

Public Consultation Meeting Regulatory and Non-Regulatory Fuels Activities

February 25, 2004

California Environmental Protection Agency



Air Resources Board

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Agenda

- ♦ **Introductions**
- ♦ **Implementation Discussions**
 - Phase 3 RFG
 - Diesel Fuel Lubricity
- ♦ **Potential Regulatory Activities**
 - Phase 4 RFG
 - Diesel fuel for locomotive and marine diesel engines
 - Diesel fuel deposit control additives and diesel engine lubricating oils
 - Clean Fuels Outlets - Hydrogen
 - Biodiesel
- ♦ **Presentations by Others**
- ♦ **Open Discussion**
- ♦ **Closing Remarks**

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Implementation Issues

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Implementation of Phase 3 RFG Regulation

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Phase 3 RFG Implementation Issues

- ✦ Documentation for transfer of denatured ethanol for use in California gasoline
- ✦ Blending small amounts of finished gasoline into CARBOB terminal tanks
- ✦ Blending small amounts of transmix into CARBOB terminal tanks
- ✦ Other issues may exist

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Documentation for Transfer of Denatured Ethanol

- ✦ Importers and producers of ethanol must provide the following information with the product transfer documents:
 - Name, location and operator of the facilities at which the ethanol was produced or denatured
- ✦ Concerns about the practicality of this requirement
 - commingling of denatured ethanol
 - commingling of neat ethanol before it reaches a California production facility that adds the denaturant

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Blending Finished Gasoline into CARBOB Terminal Tank

- ✦ Blending of CARBOB with California gasoline is prohibited except for specific situations that involve a changeover in service
- ✦ Address the blending of small amounts of finished gasoline into CARBOB terminal tanks
 - After calibration of ethanol meters
 - After pulling gasoline from service station tank
 - After aborted loading of ethanol and CARBOB to tanker truck

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Blending Transmix into CARBOB Terminal Tanks

- ✦ CaRFG3 regulations include provisions for enforcement protocols for blending transmix with finished gasoline but none for blending transmix with CARBOB

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CaRFG3 Implementation Refinements

- ✦ Plan proposed amendments for October 2004 hearing
 - Identify conditions under which returning small amounts of gasoline to CARBOB terminal tanks is allowed
 - Allow protocols for blending transmix into CARBOB terminal tank
 - Allow ethanol shipper to maintain all sources of ethanol instead of providing on each transfer document
- ✦ ARB staff to announce interim policy on website pending completing of rulemakings

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Implementation of Diesel Regulation

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Diesel Fuel Lubricity

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ARB Diesel Fuel Lubricity Standard Phase I: Protect Existing Equipment

- ♦ 520 micron maximum WSD based on HFRR @60 deg C
- ♦ Time frame: 90 day phase-in commencing August 1, 2004

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ARB Diesel Fuel Lubricity Standard Phase 2: Protect Advanced Technology Fuel Injection Systems

- ✦ Placeholder in regulation for 2006 lubricity standard
- ✦ Board resolution direction to staff:
 - Conduct technology assessment by 2005
 - Propose new lubricity standard to Board for 2006 if assessment determines:
 - HFRR maximum WSD of 460 microns, or more appropriate standard, should be implemented in 2006 with proposed 15 ppmw sulfur limit
- ✦ Time frame:
 - Technology assessment complete 2005
 - 2006 standard: 90 day phase-in commencing June 1, 2006

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Deference to ASTM Lubricity Standard

- ✦ ARB lubricity standards will defer to ASTM standards if:
 - For 2004:
 - ASTM establishes a standard at least as protective as ARB adopted standard
 - For 2006:
 - ASTM establishes a standard that is protective of advanced technology fuel injection systems
 - Division of Measurement Standards adopts

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Status of ASTM Ballot

- ✦ Current ballot is identical to ARB 2004 standard
 - Received negative votes
- ✦ Current plans:
 - Reballot prior to June meeting

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National Lubricity Standard for Diesel Fuel

- ✦ EPA is considering pursuit of lubricity regulation to align with ARB standard

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Potential Regulatory Activities

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Phase 4 RFG

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Suggested Measures for Further Evaluation

- ✦ SIP commitment includes examination of feasibility and scope of further gasoline specifications

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Suggested Measures for Further Evaluation (cont.)

✦ Sulfur	5 ppm
✦ Oxygen	0 %wt. ^a
✦ Aromatics	25 %vol.
✦ Olefins	6 %vol.
✦ T50	200°
✦ T90	300°
✦ RVP	6.4 ^b - 6.5 psi
✦ Benzene	0.1% vol.

