

**AIRBORNE TOXIC CONTROL MEASURE  
FOR IN-USE DIESEL-FUELED  
TRANSPORT REFRIGERATION UNITS (TRU) AND TRU  
GENERATOR SETS AND FACILITIES WHERE TRUs OPERATE**



**December 11, 2003**



**California Environmental Protection Agency**

**Air Resources Board**

## **Overview**

- Background
- Emissions
- Health Impacts
- Proposed ATCM
- Environmental and Economic Impacts
- Future Activities

## Background

- Diesel PM Identified as Toxic Air Contaminant in 1998
  - ◆ 70% of Ambient Air Toxics Risk from Diesel PM
- Diesel Risk Reduction Plan adopted in 2000
  - ◆ Included provision for transport refrigeration units
- Prioritization of Toxic Air Contaminants Under Children's Environmental Health Protection Act (SB 25)
  - ◆ OEHHA included diesel PM in 2001 list
  - ◆ No "safe" exposure threshold

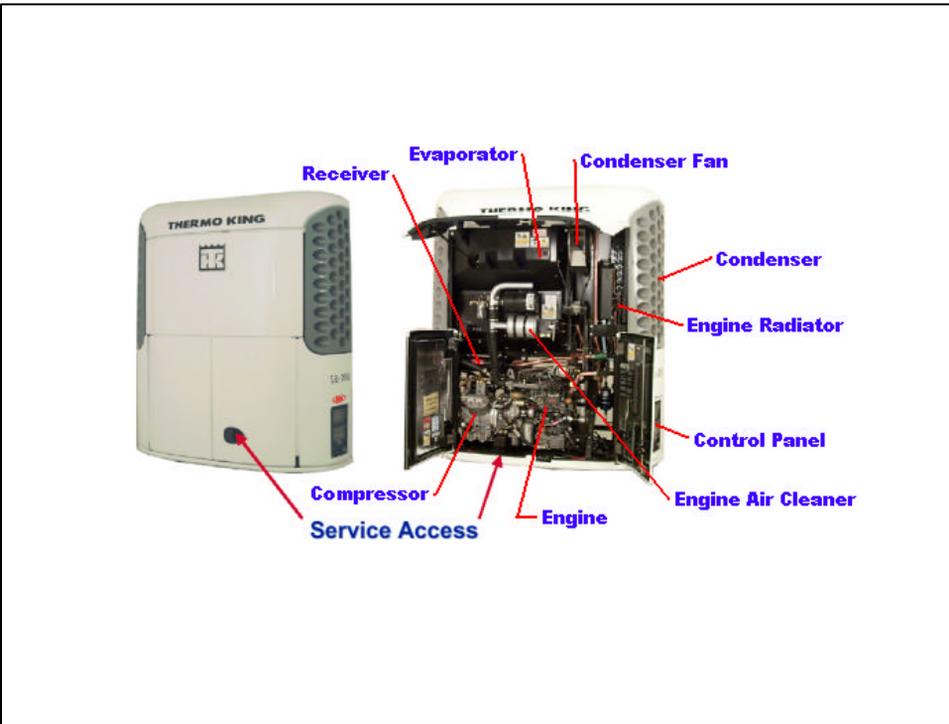
## Outreach Process

- Two public consultation meeting
- Five Workshops
- Nine TRU Workgroup meetings
- Four TRU Electrification Workgroup meetings
- 25 facility tours
- Numerous personal contacts

## What is a TRU?

- Refrigeration system powered by a diesel engine to control the environment of temperature-sensitive products
  - ◆ Trailer vans
  - ◆ Truck vans
  - ◆ Railcars
  - ◆ Shipping containers









# Emissions



## Why Control TRU Emissions?

- Emissions per unit are high
- Result in high risk near facilities
- Contribute to overall exposure to diesel PM
- Large reductions are possible
- Cost-effective

