

**PUBLIC CONSULTATION MEETING TO DISCUSS REGULATORY
APPROACHES TO REDUCE EMISSIONS FROM STATIONARY DIESEL-
FUELED ENGINES**

**Presentation of the Methods and Key Assumptions for
Estimating the Costs for In-Use Stationary Engines**



August 26, 2003



California Environmental Protection Agency

Air Resources Board

*Presentation of the Methods and Key Assumptions for Estimating the
Costs for In-Use Stationary Engines*

Analysis Overview

- Approach
- Estimated costs associated with controls
- Key assumptions
- Preliminary results



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Approach

- **Identified representative sample**
 - ◆ Used reported data from ARB Surveys
- **Determined level of control to comply with ATCM**
- **Adjusted engine population to reflect emission inventory population**

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Approach continued

- **Determined capital and operation and maintenance costs per engine**
- **Annualized cost based on expected life of control equipment**
- **Determined annual emission reductions with each compliance option**
- **Calculated cost effectiveness**
 - ◆ \$/lb PM reduced

Estimated Capital Costs

- **Retrofit control technologies and total retrofit costs**
 - ◆ Operational limits = \$0
 - ◆ DOCs ~ \$10/hp
 - ◆ Active and Passive DPFs ~ \$38/hp
 - ◆ New Engine ~ \$93/hp
 - ◆ New Engine + DPF ~ \$131/hp
- **Emissions Testing**
 - ◆ \$5,000 per test
- **Permit Costs**
 - ◆ \$430 (\$124 for operational change)

Estimated Operation and Maintenance Costs

- **Diesel Emission Control Systems Maintenance**
 - ◆ DPF - Anticipated cleaning once every 300 - 2000 hours at cost of \$600 (average ~ \$ 6 yr)
- **Emergency Standby Engines**
 - ◆ Yearly reporting - \$100 per engine (1 hour at \$100/hour labor costs)
 - ◆ Reduced fuel consumption when reducing annual hours of M&T
- **Fuel**
 - ◆ Incremental cost LSF in 2005 - \$0.15/gal
 - ◆ Cost CARB Diesel - \$1.74/gal

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Key Assumptions: New Prime

- New engines install DPF between 2005-2011
- .01 g/bhp-hr engines available “off-the-shelf” in 2011
- DPFs effective for 8400 hours or 25 years
- Additional costs for low sulfur fuel in 2005
- 5 new prime engines each year
- Permit cost not attributed to ATCM
- No emissions testing
 - ◆ Certified Engines
 - ◆ Assume a verified DPF

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Key Assumptions: New Emergency Standby/Agricultural

- 0.15g/bhp-hr engines available “off-the-shelf”
- Approximately 200 new engines each year
 - ◆ (100 ag and 100 non-ag)
- No capital costs attributable to the ATCM
- 20 engine distributors of agricultural engines incur annual reporting costs of \$100
- Yearly reporting of \$100 per engine (non-ag)

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Key Assumptions: In-Use Prime

- 80% engines install DPF (1062 engines)
- 20% engines initially install DOC and replace with Tier IV engine in 2011 (265 engines)
 - ◆ Assume 10% of engines were at end of useful life and cost of new engine not attributed to ATCM
- DPF/DOC effective 8400 hours or 25 years
 - ◆ Expected life 10 years on average (4 to 25 year range)
- Assume 30% of engine will need emission source tests to demonstrate compliance (not yet incorporated in estimated cost)
- Permits - \$430

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Key Assumptions: In-Use Emergency Standby

- M&T hours capped at 30 hours per year
- 90% of pre 1988 engines operating over 20 hours per year for M&T will reduce hours to 20 hours or less
 - ◆ \$1.74 gallon fuel savings for reduce hours
 - ◆ Lower permit costs for hour change (\$124)
 - ◆ Existing hourly M&T
 - ◆ <=20 hours = 72%
 - ◆ 20-30 hours = 18%
 - ◆ 30+ hours = 10%
- 5% of engines install hour meters
- DOCs effective for 8400 hours or 25 years
 - ◆ DOCs installed on 1% of engines (170)
 - ◆ Higher permit costs (\$430)
- Reporting and record-keeping - \$100 per engine per year

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Key Assumptions: Cost Analysis

- Capital costs amortized over the lifetime of the DECS
- 7% annual discount rate
- ARB Survey sample representative of total engine population
- Cost presented in 2002 dollars

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Estimated Annual Average Costs for In-Use Compliance Options

		Capital	O&M	Annual Costs
Emergency Standby	Operational	\$124	\$100	\$111
	DOC	\$4,900	\$106	\$574
Prime	DPF	\$22,900	\$106	\$5,500
	DOC & Replace 2011	\$6,600 + \$49,600	\$106	\$1,700 + \$4,800

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Preliminary Estimates of Total Cost

	Capital	Lifetime O&M	Total Lifetime Costs
Emergency Standby	\$3,100,000	\$-6,450,000	-\$3,320,000
Prime	\$39,900,000	\$2,200,000	\$42,100,000

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Preliminary Estimates of Annual Costs, Emission Reductions, and Cost Effectiveness

	Annualized Cost	Annual Emission Reductions lb	Cost Effectiveness \$/lb diesel PM Reduced
Emergency Standby	\$10,200	23,000	\$0.4
Prime	\$6,830,000	406,000	\$17
Combined	\$6,940,000	429,000	\$16

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