Public Consultation Meeting
Regulatory and Non-Regulatory Fuels Activities

February 25, 2004

California Environmental Protection Agency

Air Resources Board

1

Agenda

- **Introductions**
- **Implementation Discussions**
  - Phase 3 RFG
  - Diesel Fuel Lubricity
- **Potential Regulatory Activities**
  - Phase 4 RFG
  - Diesel fuel for locomotove 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**

2

Implementation Issues

Implementation of Phase 3 RFG Regulation

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

5

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

6

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

7

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

8

CaRFG3 Implementation Refinements

- ✦ Plan proposed amendments for October 2004 hearing
  - – Identify conditions under which returning smalll 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

9

Implementation of Diesel Regulation

10

Diesel Fuel Lubricity

11

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

12

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

13

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

14

Status of ASTM Ballot

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

15

National Lubricity Standard for Diesel Fuel

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

16

Potential Regulatory Activities

17

Phase 4 RFG

18

Suggested Measures for Further Evaluation

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

19

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.

20

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

21

Estimated Potential Benefits

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

	tons per day
NOx	15
Hydrocarbons	35

22

Significant Issues

- Costs
- Supply

23

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 NOx emissions reductions used to calculate cost effectiveness
c. Intended to eliminate MTBE

24

Significant Issues (cont.)

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

25

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

26

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

27

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

28

Conclusions

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

29

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

31

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.

32

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.

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.

Cleaner Fuel Opportunities Under Evaluation for Marine Vessels

<u>CARB Diesel:</u>
Harbor craft
- ***~25% PM** Reduction*
- ***~10% NOx** Reduction*
- ***Greater use of add-on controls***

<u>Marine Distillate:</u>
Ships at Dockside (auxiliary engines)
- ***~60% PM Reduction***
- ***~10% NOx Reduction***
- ***~90% SOx Reduction***

<u>Lower Sulfur Marine Bunker Fuel:</u>
Oceangoing ships at sea (main engines)
- ***~20% PM Reduction***
- ***~40% SOx Reduction***

35

Cleaner Fuel Opportunities Under Evaluation for Locomotives

<u>Use of CARB Diesel:</u>
Short Haul and Switchers
- ***~5% NOx Reductions***
- ***~20% PM Reductions***
- ***Greater use of add-on controls***

<u>USEPA's Proposed Non-Road Diesel:</u>
Line Haul Locomotives
- ***~90% SOx reductions***
- ***~5% NOx reductions***
- ***~20% PM reductions***

36

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)?

37

ARB Webpages and List Serves

- Http://www.arb.ca.gov/offroad/
- Locomotives - loco/loco.htm
- Marine Vessels - marinevess/marinevess.htm

38

Diesel Fuel Deposit Control Additives

39

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

40

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

41

Diesel Engine Lubricating Oils

42

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

43

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)

44

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

45

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

46

Clean Fuels Outlets

47

Objective

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

48

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

49

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

50

Tentative Schedule

- Board hearing September 2004

51

Biodiesel

52

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

53

Use of Biodiesel

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

54

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	$\leq$15
Aromatics %vol.	Below detection limit	19 %vol.

55

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%

56

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)

57

Issues with Biodiesel

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

58

Presentations by Others

59

Open Discussion

60

Closing Remarks

61