonroad (2010)</td>
<td>15</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>Nonroad (2012) *</td>
<td>15</td>
<td>35</td>
<td>40</td>
</tr>
</tbody>
</table>

* Applicable to locomotives and marine vessels.
Intrastate Locomotives:  
Statewide Diesel Fuel Consumption  
(million gallons per year)

<table>
<thead>
<tr>
<th>RAILROAD</th>
<th>CARB</th>
<th>U.S. EPA</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>6.4</td>
<td>16.9</td>
<td>23.3</td>
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<tr>
<td>Passenger</td>
<td>19.9</td>
<td>0.5</td>
<td>20.4</td>
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<tr>
<td>Class III</td>
<td>2.1</td>
<td>1.2 *</td>
<td>3.3</td>
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<tr>
<td>TOTAL</td>
<td>28</td>
<td>19 *</td>
<td>47</td>
</tr>
</tbody>
</table>

* includes 300,000 gallons of nonroad for Class III railroads.
## Harborcraft: Statewide Diesel Fuel Consumption

*(million gallons per year)*

<table>
<thead>
<tr>
<th>HARBORCRAFT</th>
<th>CARB</th>
<th>U.S. EPA</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>37.1</td>
<td>45.3</td>
<td>82.4</td>
</tr>
<tr>
<td>Recreational</td>
<td>0.1</td>
<td>4.9</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>37.2</strong></td>
<td><strong>50.2</strong></td>
<td><strong>87.4</strong></td>
</tr>
</tbody>
</table>
## Harborcraft and Intrastate Locomotives: Statewide Diesel Fuel Consumption

(million gallons per year)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CARB</th>
<th>U.S. EPA</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrastate</td>
<td>28.4</td>
<td>18.6</td>
<td>47.0</td>
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<tr>
<td>Locomotives</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Harborcraft</td>
<td>37.2</td>
<td>50.2</td>
<td>87.4</td>
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<tr>
<td>TOTAL</td>
<td>65.6</td>
<td>68.8</td>
<td>134.4</td>
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</table>

Based on:
- 2004 ARB Intrastate Locomotive Survey (intrastate locomotives)
- 2002 ARB Commercial Harborcraft Survey (commercial harborcraft)
- 2003 ARB Emissions Inventory (recreational harborcraft)
CARB Diesel Anticipated Emission Benefits

- NOx - 6%
- PM - 14%
- SOx - 95%
- Air toxics benefits
## Harborcraft and Intrastate Locomotives:
### 2003 Statewide Emissions
#### (tons per day)

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>NOX</th>
<th>SOX</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrastate Locomotives</td>
<td>38.4</td>
<td>0.3</td>
<td>0.9</td>
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<tr>
<td>Harborcraft</td>
<td>19.8</td>
<td>1.9</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>58.2</strong></td>
<td><strong>2.2</strong></td>
<td><strong>2.0</strong></td>
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</tbody>
</table>
## Harborcraft and Intrastate Locomotives: 2007 Statewide Emission Reductions

(tons per day)

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>NOX</th>
<th>SOX</th>
<th>PM *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrastate Locomotives</td>
<td>1.0</td>
<td>0.3</td>
<td>0.2 *</td>
</tr>
<tr>
<td>Harborcraft</td>
<td>1.0</td>
<td>1.5</td>
<td>0.4 *</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2.0</td>
<td>1.8</td>
<td>0.6 *</td>
</tr>
</tbody>
</table>

* includes both directly and indirectly emitted PM emission benefits.
Estimated Costs in 2007

- Incremental Costs: 3 cents per gallon.
  - Transition from CARB to U.S. EPA diesel fuels.
  - Cost for aromatic hydrocarbon reduction.

- Statewide Costs: $2 to $3 million annually.

- Lower sulfur will decrease engine wear.

- Lower sulfur will increase life of lubricating oils.

- Cost-Effectiveness: $1.10 to $1.60.
  - per pound of NOx and PM reduced.
Economic Impacts

- Cost-effectiveness within range of ARB control measures.
- No significant impact expected on California economy.
- Estimate minor impacts on owners/operators.
- Expect no significant effects on small businesses due to the cost impacts.
Regulatory Schedule

✦ Staff Report OAL Publication Date
  – October 1, 2004

✦ Workshop Schedule
  – mid-late October

✦ Board Meeting Date
  – November 18, 2004
  – Sacramento, CA
Presentations by Others
Open Discussion
Closing Remarks