

Diesel Particulate Matter Control Measure

On-Road Heavy-Duty Residential and Commercial Solid Waste Collection Vehicles

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California Environmental Protection Agency



Air Resources Board

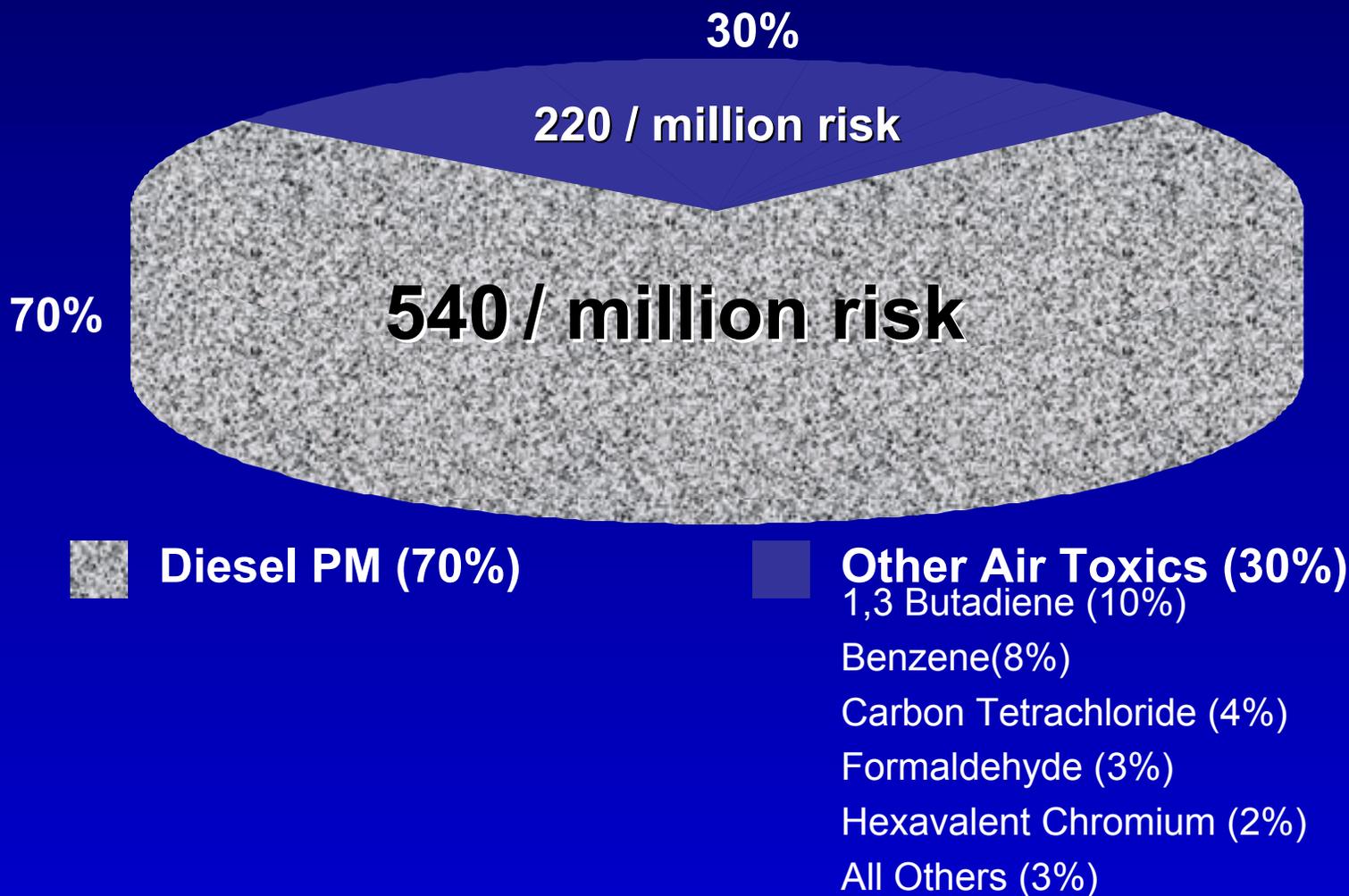
Today's Presentation

- ***Background***
- **Proposed Regulation**
 - ◆ **Regulation Summary**
 - ◆ **Benefits & Cost-Effectiveness**
 - ◆ **Technical Feasibility**
- **Remaining Issues**
- **Recommendations**

