Proposed Regulatory Amendments to Extend the CARB Diesel Fuel Requirements to Harborcraft and Intrastate Locomotives

November 18, 2004

California Environmental Protection Agency

Air Resources Board

Overview

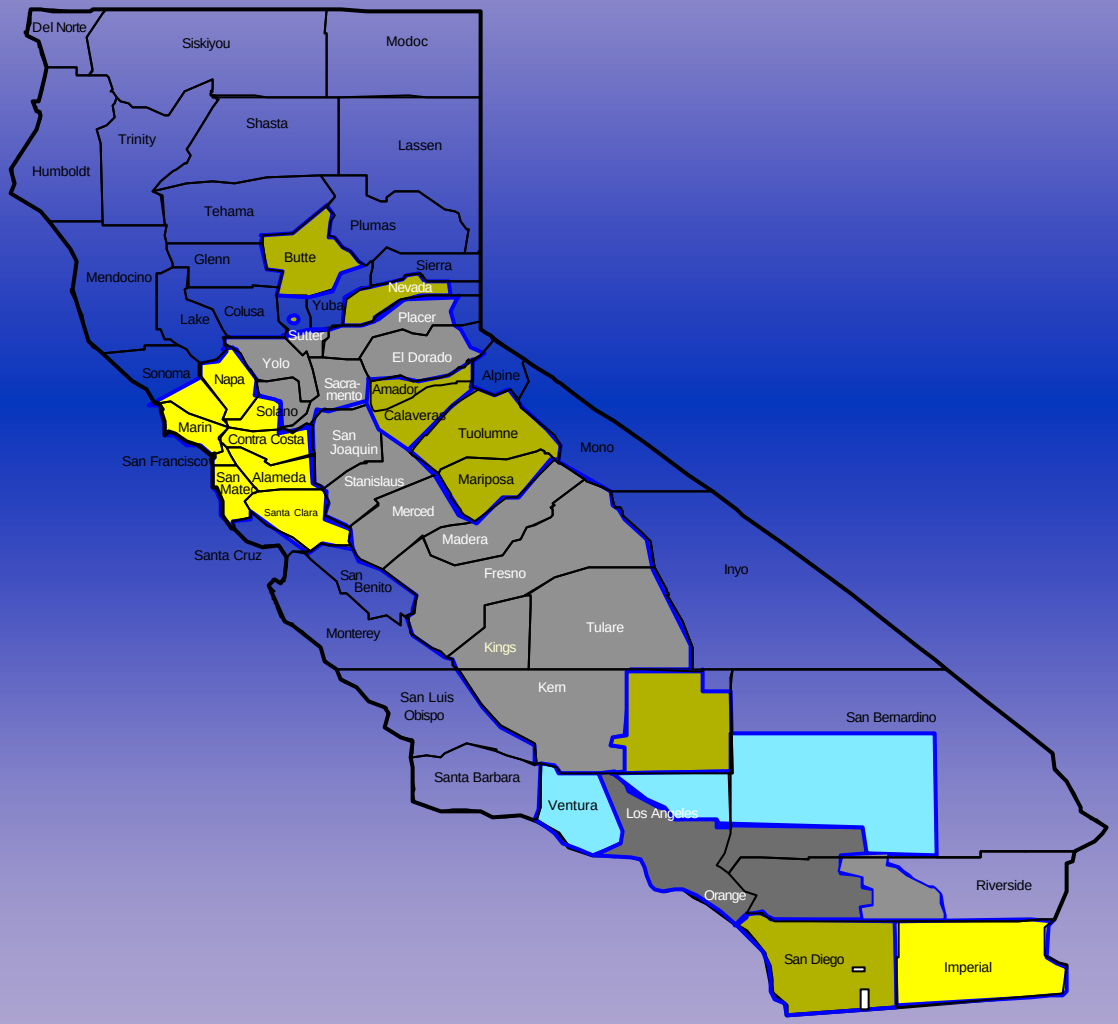
- Background
- Diesel Fuel
- Railroads
- Harborcraft
- Proposal
- Impacts
- Recommendation

