

An Integrated Approach to Clean Fuels and Vehicles

Dennis Leaf
Office of Transportation and Air Quality
United States Environmental Protection Agency
Washington, DC USA

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- Why do we care about emissions about emissions from the transportation sector?
 - The relationship between power plant emissions and transportation sector emissions
- Emission standards
- Fuel Quality Standards
- Costs and benefits of an Integrated approach
- Additional government policies
 - Fuel taxes
 - Fuel efficiency standards
 - Tax incentives

Why do we care about vehicle emissions?

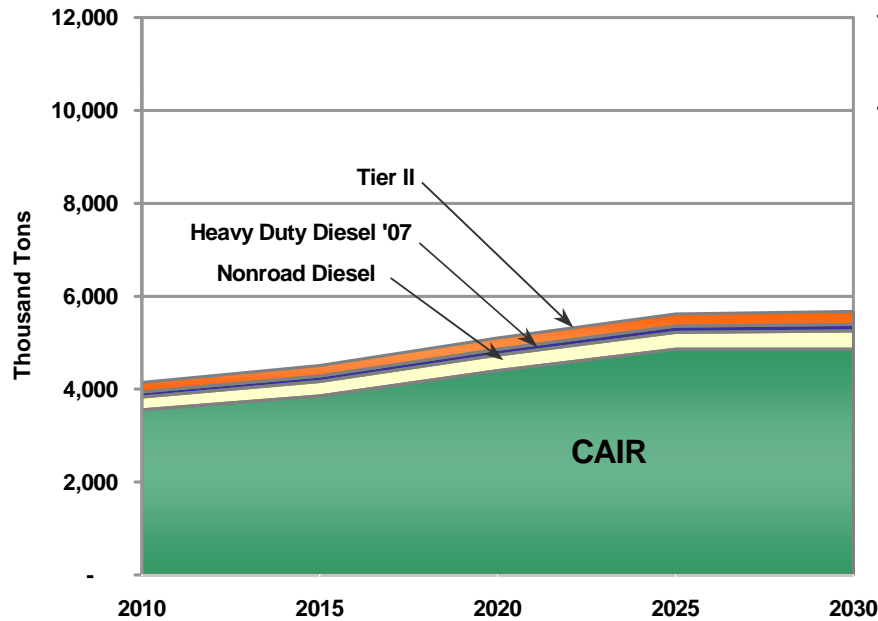
Both ozone and PM2.5 contribute to serious public health problems, including:

- » premature mortality,
 - » aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, loss work days, and restricted activity days),
 - » changes in lung function and increased respiratory symptoms, altered respiratory defense mechanisms, and chronic bronchitis.
 - » Diesel exhaust is of special public health concern, and since 2002 EPA has classified exposure to diesel exhaust as likely to be carcinogenic to humans by inhalation from environmental exposures*
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- » Transportation sector is a major source of greenhouse gas emissions.