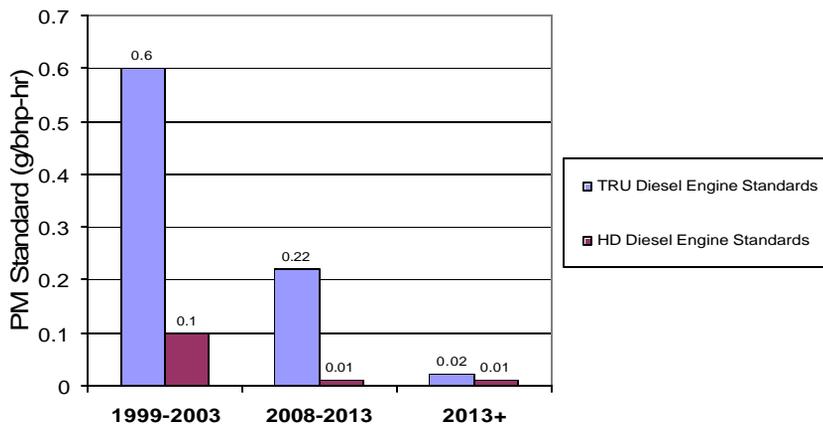
## TRUs and TRU Generator Sets Operating in California in 2000

Category	Number Operating in California in 2000
Truck TRUs (<25 HP)	6,600
Trailer/Rail/Gen Set TRUs (>=25 HP)	33,800
<b>Total</b>	<b>40,400</b>

# TRU Emissions In California

Emissions (tons per day)			
	2000	2010	2020
PM	2.0	2.5	3.1
NOx	19.6	24.9	38.2

**Comparison of Diesel Engine PM Standards:  
TRUs versus Onroad Trucks**



## Why Do TRUs Located at Facilities Concern Us?

- TRUs congregate at facilities in large numbers
- Many facilities are located near populated areas
- Significant potential risk for extra cancer cases near facilities





## Significant Potential Cancer Risk Near Distribution Facilities

- 100 TRUs with engines operating 2.5 hrs/day (1500 hours per week):
  - ◆ >100/million out to 600 meters
  - ◆ <10/million beyond 2800 meters (1.8 mi)
- 20 TRUs with engines operating 2.5 hrs/day (300 hours per week):
  - ◆ >100/million out to 300 meters
  - ◆ <10/million beyond 1100 meters

## What Options are there for Reducing TRU Diesel Emissions?



## TRU Emission Control Options

- Use a new engine meeting U.S. EPA's proposed Tier 4 standards
- Use a new TRU with Tier 4 engine
- Retrofit with diesel emission controls
  - ◆ PuriNox™ plus oxidation catalyst
  - ◆ Alternative fuel: Dual-fuel pilot-injection (diesel pilot with propane fumigation)
  - ◆ Actively regenerated diesel particulate filter

## TRU Emission Control Options (cont'd)

- Alternative Technologies
  - ◆ Electrification - plug in while at facility
  - ◆ Cryogenic temperature control system
  - ◆ Alternative fuels (CNG, LNG, LPG)
  - ◆ Alternative diesel fuels (biodiesel and synthetic diesel fuel)

A topographic map of California, showing the state's outline and internal terrain features. The map uses a color gradient from green (low elevation) to brown and tan (high elevation) to represent the state's diverse geography, including the Sierra Nevada mountains and the Central Valley.

## Proposed Airborne Toxic Control Measure

## Key Elements

- Progressively tighter in-use performance standards for PM
- Compliance options achieve PM emission reductions by
  - ◆ Accelerated engine replacement
  - ◆ Accelerated TRU replacement
  - ◆ Retrofit of existing engines
  - ◆ Use of alternative technologies

## Other Elements

- Recordkeeping & reporting
  - ◆ Owner/Operator
  - ◆ Facility
- Registration and I.D. numbering system
- Affects all TRUs and TRU gen sets operating in California
  - ◆ Includes out-of-state units
- Early compliance incentive
- Technology reviews in 2007 and 2009

## Accelerated Replacement or Retrofit and Useful Life

- The goal of staff's proposal is to accelerate the retrofit or replacement of in-use engines
- 7-year retrofit/replacement schedule designed to accelerate replacements and emission reductions