BACKGROUND

Need for Emissions Reductions

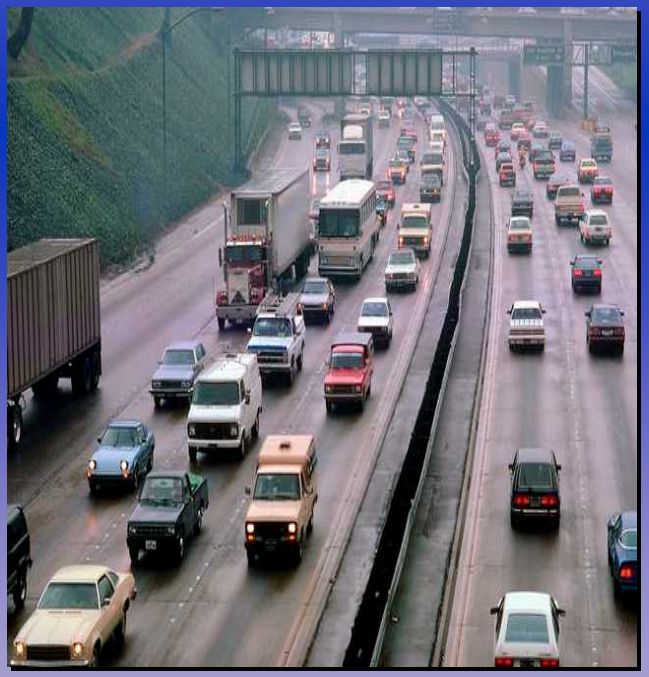
- Over 90% of California's 35 million residents breathe unhealthy air.
- Over 55% of the national population live in areas that are in violation of the federal 8-hour ozone attainment standard.
- The public deserves the cleanest fuels and vehicles.

California 8-Hour Federal Ozone Nonattainment Areas

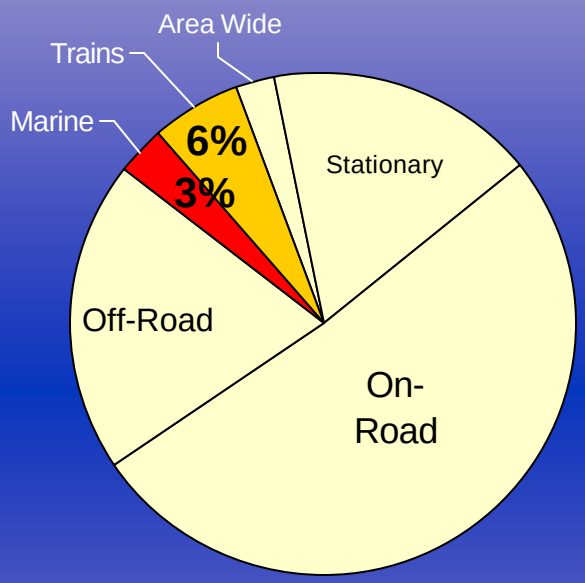


Impact of Diesel Powered Vehicles

- Disproportionate contribution to statewide mobile source emissions
  - They represent about 4 percent of California motor vehicles
  - Produce about 40 percent of the NOx and about 60 percent of directly emitted PM10 from vehicles
  - Account for approximately 70 percent of the ambient air toxics cancer risk



Marine & Locomotive Contribution to Statewide NOx Emissions



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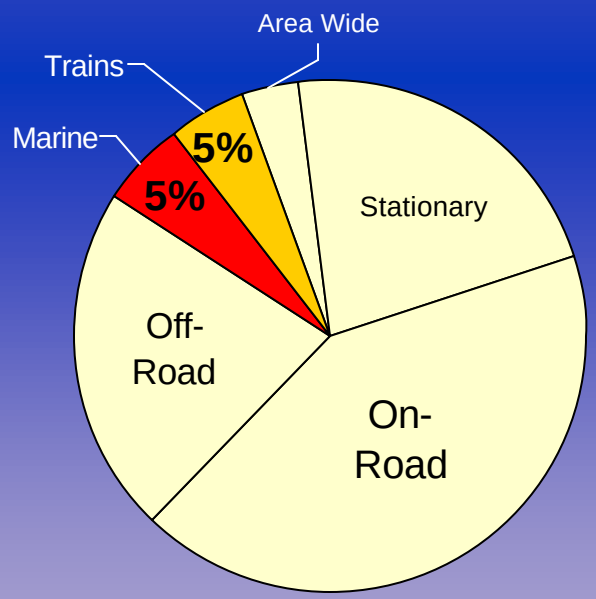

