

# Controlling Emissions from Locomotive and Marine Diesels



Don Kopinski, U.S. EPA  
MSTRS Meeting  
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# Overview

- Brief update on the **nonroad diesel** final rule
- **Locomotive and marine** diesel initiative

# Nonroad Diesels: An Effective Collaboration

- Program success keyed to extensive outreach done by EPA with all stakeholder groups
  - State and local governments
  - Environmental and public health organizations
  - Engine and equipment manufacturers
  - Oil industry
  - Emissions control manufacturers
- Final rule has received widespread support

# Nonroad Diesel Program Overview

**2007: Nonroad, locomotive and marine diesel fuel sulfur limited to 500 ppm**

- Large immediate reductions in sulfate PM & SO<sub>x</sub> from existing fleet

**2008: Initial Tier 4 PM standards for engines <75 hp**

- Achieves early Tier 4 PM reductions

**2010: Sulfur limit drops to 15 ppm**

- Enables advanced-technology nonroad engine standards
- Applies to locomotive & marine fuel starting in 2012

**2011-15: Phase-in of advanced-technology Tier 4 standards**

- Reductions of >95% PM, ~90% NO<sub>x</sub>
- Also new test requirements to ensure control in use

# Distillate Fuels



home heating, etc 15%  
*not covered*



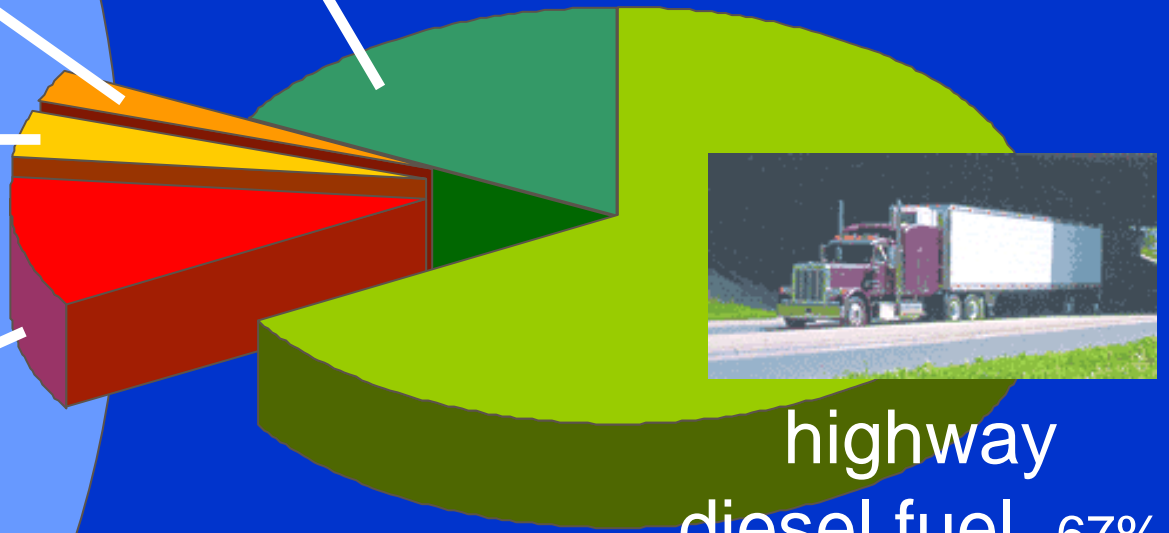
marine 2.6%



locomotive 3.2%



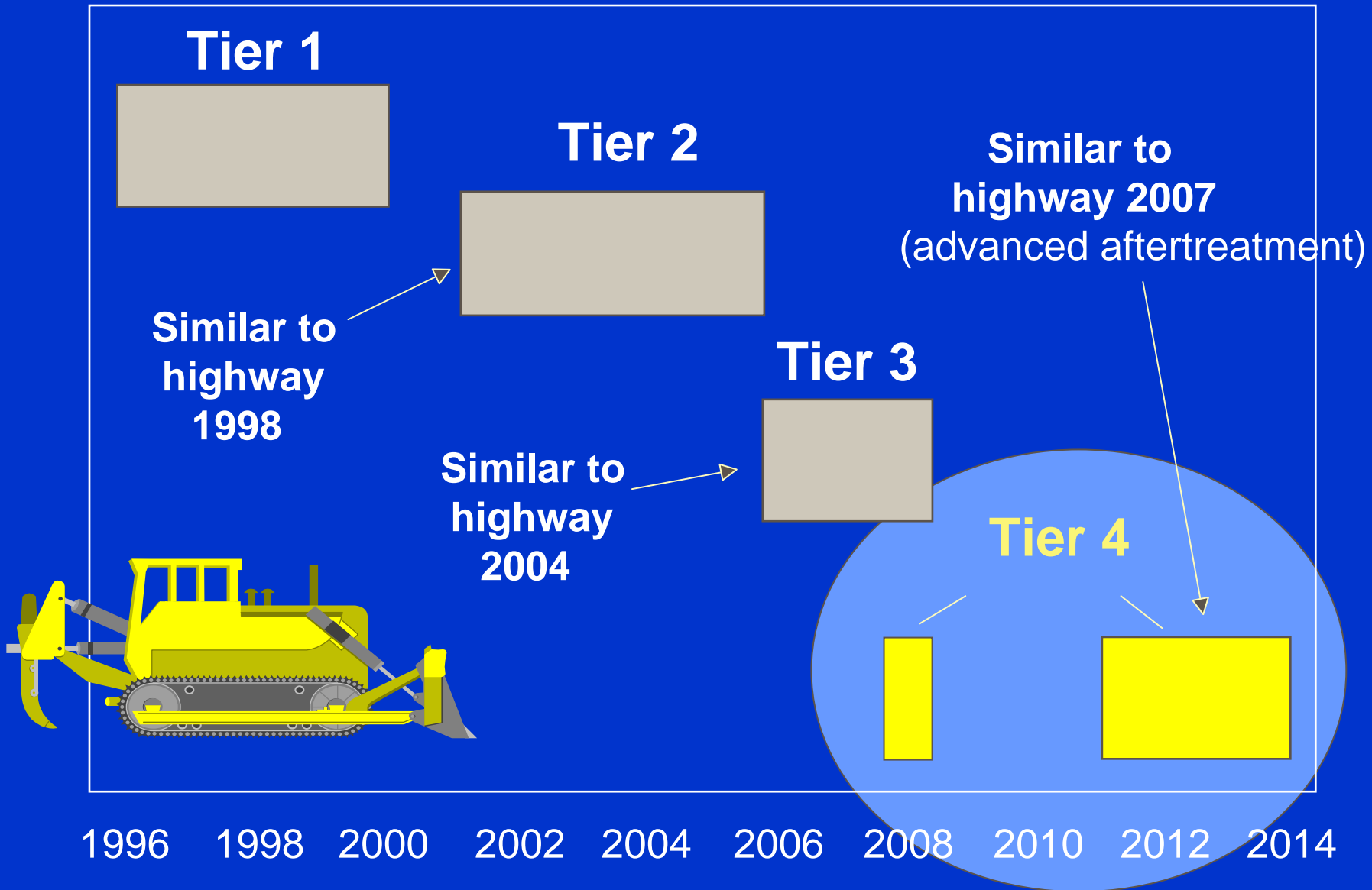
nonroad equipment  
12%



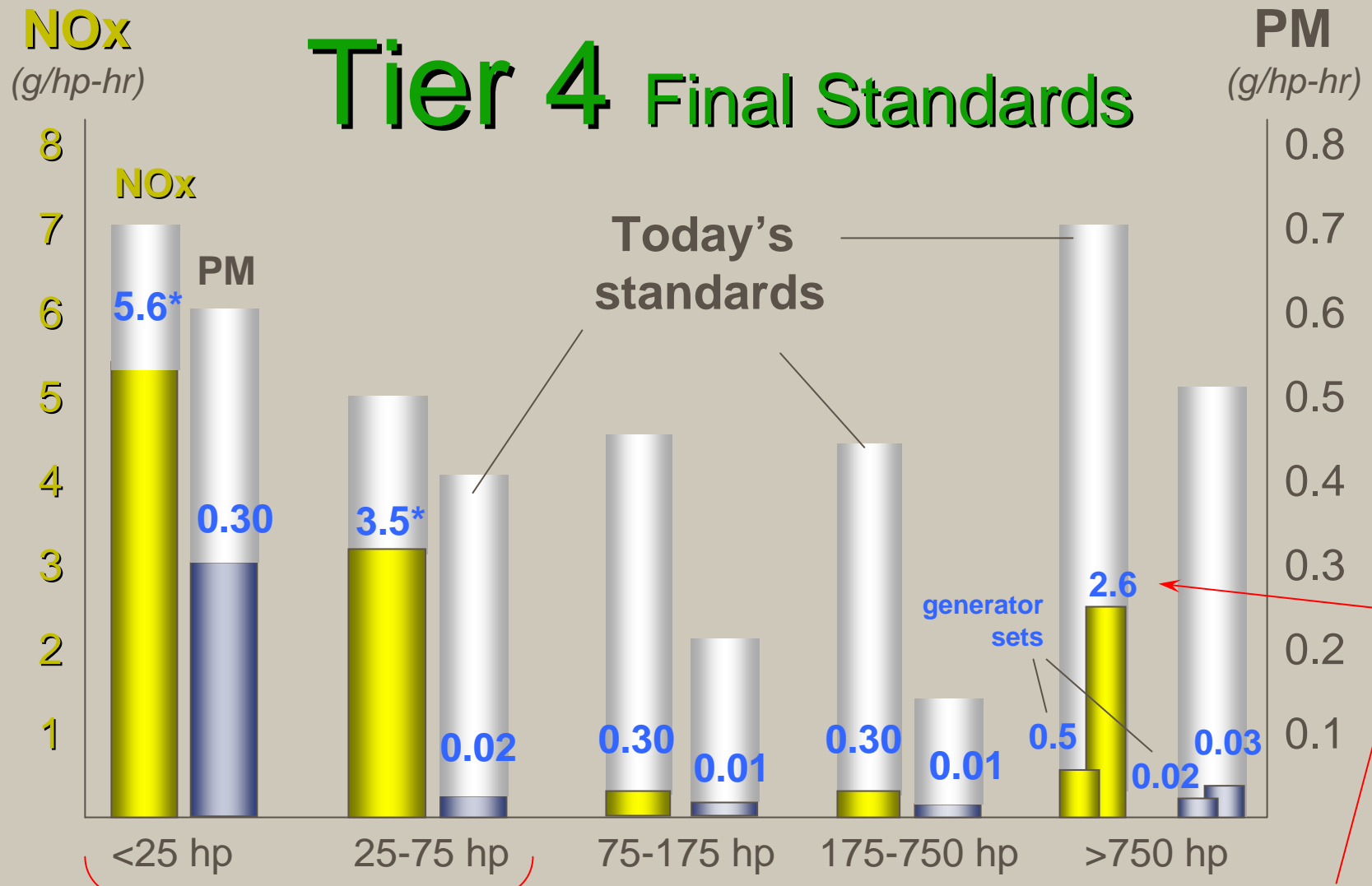
highway diesel fuel 67%  
*regulated since 1993*