Diesel PM is a Toxic Air Contaminant

- **Increased Risk of Lung Cancer**
- **May Aggravate Chronic Respiratory Symptoms and Asthma**
- **Irritates Eyes, Nose, and Lungs**
- **Contributes to Premature Death in Those with Heart and Lung Diseases**

70% of Air Toxic Risk is From Diesels



Diesel PM Risk Reduction Plan

- **Reduce Emissions from New Engines**
- **Require Retrofit of Existing Engines**
- **Ensure In-use Emission Performance**
- **Provide Low Sulfur Fuel (<15 ppmw) to Enable Aftertreatment Technology**

Proposed Regulation Benefits

2020

- Prevents 80 Premature Deaths At \$900,000 per Premature Death Prevented
- Reduces Cancer Risk
- Eliminates 2,260,000 Pounds PM
- Eliminates 30,600 Tons NOx + HC
- Cost per Household <\$1 per Year

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Scope & Applicability

■ Solid Waste Collection Vehicle Owners

- ◆ Municipalities
- ◆ Private Companies

■ Solid Waste Collection Vehicles

- ◆ 1960 - 2006 Model Year Diesel Engines
- ◆ Greater than 14,000 lbs. GVWR
- ◆ Residential and Commercial Solid Waste

Owner Compliance Requirements

- Choose the Best Available Control Technology (BACT) for Each Vehicle
- Follow the Implementation Schedule
- Keep Records

BACT Options

■ Repower with Diesel Engine

- ◆ 0.01 g/bhp-hr PM Standard, or
- ◆ 0.10 g/bhp-hr PM Standard with Retrofit

■ Replace

- ◆ Alternative-Fueled, or
- ◆ Pilot Ignition Engine

■ Retrofit

- ◆ Verified to Highest Diesel PM Emission Reduction

Retrofit

- Required to Be Verified
- Highest Applicable Level, Agreed to by Manufacturer
- Commercially Available

Current Retrofit Verifications

As of September 2003

■ Level 3 (85% PM Reduction)

- ◆ Johnson Matthey CRT DPF (MY 1994 and newer)
- ◆ Engelhard DPX DPF (MY 1994 and newer)
- ◆ Clean Air Partners DPF (MY 1994 and newer for specified bi-fuel engines)
- ◆ Cleaire Longview DPF + Lean NOx (25% Reduction) (MY 1994 and newer for specified Cummins and Navistar engines)

■ Level 1 (25% PM Reduction)

- ◆ Donaldson DOC Spiracle (MY 1994 and newer)
- ◆ Donaldson DOC Spiracle (MY 1991 and newer)
- ◆ Donaldson DOC Spiracle + USLD (MY 1991 and newer)

Implementation Schedule

Engine Model Years Group	Percentage of Active Fleet	Implementation Dates Dec. 31st
1960 - 1987	25	2007
	50	2008
	75	2009
	100	2010
1988 - 1993	10	2004
	25	2005
1994 - 2002	50	2006
	100	2007
2003 - 2006	50	2009
	100	2010

1960 – 1987 Engines

Engine Model Years Group	Percentage of Active Fleet	Implementation Dates Dec. 31st
1960-1987	25	2007
	50	2008
	75	2009
	100	2010

Available BACT Options

- Repower
- Replace
- Limited Retrofits Allowed

1988 – 1993 Engines

Engine Model Years Group	Percentage of Active Fleet	Implementation Dates Dec. 31st
1988 - 1993	10	2004
	25	2005
	50	2006
	100	2007

Available BACT Options

- Retrofit with DOC
- Repower
- Replace

1994 - 2002 Engines

Engine Model Years Group	Percentage of Active Fleet	Implementation Dates Dec. 31st
1994 - 2002	10	2004
	25	2005
	50	2006
	100	2007