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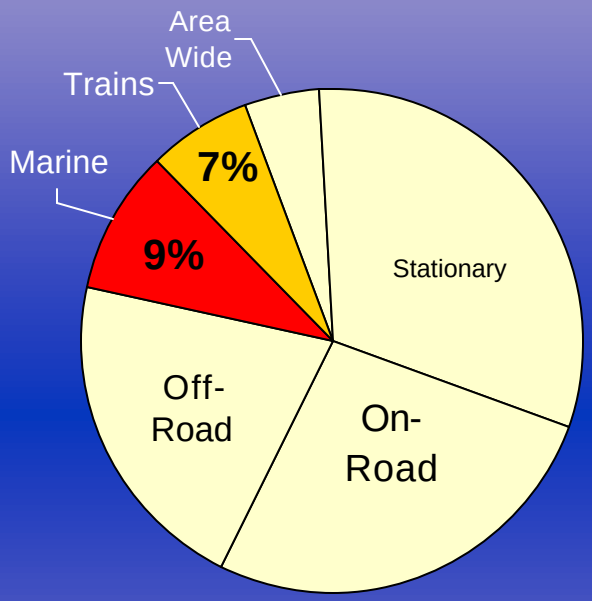
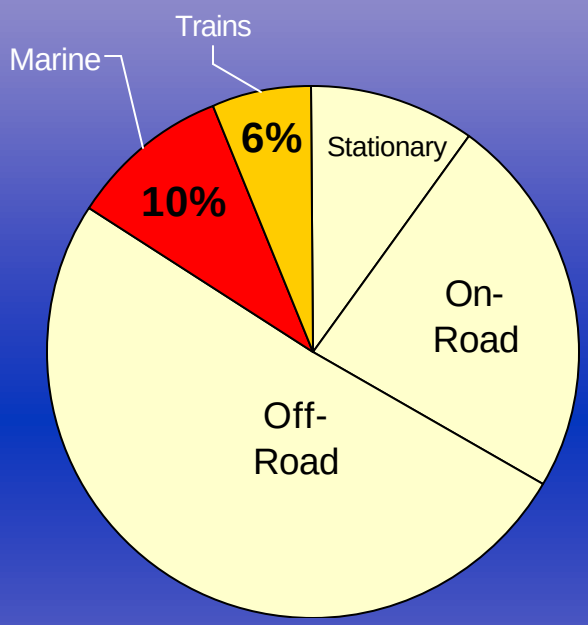


2020

Marine & Locomotive Contribution to Statewide Diesel PM Emissions



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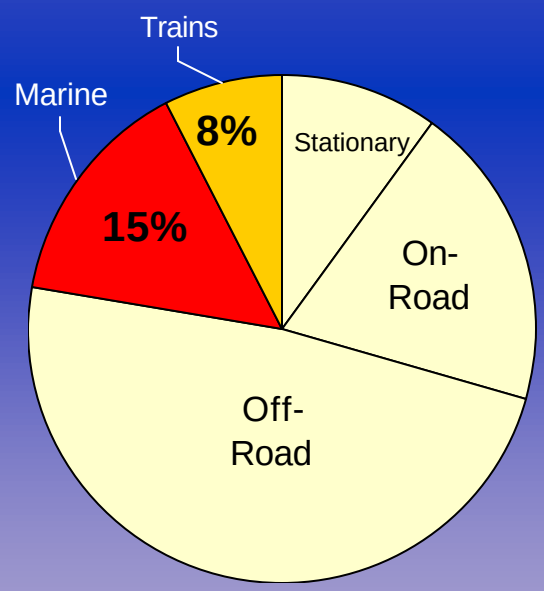