*covered by the new program*

# Phase-In of Nonroad Diesel Engine Programs



# Tier 4 Final Standards

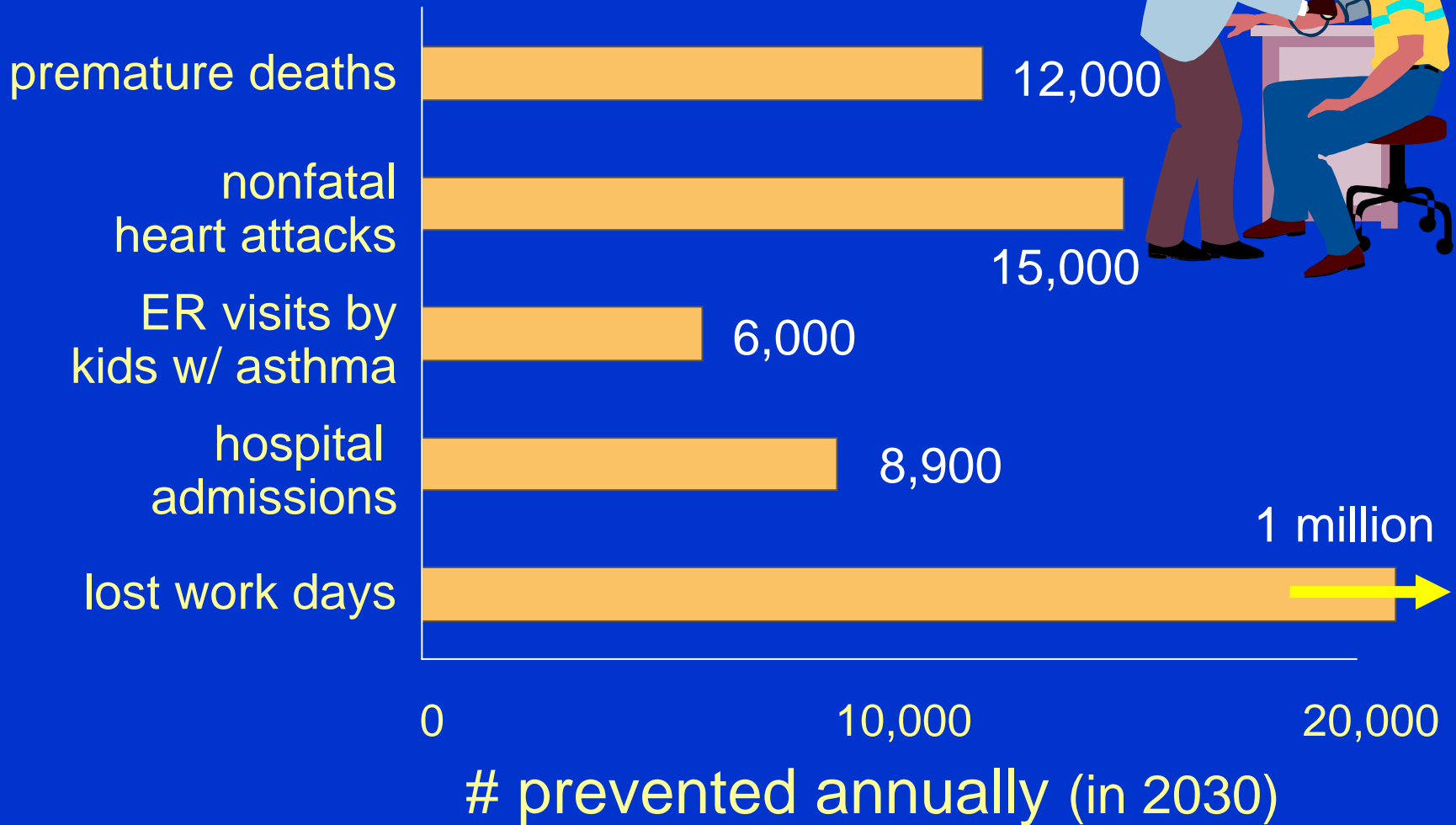


will be reassessed in 2007  
technology review

will be reassessed in  
future action

\* This is a combined NOx + hydrocarbon standard

# Nonroad Diesel Health Benefits



**\$80B annual benefits vs \$2B cost (in 2030)**



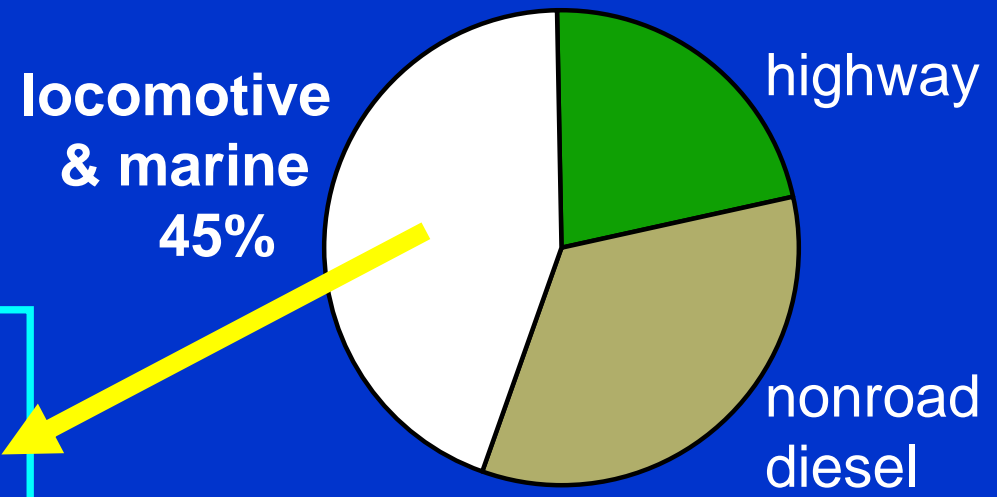
# Controlling Emissions From Locomotives and Marine Diesel Engines