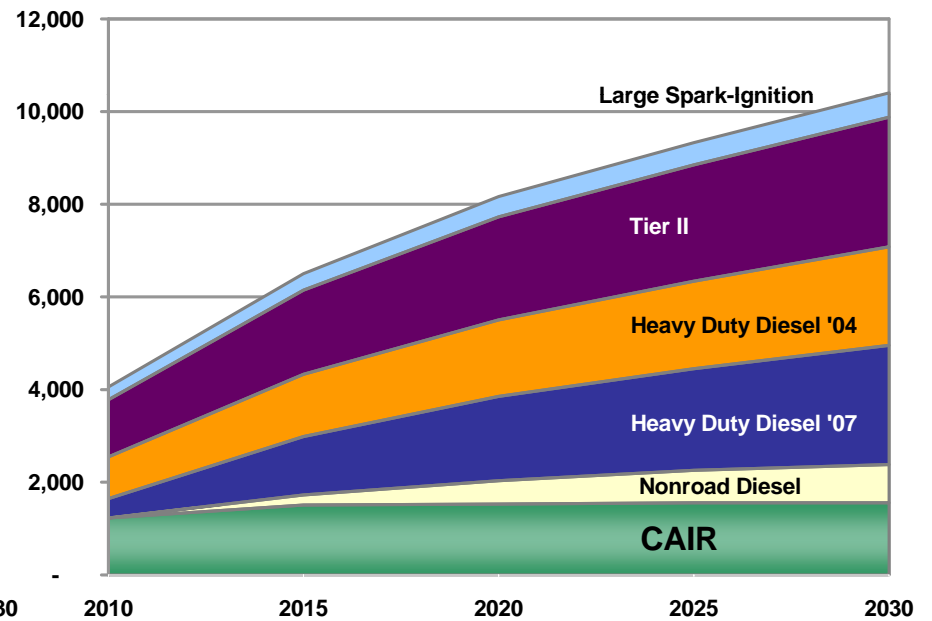
* Source: U.S. EPA (2002) Health Assessment Document for Diesel Engine Exhaust. EPA/600/890/057F. Office of Research and Development, Washington DC. This document is available electronically at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060>.

Projected Emission Reductions of SO₂ and NO_x with CAIR and Recent Mobile Source Rules