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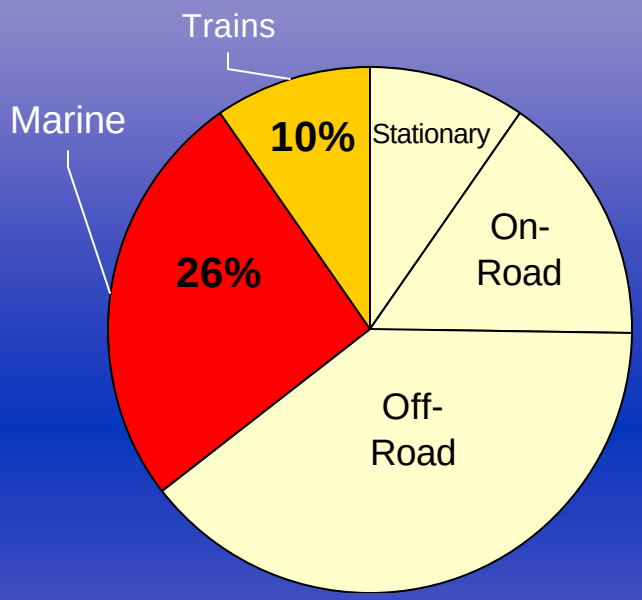
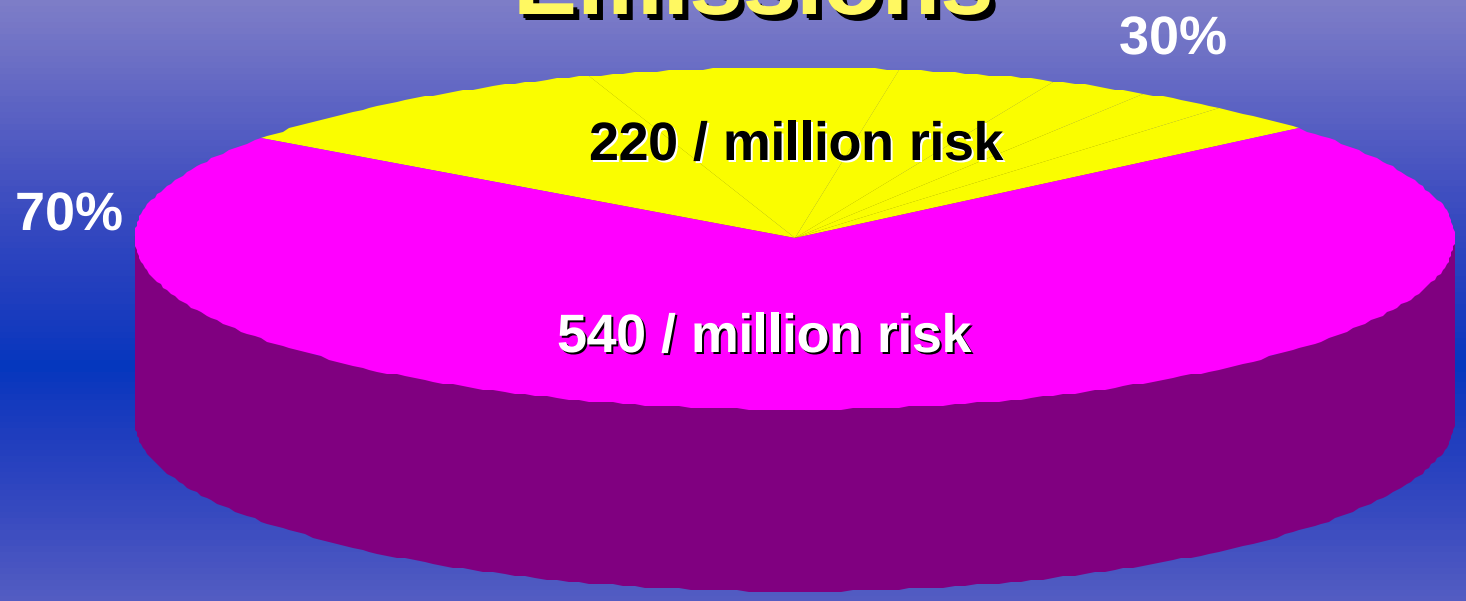