## In-use Performance Standards

- Greater than or equal to 25 horsepower
  - ◆ Low-Emission PM Performance Standards (2008)
  - ◆ Ultra-Low-Emission PM Performance Standards (2010)
  - ◆ Three options for complying with each PM standard
    - ◆ Engine certification
      - Low-emission PM standard: 0.22 g/bhp-hr
      - Ultra-low-emission PM standard: 0.02 g/bhp-hr
    - ◆ Install a verified diesel emission control device
      - Low-emission PM standard: Level 2 retrofit (50%)
      - Ultra-low-emission PM standard: Level 3 retrofit (85%)
    - ◆ Use an “Alternative Technology”

## Compliance Schedule

Model Year of Engine	Compliance Date for Low Emission Standard	Compliance Date for Ultra-Low Emission Standard
2001 or older	2008	2015
2002	2009	2016
2003	N/A	2010
Future years	N/A	Model year + 7

## Early Compliance Provisions

- Encourages early compliance with low-emission performance standards
  - ◆ Applies to 2002 and earlier model years
  - ◆ Each year of early compliance extends the compliance date for ultra-low emission standard by one year
  - ◆ Maximum of 3 years extension

## Recordkeeping & Reporting

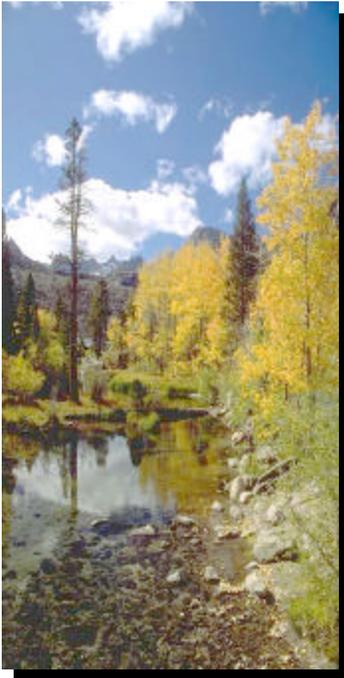
- Owner/Operator reporting (2009)
  - ◆ Initial Report
    - ◆ Information on the TRUs they operate in CA
  - ◆ Update reports as information changes
- Facility reporting (2005)
  - ◆ Large facilities (20 or more loading dock doors serving refrigerated areas)
  - ◆ One-time report

## Registration/I.D. Numbering

- California-based TRUs required to register and apply I.D. Number
- Out-of-state operators that operate in California – voluntary
- I.D. Numbers include coded compliance information
- Quicker inspections with I.D. Number

## Technology Reviews

- Two Technology Reviews to assure technology is available and cost-effective for broad range of TRU engines
  - ◆ Late 2007
    - ◆ One year prior to low-emission standard (2008)
  - ◆ Late 2009
    - ◆ One year prior to ultra-low-emission standard (2010)



## Environmental and Economic Impacts

### Air Quality Benefits Include Reduced Diesel PM and Criteria Pollutant Emissions

- **PM Reductions**
  - **65% by 2010**
  - **92% by 2020**
- **NOx - 10% to 50% reduction**
- **ROG - about 30% reduction**



## The Proposed ATCM Will Result in Health Benefits for All Californians

- Avoid an estimated 211 premature deaths
- Potential cancer risk to all receptors reduced

## Costs

- **Capital Costs**
  - ◆ Retrofit: \$2,000 to \$2,300/unit
  - ◆ New Engine: \$4,000 to \$5,000/unit
  - ◆ New TRU unit: \$10,000 to \$20,000/unit
- **Total Costs**
  - ◆ \$5 to \$15 million per year
  - ◆ \$90 to \$160 million total over 13 years

# Cost Effectiveness



## ■ Cost-Effectiveness

- ◆ Considering only diesel PM reductions
- ◆ 383,000 to 592,000 pounds per year of diesel PM
- ◆ \$10 to \$20 per pound of diesel PM reduced



## Future Activities

## Future Activities

- Seek Title I, Section 209 (e) waiver from U.S. EPA
- Work with affected businesses to develop outreach and training materials
- Develop TRU identification number issuing systems and database
- Follow retrofit system development work and conduct technology reviews in 2007 and 2009
- Work with U.S. EPA to develop long-term PM emission standards for <25 hp TRU engines
- Monitor TRU engine compliance and evaluate control measure effectiveness
- Conduct analysis of the large facility data

**THE END**