Available BACT Options

- Retrofit with Particulate Filter or Oxidation Catalyst
- Repower
- Replace

2003 – 2006 Engines

Engine Model Years Group	Percentage of Active Fleet	Implementation Dates Dec. 31st
2003 - 2006	50 100	2009 2010

Available BACT Option

■ Retrofit

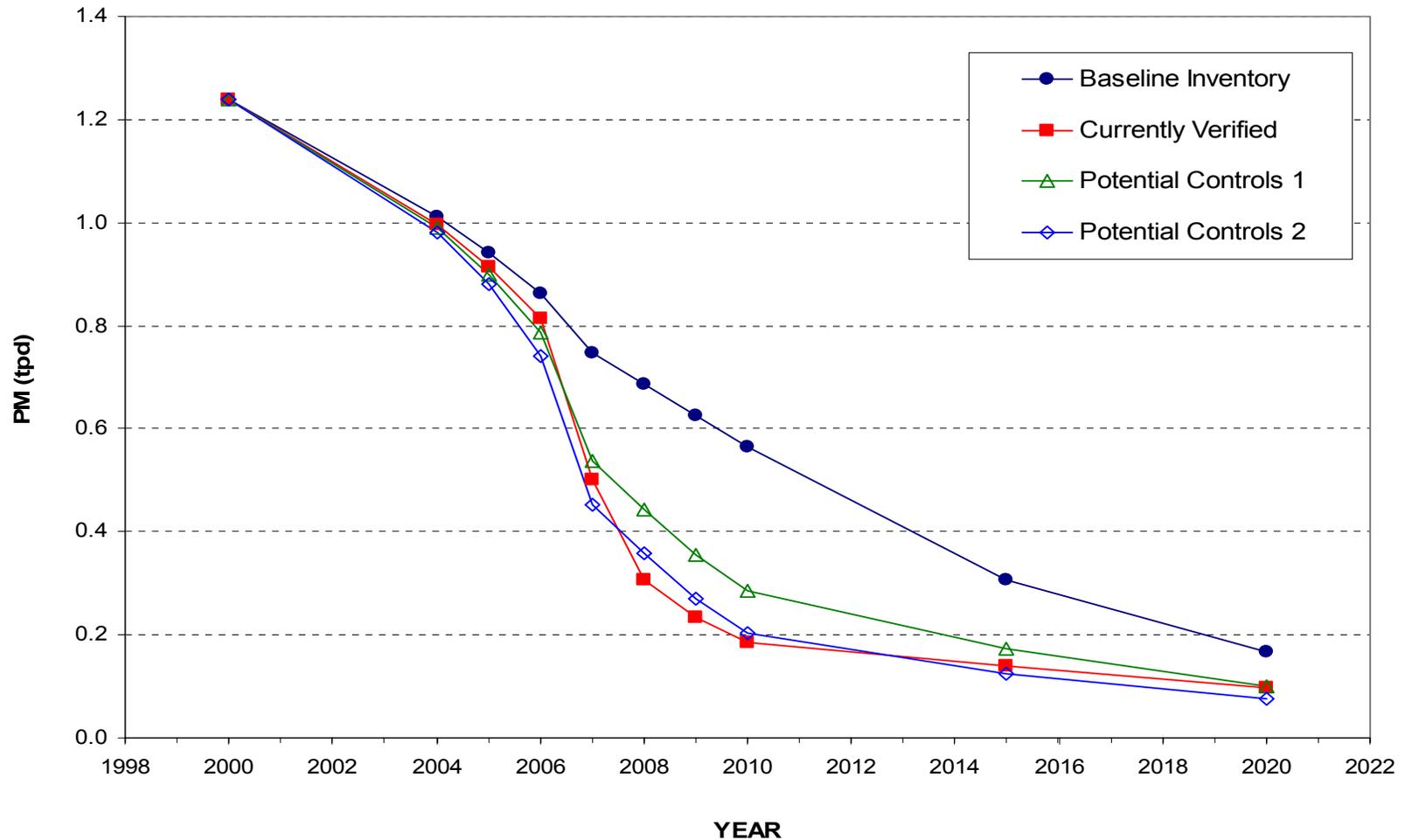
Compliance Extensions

- **Early Compliance**
- **No Verified Retrofit Products**
- **Fewer Than Four Vehicles**
 - ◆ **No Phase-In Required**