Annual SO₂ Reductions from Major EPA Rules



Annual NO_x Reductions from Major EPA Rules

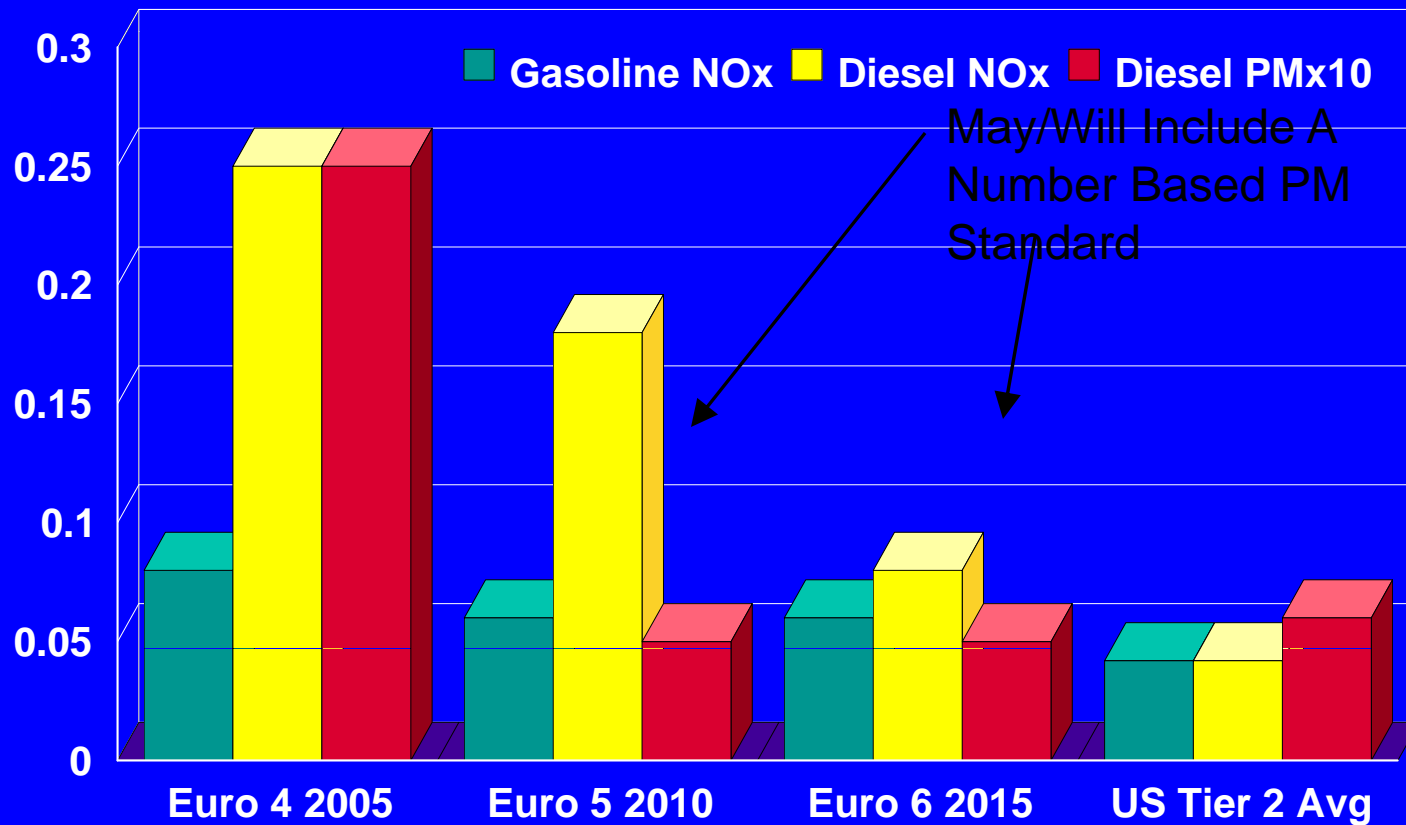


Note: Mobile source rules also result in reductions of VOCs and PM. The IAQR also lowers mercury emissions. Projections for CAIR are from the Integrated Planning Model. Projections for mobile source rules are from either the MOBILE, NONROAD, MOVES, Fuels, or CALINE models. The Title IV and NO_x SIP call programs have also led to significant power sector emissions reductions for SO₂ and NO_x.

EMISSION STANDARDS FOR CONVENTIONAL POLLUTANTS

EU and US Light Duty Gasoline and Diesel Vehicle Standards

Grams/Km



U.S. Comprehensive Regulatory Approach on Clean Fuels and Vehicles

- **Clean Cars and Passenger Trucks (1999 rulemaking)**
 - Tier 2 Standards
 - **Gasoline sulfur control (30 ppm avg / 80 ppm max, 2006 for most ref**
 - 77-95% lower light-duty vehicle standards (beginning in 2004)
 - Same standards for light trucks and cars; gasoline and diesel
- **Clean Heavy-Duty Trucks and Buses (2000 rulemaking)**
 - Heavy-Duty 2007 Standards
 - **Diesel sulfur control (15 ppm maximum, beginning in 2006)**
 - 90% lower heavy-duty gasoline & diesel vehicle standards
 - PM filter forcing standards, NOx catalyst based standards
- **Clean Nonroad Diesel Engines and Equipment (2004 rulemaking)**
 - Nonroad Tier 4 Standards
 - Diesel sulfur control (2 steps - 500 ppm in 2007, 15 ppm in 2010)
 - 90-95% lower emission standards - based on highway technology
- **Locomotive and Marine Diesel Standards (2008)**
 - Marine diesel sulfur control (15 ppm maximum) in 2012
 - 90% cut in PM emissions; 80% cut in NOx emissions