2020

Diesel PM Responsible for 70% of Year 2000 Statewide Risk from Air Toxic Emissions*



Diesel Exhaust PM_{10} (70%)

1,3 Butadiene (10%)
Benzene(8%)
Carbon Tetrachloride (4%)
Formaldehyde (3%)
Hexavalent Chromium (2%)
All Others (3%)

*Air Resources Board Risk Reduction Plan

California State Implementation Plan (SIP)

- ARB approved 2003 SCAQMD and Federal Strategy for CA SIP.
- Ozone and PM control measures 2003-2006.
- SCAQMD SIP Measure Marine-1:
  - Harborcraft use of cleaner diesel fuel.

California Diesel Risk Reduction Plan

- Established a goal:
  - 75% reduction in diesel PM by 2010.
  - 85% reduction in diesel PM by 2020.
  - Additional NOx reductions.

- Four main strategies:
  - More stringent new engine standards.
  - Assure in-use compliance.
  - Cleanup of existing engines.
  - Cleaner diesel and alternative fuels.

DIESEL FUEL

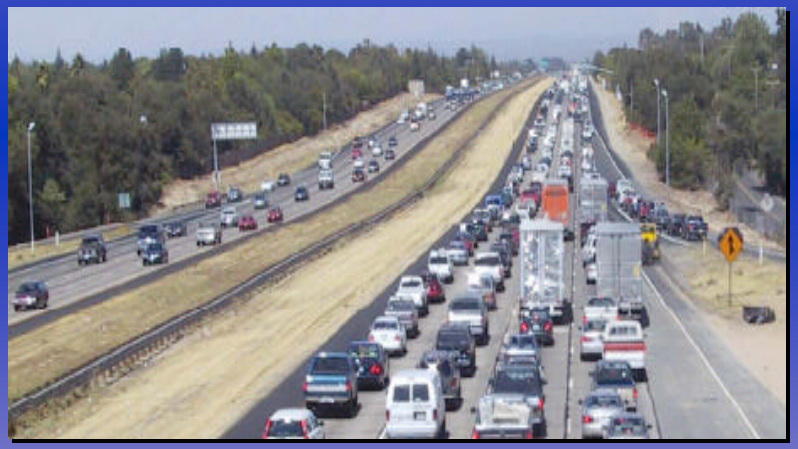
California Diesel Fuel Consumption

- Since 1990, annual consumption of diesel fuel has increased by nearly 60%.
- In 2003, consumption was 2.7 billion gallons.
- Statewide, diesel fuel consumption is expected to increase 2.4% annually in the near term*.

* Source: California Energy Commission

California Diesel Fuel Regulations

- Implemented October 1993.
- Designed to achieve maximum reductions of emissions from diesel vehicles:
  - PM, NOx, Toxics
- Provide flexibility to producers.
- Accomplishment of goals required control of sulfur as well as other fuel properties such as aromatics and cetane.



California Low Sulfur Diesel Fuel Regulations

- Board approved on July 2003.
- Effective June 1, 2006.
- Low sulfur (15 ppmw) diesel fuel designed to enable advanced control technologies.
  - Aligned with U.S. EPA on-road low sulfur diesel fuel.
- Retains aromatic hydrocarbon standard with flexibility to producers.

Federal Diesel Fuel Program

- New sulfur standards will be phased-in from 2006-2012.
  - California low sulfur standard will be implemented in 2006/2007.
- No limit on aromatic hydrocarbon content.

California Vs. Federal Diesel Fuel Emission Benefits*

(tons/day - 2000 Emissions Inventory)

Pollutant	Federal	CARB
SOx	64	85
PM (Directly Emitted)	4	18
NOx	0	110

* Emissions reductions (tpd) relative to pre-1993 diesel.

Implementation of California Low Sulfur Diesel Fuel

- Effective June 1, 2006.
- Received first set of compliance plans.
  - CEQA process has begun.
  - Permit process commenced.

- Refiners on schedule to meet implementation date.