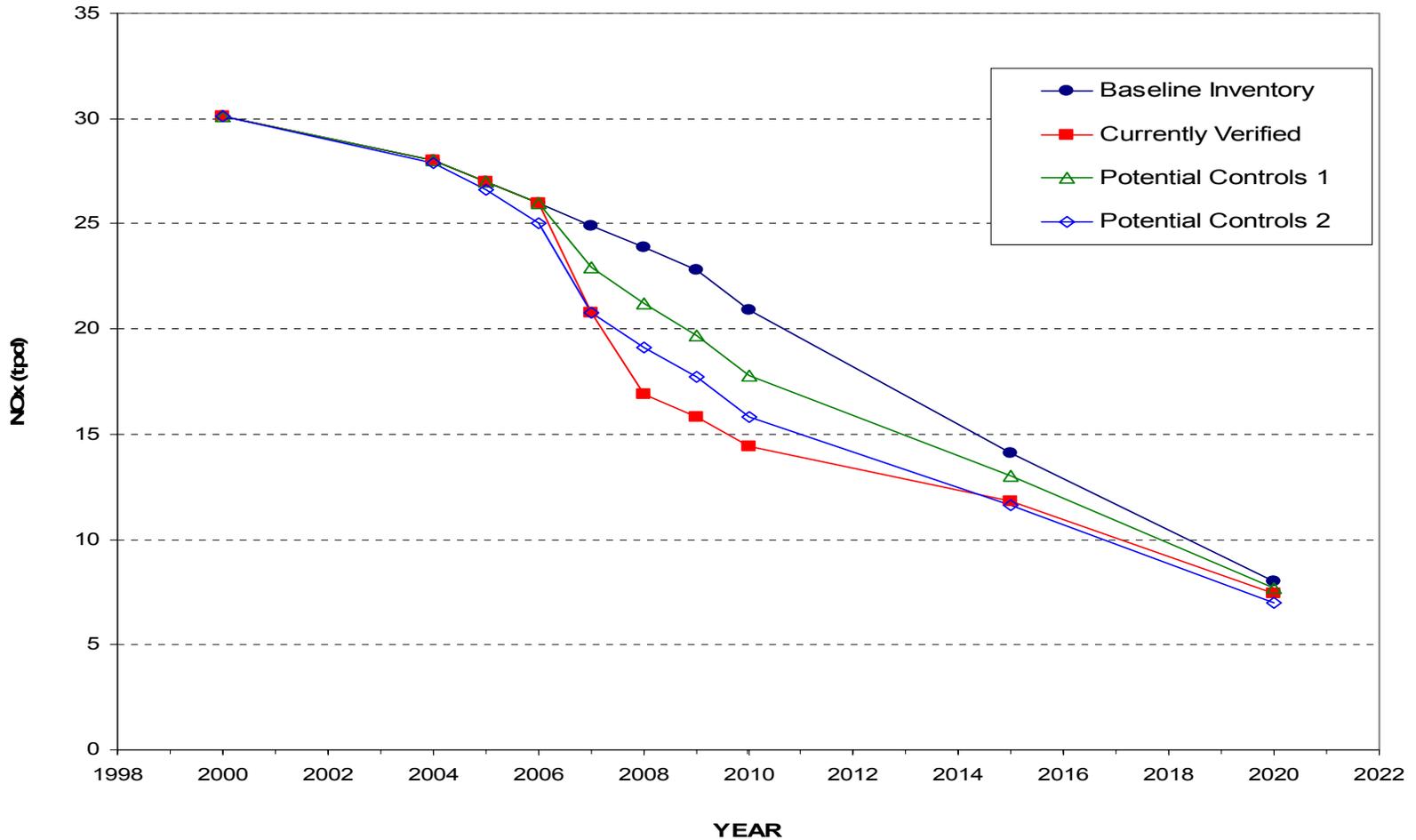
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Benefits: PM Reductions