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Comparison of Flat Limits

	Phase 2	Phase 3	Suggested Measure
Sulfur ppm	40	20	5
Oxygen %wt.	2 ^a	2 ^a	0
Aromatics	25	25	25
Olefins %vol.	6	6	6
T50 °F	210	213	200
T90 °F	300	305	300
RVP psi	7.0	7.0 ^b	6.5 ^c
Benzene %vol.	1.0	0.8	0.1

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Estimated Potential Benefits

- ✦ The estimated potential benefits associated with suggested measure in 2010:

	<u>tons per day</u>
NOx	15
Hydrocarbons	35

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Significant Issues

- ✦ Costs
- ✦ Supply

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Significant Issues (cont.)

Capital	cents per gallon	\$/lb. controlled
Suggested Measure: 4 to 6 Billion dollars	10 - 20 ^a	45 - 90 ^b
CaRFG2: 4 Billion	10	6.3 ^b
CaRFG3: 1 Billion	3	NA ^c

a. Depends on costs of imports

b. Only HC and NO_x emissions reductions used to calculate cost effectiveness

c. Intended to eliminate MTBE

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Significant Issues (cont.)

- ♦ Production and Imports
 - Could further reduce in-state production by about 15%
 - Require more imports

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Significant Issues (cont.)

- ♦ Availability of Imports
 - Limited due to specifications that are radically different from federal RFG for rest of the nation
 - Sulfur - 5 ppm cap vs 30 ppm average for federal RFG
 - Benzene - 0.1% by volume vs 1% by volume for federal RFG

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Other Significant Issues

✦ Proposed 0% Oxygen Content

- Federal CAA requires 2% oxygen content
- Federal CAA oxygen requirement applies to 80% of all fuel sold in California
- Would require a waiver of the federal oxygen requirement
- Wintertime oxygen content requirement still in effect for the South Coast and parts of Imperial County

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Other Significant Issues (cont.)

- ### **✦ Proposed 6.5 psi RFG limit makes production of complying fuel difficult if not impossible**
- Federal RVP minimum limit for fuel 6.4 psi
 - Leaves only 0.1 psi of flexibility
 - Reproducibility of test method is 0.2 psi

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Conclusions

- ✦ Significant supply and production issues to be addressed
- ✦ Feasibility assessments require additional investigation
- ✦ Potential for emissions benefits for gasoline

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CARB DIESEL FUEL USE WITH INTRASTATE



Why Evaluate Intrastate Marine and Locomotives?

- ♦ ARB Public Hearing - July 24, 2003
- ♦ ARB Status Report - October 23, 2003
- ♦ ARB SIP Summit - January 13-14, 2004
 - ARB staff directed to prepare an evaluation of potential concepts to reduce emissions from intrastate marine and locomotives

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Line Haul Locomotive and Oceangoing Ship Fueling Patterns

- ♦ Operate nationally and internationally.
- ♦ Low quality fuels with high sulfur content.
- ♦ Can fuel prior to arriving in California.
- ♦ Fuel storage capacity sufficient to avoid fueling in California.
- ♦ Most fuel dispensed in California consumed out-of-state.

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Intrastate Harbor Craft and Locomotive Fueling Patterns

- ✦ Operate locally and regionally.
- ✦ Fueled primarily at California locations.
- ✦ Already some use of higher quality fuels.
- ✦ Opportunities for additional use of cleaner fuels.

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In-Use Sulfur Levels of Transportation Fuels Consumed in California

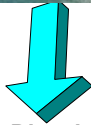
(ppmw)

Fuel Type	Current 2003	Anticipated 2006/2007
CARB Diesel	140	10
EPA Diesel		
On-Road	360	10
Non-Road	3,200	340*
Marine Distillate	340-20,000	No Change
Marine Bunker Fuel	28,000	No Change

* Currently unregulated. US EPA has proposed regulations.

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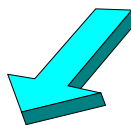
Cleaner Fuel Opportunities Under Evaluation for Marine Vessels



CARB Diesel:

Harbor craft

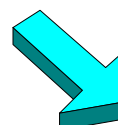
- ~25% *PM* Reduction
- ~10% *NOx* Reduction
- Greater use of add-on controls



Marine Distillate:

Ships at Dockside (auxiliary engines)

- ~60% *PM* Reduction
- ~10% *NOx* Reduction
- ~90% *SOx* Reduction



Lower Sulfur Marine

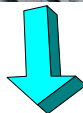
Bunker Fuel:

Oceangoing ships at sea (main engines)

- ~20% *PM* Reduction
- ~40% *SOx* Reduction

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Cleaner Fuel Opportunities Under Evaluation for Locomotives



Use of CARB Diesel:

Short Haul and Switchers

- ~5% *NOx* Reductions
- ~20% *PM* Reductions
- Greater use of add-on controls



USEPA's Proposed Non-Road Diesel:

Line Haul Locomotives

- ~90% *SOx* reductions
- ~5% *NOx* reductions
- ~20% *PM* reductions

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ARB Evaluation Process

- ✦ Gather information on intrastate marine and locomotives (e.g., engines, fuel use)
- ✦ ARB survey of marine and locomotives
- ✦ Conduct future workshops
- ✦ ARB Board Meeting (4th Quarter 2004)?