CALIFORNIA RAILROADS

Types of Railroads

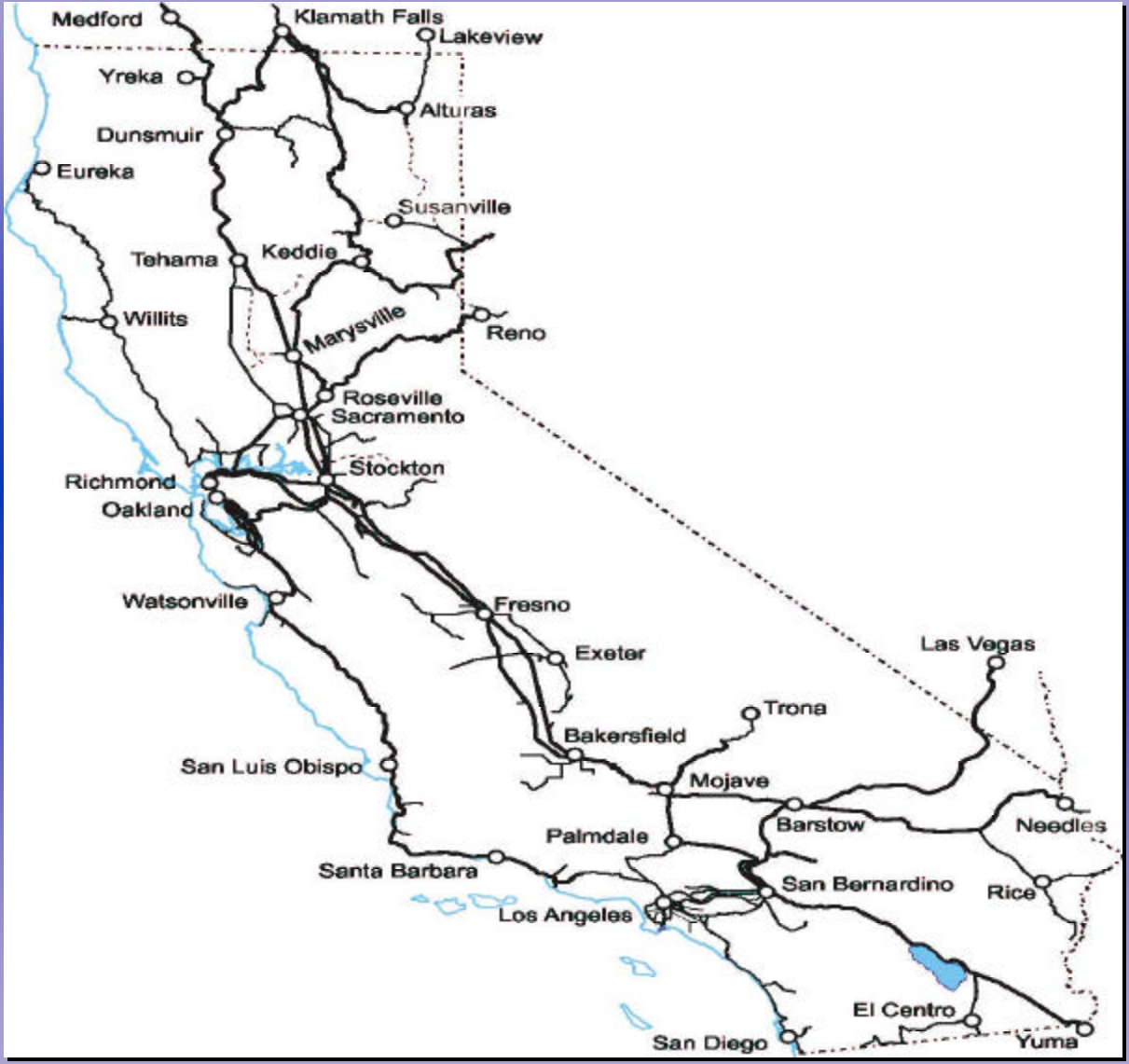
- Surface Transportation Board (STB)
  - Defines size of railroads (49 CFR Part 1201) based on three years average of annual operating revenues.
  - STB thresholds adjusted annually based on rate of inflation.
- Class I Railroads (> $278 million)
  - Seven Class I railroad move 90% of freight in the U.S.
  - UP and BNSF comprise about 60% of nationwide fleet.
- Class II Railroad ($40-$278 million)
- Class III Railroads (<$40 million)

Number of Class I Freight Locomotives in the United States Fleet

Railroad	# of Locomotives	% of U.S. Fleet
Union Pacific	7,200	35%
BNSF	5,300	25%
Others	8,300	40%
Total	20,800	100%

Source: Association of American Railroads - 2003.