Benefits: NOx Reductions



Premature Deaths Prevented

- 80 Premature Deaths Prevented by 2020
- \$900,000 per Premature Death Prevented
- U.S. EPA Value of \$4.2 to \$5.9 million

Cancer Risk Reduction

- **Maximum Case (Roadway to Landfill)**
 - ◆ 100 Vehicles/Day
 - ◆ 26.5 cases per million
- **Average Case (Neighborhood)**
 - ◆ Four Trucks/Week
 - ◆ 3.5 cases per million

Cost-Effectiveness

■ Total Cost

- ◆ \$63 million from 2004 - 2010
- ◆ \$154 million from 2004 - 2020

■ Cost-Effectiveness 2004 - 2020

- ◆ PM: \$32/lb
- ◆ NO_x + HC: \$1.79/lb

Cost Per Household

- **Total Cost per Household 2004-2020**

- ◆ \$12.00

- **Average Cost per Household per Year**

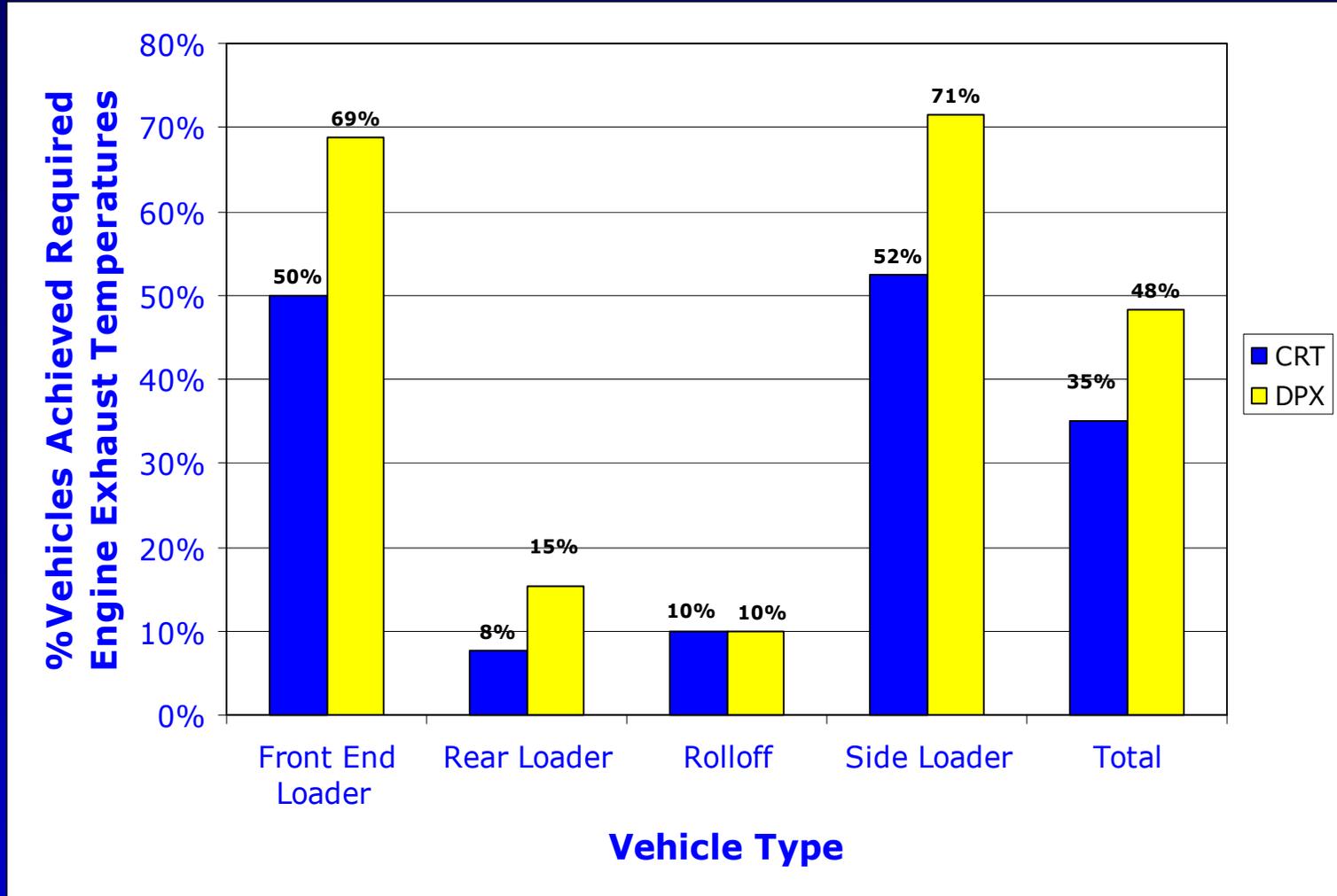
- ◆ \$0.70

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Exhaust Temperature Study Results

Passive DPF Applicable to 12 Percent SWCV



Fleet In-Use Experiences

■ City of Los Angeles

- ◆ Participant in BP-ARCO ECD Demonstration, 2000 - 2001
- ◆ ~360 DPFs Installed on Trash Trucks Now
- ◆ No Technical Problems
- ◆ Plan to install ~600 more, inc. Other Trucks

■ New York City

- ◆ ~30 DPFs Installed To Date
- ◆ Planning to Install ~100 DPFs on SWCVs

Fleet In-Use Experiences

■ Sweden

- ◆ Mandate for PM Emission Control in Specified Urban Areas
- ◆ MTC AB Surveyed In-Use Experience
- ◆ 46 Collection Vehicles Equipped with DPFs
 - ◆ 22 Retrofitted, 24 Original Equipment
- ◆ No Filter-Related Problems Reported

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Industry Issues: Cost Recovery

- **Affects Rate-Regulated Contractors**