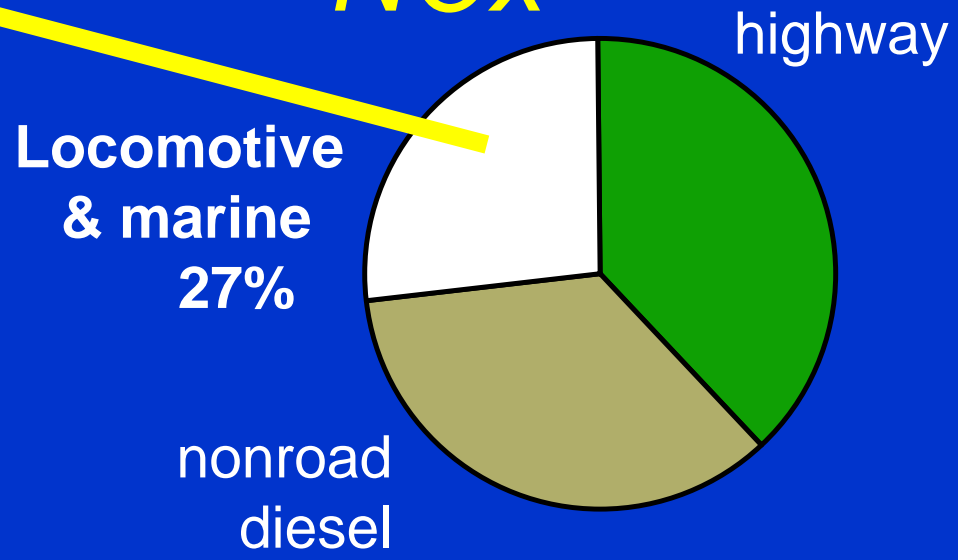
# Mobile Source Inventories in 2030

- Potential reductions on the order of:
  - ~25,000 tons/yr of PM
  - ~900,000 tons/yr of NOx
- Compares to nonroad rule reductions of:
  - ~129,000 tons/yr of PM
  - 738,000 tons/yr of NOx

## Diesel PM<sub>2.5</sub>



## NOx



# Locomotive Types



Line-Haul



Switch



Passenger

# Key Elements of Current Locomotive Program

(only applies to U.S. railroads)



**Tier 0**

(35%  
NOx ↓)

■ new-built in 2001

rebuilds of locomotives built in 1973-2001



**Tier 1**

(50% NOx ↓)

■ new-built in 2002-2004

**Tier 2**

(60/50% NOx/PM ↓)