California Railroads



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California Passenger Trains

California Class III Railroads

Source: California Department of Transportation - California State Rail Plan - 2002

Survey of Intrastate Locomotive Operators

- Worked with industry to develop the survey.
- Mailed in May 2004 and placed on ARB website.
- Mailed to 50 intrastate locomotive operators.
- Received responses by July 2004 from nearly all of the intrastate locomotive operators.

Interstate Locomotive Fueling Patterns

- Have the ability to enter and exit California without fueling
  - Refuel at about 1,000 miles; Max. range up to 1,500 miles.
- Most interstate locomotive diesel fuel used in California can be purchased from out-of-state.
  - Lower quality, high sulfur (up to 5,000 ppmw).
  - Sulfur level will lower to 500 ppmw in 2007.

Intrastate Locomotive Fueling Patterns

- California fuel distribution system limits fuel choices for locomotives to:
  - CARB diesel
  - U.S. EPA on-road

Class I Freight Railroads' Intrastate Operations

- Two Class I freight railroads:
  - Union Pacific Railroad.
  - Burlington Northern and Santa Fe (BNSF).
- Nearly 400 intrastate locomotives.
  - Average about 2,400 horsepower and 15 years old.
- Average about 60,000 gallons of diesel per locomotive annually.

Intrastate Passenger Train Operations

- Seven operations within the state.
- 113 locomotives.
  - Average 3,100 horsepower and about 10 years old.
- Average about 180,000 gallons of diesel per locomotive annually.

Intrastate Class III Railroads

- Twenty Class III railroads.
- About 120 intrastate locomotives.
  - Average 1,600 horsepower.
  - Average about 40 years old.
- Average about 28,000 gallons of diesel per locomotive per year.

Locomotive Diesel Fuel Dispensed and Consumed in California in 2003

(millions of gallons)

Type of Locomotive	CARB	Federal	Total
Intrastate			
Class I	6	17	23
Passenger	20	1	21
Class III	2	1	3
Subtotal	***28***	***19***	***47***
Interstate			
Class I	12	89	101
Total	***40***	***108***	***148***

South Coast MOU Locomotive Fleet Average Program

- July 2, 1998 - CARB/UP/BNSF sign MOU.
  - Applicable to the South Coast AQMD.
- Accelerate introduction of newer, lower emitting locomotives (U.S. EPA Tier II locomotives).
  - 2010 and later average no > 5.5 g/bkhpr of NOx.
- Approved by U.S. EPA in the 1994 SIP as Measure M-14.
- CARB diesel fuel emission reductions could be part of the South Coast MOU emission credits.

CALIFORNIA HARBORCRAFT

Survey of California Harborcraft Operators

- 2002 Commercial Harborcraft Survey.
- Survey report completed in March 2004.
- Collected data on 900 vessels and 1,800 engines (fuel consumption, age, activity, etc.)
- Data from 1999-2001.
- Using information to improve the ARB harborcraft emissions inventory.

Oceangoing Ship Fueling Patterns

- Operate 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.

Harborcraft Fueling Patterns

- Typically operate within coastal waters.
- Fueled primarily at California locations.
- Typically use higher quality fuels.

California Harborcraft

- About 4,000 statewide.
- Commercial fishing boats represent about 65% of total.
- Ferries consume about 35% of diesel annually.

- Primary engines range up to 3,600 hp.
- Auxiliary engines range up to 400 hp.
- Average about 30 years old.

Harborcraft Diesel Fuel Consumed in California

(millions of gallons)

Harborcraft Type	CARB	Federal	Total
Commercial	37	45	82
Recreational	0	5	5
Total	**37**	**50**	**87**

STAFF PROPOSAL

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 is the Alternative Emission Control Plan?