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ARB Webpages and List Serves

- ✦ [Http://www.arb.ca.gov/offroad/](http://www.arb.ca.gov/offroad/)
- ✦ Locomotives - [loco/loco.htm](http://www.arb.ca.gov/offroad/loco/loco.htm)
- ✦ Marine Vessels - [marinevess/marinevess.htm](http://www.arb.ca.gov/offroad/marinevess/marinevess.htm)

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Diesel Fuel Deposit Control Additives

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Diesel Deposit Control Additives

- ✦ SIP keep clean measure
- ✦ No current deposit control additive requirement for diesel fuel
- ✦ Issue may gain significance for 2007 engine designs

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Deposit Control Additives Potential Benefits

- ✦ Could reduce potential deposit formation in fuel systems and engines
- ✦ Keep engines closer to factory tolerances
- ✦ Minimize deterioration rate of engine-out emission levels

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Diesel Engine Lubricating Oils

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Diesel Engine Lubricating Oils

- ♦ Diesel engines consume (combust) lubrication oils as part of their normal operation
- ♦ Need to consider lubricating oil sulfur and ash content
 - Emissions
 - Impact on after treatment control technology

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Industry Efforts to Study Lubricant Effects on Aftertreatment Devices

- ♦ Government/Industry workgroup
 - DOE Advanced Petroleum-Based Fuels - Diesel Emissions Control (APBF-DEC) Program
- ♦ Private consortium
 - Southwest Research Institute Diesel Aftertreatment Sensitivity to Lubricants (DASL) / Non-Thermal Catalyst Deactivation (N-TCD)

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ASTM Heavy Duty Engine Oil Classification Panel

- ♦ Industry developing HD engine oil specifications for use with aftertreatment technology
 - Proposed Category 10 (PC-10)
 - Lower sulfur, phosphorous, and sulfated ash
 - Engine durability issues to be addressed
- ♦ Target API licensing: late 2005/early 2006
- ♦ Oils in market 3rd quarter 2006

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Summary of Potential Diesel Measures

- ♦ Diesel deposit control additives
 - Need to investigate feasibility of deposit control additives - effectiveness and cost
 - Time frame: 2010+
- ♦ Diesel engine lubricating oils:
 - Industry efforts may preclude regulatory need
 - Licensing of new API engine oil category targeted for late 2005/early 2006

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Clean Fuels Outlets

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Objective

- ♦ To ensure that clean fuels are available for alternative fueled vehicles to operate and achieve the emissions benefits attributed from these vehicles

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Key Points of Program

- ♦ Require certain owners/lessors of gasoline stations to install clean fuel outlets
- ♦ Requirement is triggered when 20,000 vehicles are certified to California LEV standards on a specific fuel

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Considering Program Updates

- ♦ Current program does not consider:
 - New fuel/vehicle technologies
 - hydrogen fuel cells
 - hybrids
 - Infrastructure requirements
 - Lead time
 - Demand Needs
 - Mechanisms to adjust for market conditions

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Tentative Schedule

- ◆ Board hearing September 2004

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Biodiesel

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Background

- ♦ Generally refers to methyl and ethyl esters of fatty acids that are derived from natural products
 - Vegetable, animal, and grease
- ♦ ASTM D6751 establishes fuel specification for biodiesel as a blending component.
 - Excludes fatty acids
 - Glycerol, moisture, cold flow, others
- ♦ US Production capacity: 150 million gallons/yr
- ♦ US Sales 2002: 20 million gallons/yr

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Use of Biodiesel

- ♦ Pure Biodiesel B100
- ♦ Blends of Biodiesel
 - Common blends B2, B5, B20

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Biodiesel Properties Compared to Diesel

	Biodiesel	Average California Diesel
Energy Content btu/gal	119,000 (Soy) 116,000 (Animal)	131,000
Cetane No.	53	50
Sulfur ppm	<1	≤15
Aromatics %vol.	Below detection limit	19 %vol.

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Biodiesel Emissions Compared to Diesel (cont.)

- ✦ Lowers greenhouse gas emissions wells to wheel
 - 3.2 units of energy produced per unit of energy used to produce biodiesel as compared to 0.8 units energy produced per unit of energy used for diesel
- ✦ Generally reduces tail pipe emissions of PM, HC, CO
 - B100: reduces PM and CO 40%, THC 68%
 - B20 reduces PM and CO 12%, THC 20%

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Biodiesel Emissions Compared to Diesel (cont.)

- ✦ Increase in NOx emissions
 - B100 10% increase
 - B20(soybean) 2-4% increase in NOx
 - Feedstock affect NOx (soybean highest)

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Issues with Biodiesel

- Engine durability and impact on lubrication oil
- Fuel quality
- Fuel stability
- Cold flow characteristics
- Seal and material compatibility
- NOx

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Presentations by Others

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Open Discussion

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Closing Remarks