- **ARB/IWMB Surveyed Municipalities**
 - ◆ 87% Contracts Allow for Rate Increase for Change in Law
 - ◆ Most Rate Changes Negotiated in Less than One Year
- **Staff Proposals**
 - ◆ Expect to Recover Cost
 - ◆ Biennial Board Progress Report

Municipality Issues: Responsibility

- **Joint Responsibility Burdensome**
 - ◆ Lack Enforcement Resources
 - ◆ No Control Over Vehicles
- **Staff Proposals**
 - ◆ Eliminate Compliance Responsibility
 - ◆ Reduce Reporting Requirement

Environmental Issues: Stringency

■ Clarification Issues

- ◆ Limit Exemptions
- ◆ Split 1988 - 2002 into Two Group
- ◆ Close Phase-In “Loopholes”

■ Acceleration of 1960 – 1987 Engine MY Group Four-Year Phase-In by Two Years

- ◆ Begin in 2005 versus 2007
- ◆ 18% Total Additional PM Reduced
- ◆ 14% Total Additional Cost

Environmental Issues: Stringency

■ Staff Proposals

- ◆ Limit Exemptions to One Year for the Oldest Vehicles Only
- ◆ Split 1988 - 2002 into Two Groups
- ◆ Close Phase-In “Loopholes”

Engine Manufacturer Issues: Legal Authority

- “New” versus “Non-New” Engines
- State Authority to Regulate “Non-New” Engines

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Summary Regulation Benefits

- 80 Premature Deaths Prevented
- Cost per Death Avoided 4 – 6 Fold
Less than U.S. EPA Benchmark
- Reduced Cancer Risk
- 49 - 67% PM Reduction by 2010
- 40 - 54% PM Reduction by 2020
- Cost per Household <\$1 per Year

Staff Recommendations

- Adopt New Sections 2020, 2021, 2021.1, and 2021.2 with 15-Day Changes
- Develop and Distribute Guidelines for Owners and Municipalities
- Conduct Outreach & Education