- A compliance option for intrastate locomotive operators.
- Designed to provide operational flexibility and lower costs.
- Must provide equivalent or greater emission reductions.
- Must ensure adequate environmental protections.

Which harborcraft and locomotives are included?

- Harborcraft:
  - Based on vessel size and displacement.
  - Does not include oceangoing vessels.
- Intrastate Diesel-Electric Locomotives:
  - Operate 90% or more within California.
  - Does not include some Tier II locomotives subject to the South Coast MOU.

Staff Modifications to the Proposal

- Exemption for military harborcraft
  - National security.
  - Tactical requirements.

IMPACTS

Harborcraft and Intrastate Locomotives Statewide Diesel Fuel Consumption

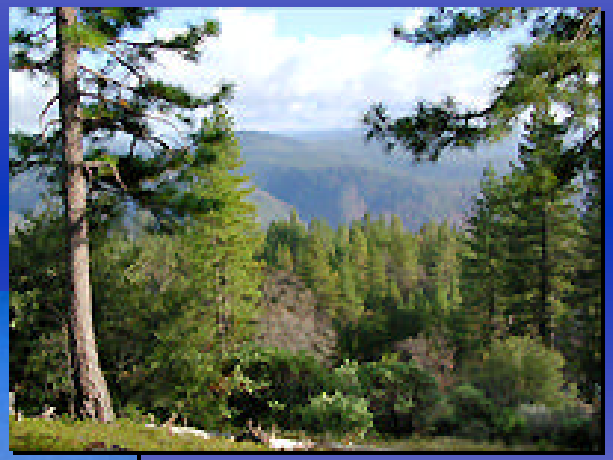
(millions of gallons)

Source Type	Consumption
Intrastate Locomotives	47
Harborcraft	87
Total	**134**

- Represents about 4.5% of statewide diesel fuel consumption.

Anticipated CARB Diesel Fuel Emission Benefits

- NOx - 6%
- SOx - 95%
- PM - 14%



Anticipated 2007 Statewide Emission Reductions

(tons per day)

Source Type	NOx	SOx	PM
Intrastate Locomotives	1	0.3	0.2
Harborcraft	1	1.5	0.4
Total	**2**	**1.8**	**0.6**

- Includes 0.4 tpd of NOx emission reductions in the SCAQMD under SIP Measure Marine-1.

Impacts on Risk and Mortality

- Lower directly and indirectly emitted PM.
  - Significantly reduce exposure to diesel PM.
- Reduced mortality
  - 71 avoided deaths by 2010.
  - 233 avoided deaths by 2020.
- Local risk exposure reductions.

Impact on California Diesel Fuel Supply and Demand

- Proposed regulations should not affect ability of California refiners to supply sufficient quantities of diesel fuel to the California market.

Estimated Costs in 2007

- Incremental Costs: 3 cents per gallon.
  - Transition from U.S. EPA to CARB diesel fuel.
- 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.
  - Within range of other ARB control measures.

Economic Impacts

- No significant impact expected on California economy.
- No capital costs to refiners.
- Estimate minor impacts on owners/operators.
- Expect no significant effects on small businesses.

FUTURE STRATEGIES FOR LOCOMOTIVES AND MARINE VESSELS

Future Strategies for Locomotives

- New programs to reduce locomotive emissions
  - Reduce idle time.
  - Early introduction of clean locomotives.
  - Evaluate potential aftertreatment retrofit control technologies.
- Comprehensive Statewide Railyard Strategy
- Encourage U.S. EPA to pursue aftertreatment based NOx and PM standards

Future Strategies for Marine Vessels

- For Oceangoing ships
  - Evaluating auxiliary engine rule.
  - Conducting shore-based power feasibility study.
  - Conducting ship retrofit demonstration project.
  - Establish Sulfur Emission Control Areas (SECAs).
  - Participating in west coast collaborative effort.

Future Strategies for Marine Vessels, Con't

- Develop a Harborcraft ATCM
- Develop a Comprehensive Statewide Strategy for Ports
  - Cargo Handling Equipment ATCM.

Staff's Recommendation

- Recommend Board approve the proposed amendments, as modified, to the California diesel fuel regulations.