■ new-built in 2005+



**Locomotive diesel fuel**

500 ppm S fuel

15 ppm

2000

2002

2004

2006

2008

2010

2012

2014

# Diesel Marine Applications

<50 hp



gen sets



sailboats

cruisers

## Recreational



yachts



## Category 1 Commercial



workboats



police boats



fishing vessels

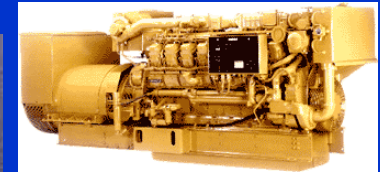
## Category 2



tugboats



ferries



auxiliary power  
for ocean-going  
vessels



Great Lakes freighters

## Category 3

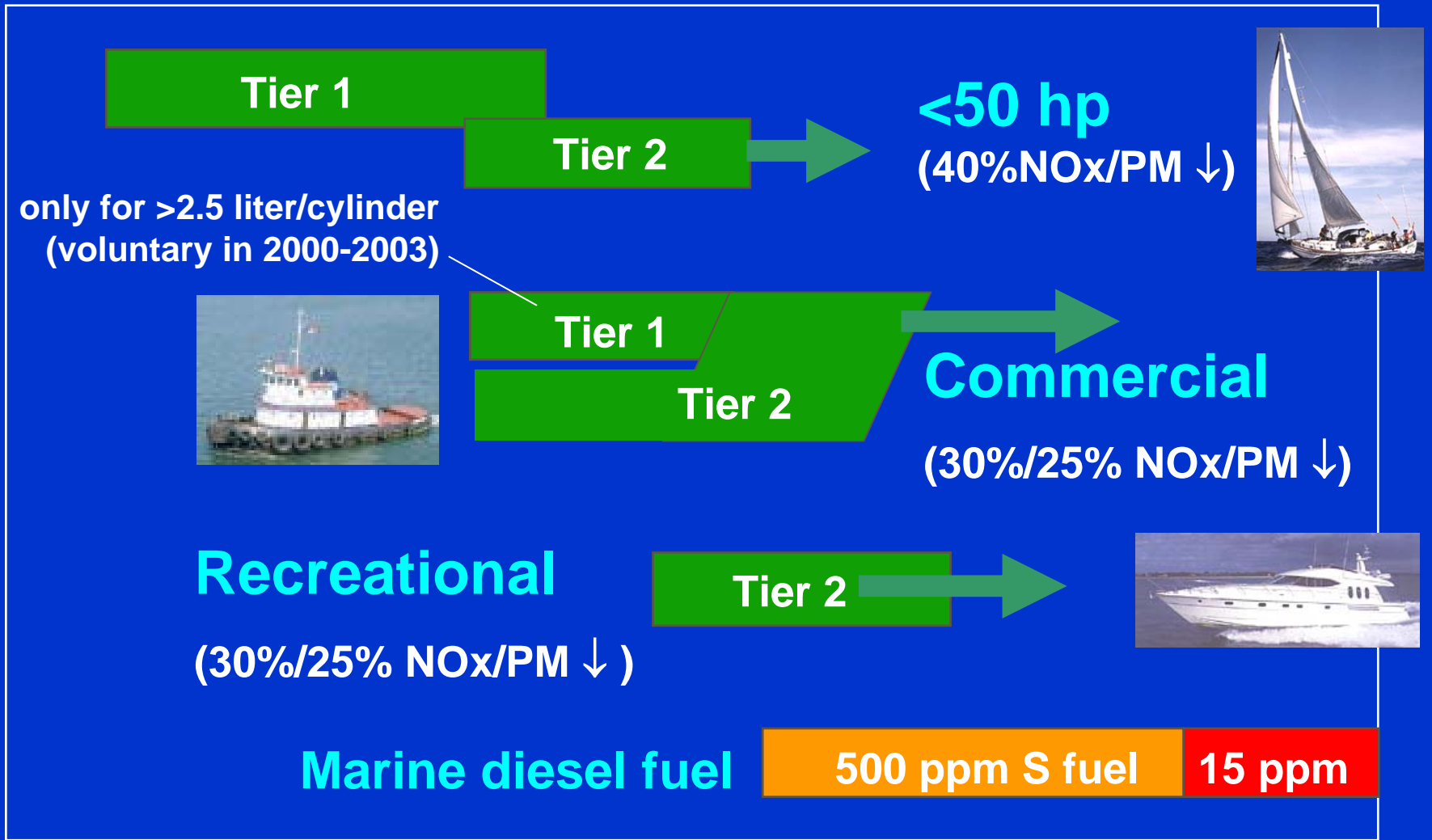


ocean-going ships

Covered in separate initiative



# Key Elements of Current Marine Diesel Program (only applies to U.S. vessels)

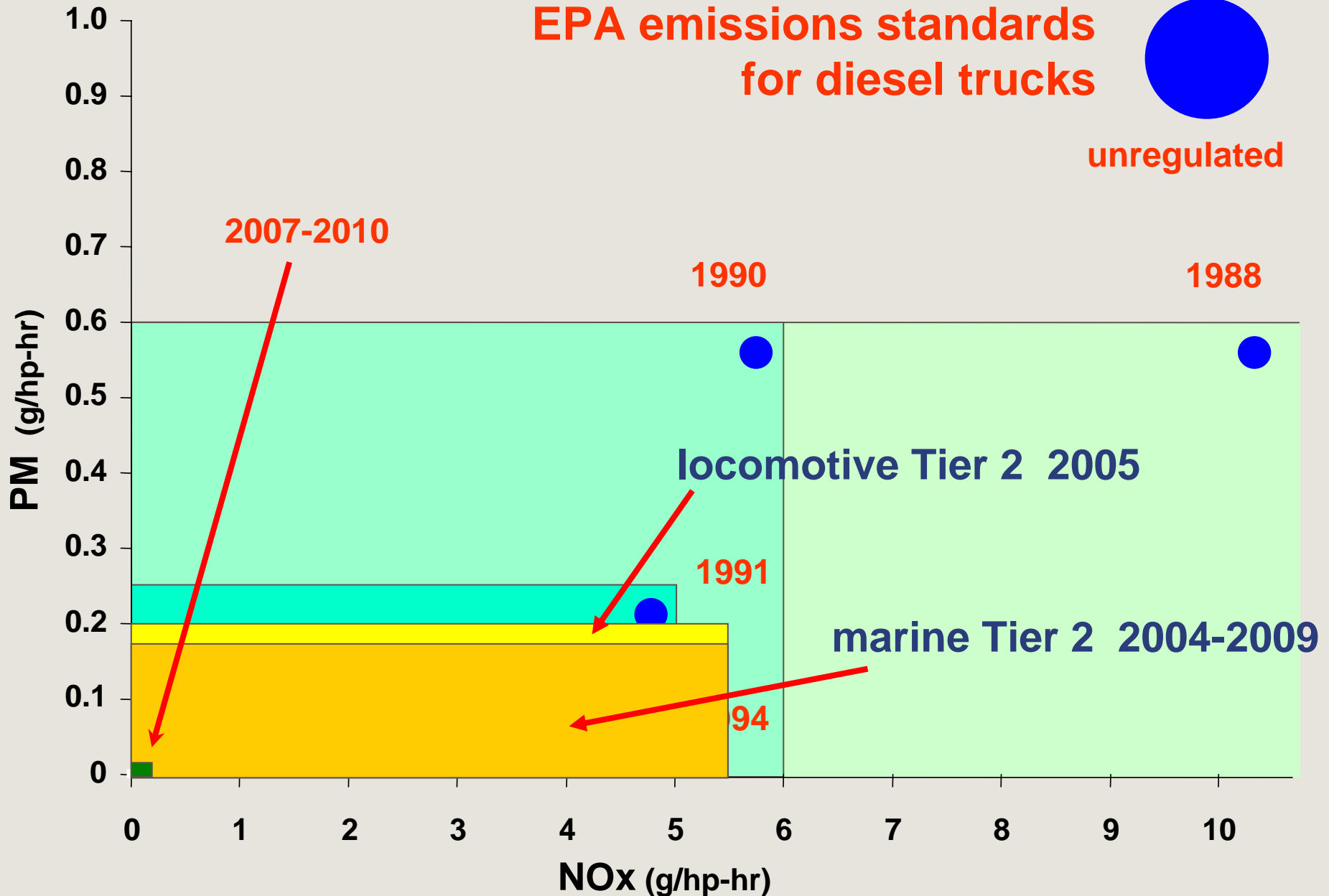


1998 2000 2002 2004 2006 2008 2010 2012 2014

# EPA emissions standards for diesel trucks



unregulated



# Comparison to Nonroad Diesel Rule

## What's Similar?

- Large potential benefits
- New technology solutions (NOx and PM traps)
- Range of engine sizes (<10 hp to 3000+ hp)
- Systems approach (need low-sulfur fuel)
- Need to coordinate with existing standards

## What's Different?

- High-concentration areas (harbors, railyards, ...)
- Packaging and operating environment issues (e.g.-- RR tunnels, water-jacketed exhaust, idling)
- Fuel already settled
- User community very different (RR's, ports, ...)
- No Tier 3 standards in place
- Major opportunity for engine rebuild/retrofit



# Locomotive & Marine Diesels Advance Notice

- Signed by Administrator Leavitt May 11
- Targets high-efficiency (sulfur-sensitive) aftertreatment
  - Patterned after highway and nonroad programs
  - L&M fuel will be at 500 ppm in 2007, 15 ppm in 2012
  - Large pool of 15 ppm fuel (highway/nonroad) earlier
- Considering new standards as early as 2011
  - With phase-in consistent with the nonroad diesel rule
  - Opportunity for comprehensive strategy (retrofits, ...)

# Locomotive & Marine Diesels

## Next Steps

- Comment period open for 60 days after ANPRM publication (likely next week)
- Starting to engage stakeholders in discussions
- NPRM planned for mid-2005
- FRM mid-2006

# EPA Contacts

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