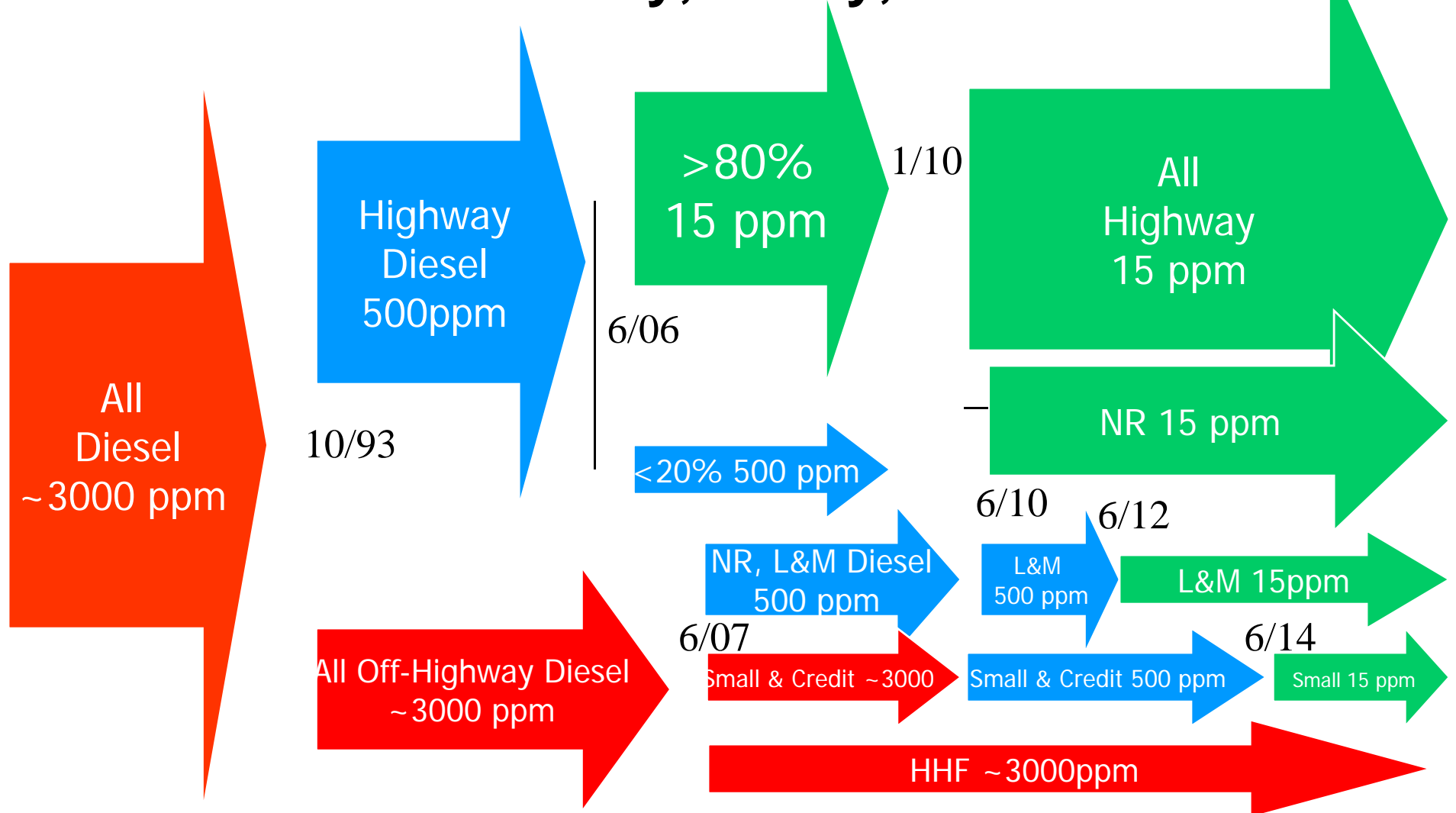


FUEL QUALITY

Reducing Sulfur Levels in Fuel is Critical

- Sulfur is a catalyst poison
- Removing sulfur, much like removing lead from gasoline, allows for maximum catalyst efficiency
- Reductions in fuel sulfur provide immediate PM reductions and is very cost-effective
- U.S. Low Sulfur Gasoline
 - New Tier 2 vehicles have near zero running emissions
 - Existing vehicles see significant improvement from the new fuel
- U.S. Ultra-Low Sulfur Diesel Fuel (Highway and Nonroad)
 - Enables PM filters that can eliminate 99% of carbonaceous PM
 - Enables advanced NOx catalysts giving 90+% reductions
 - Allows for retrofit of existing vehicles with highly efficient control devices (large programs throughout U.S., Japan, EU, and significant program in Beijing prior to 2008 Olympics)

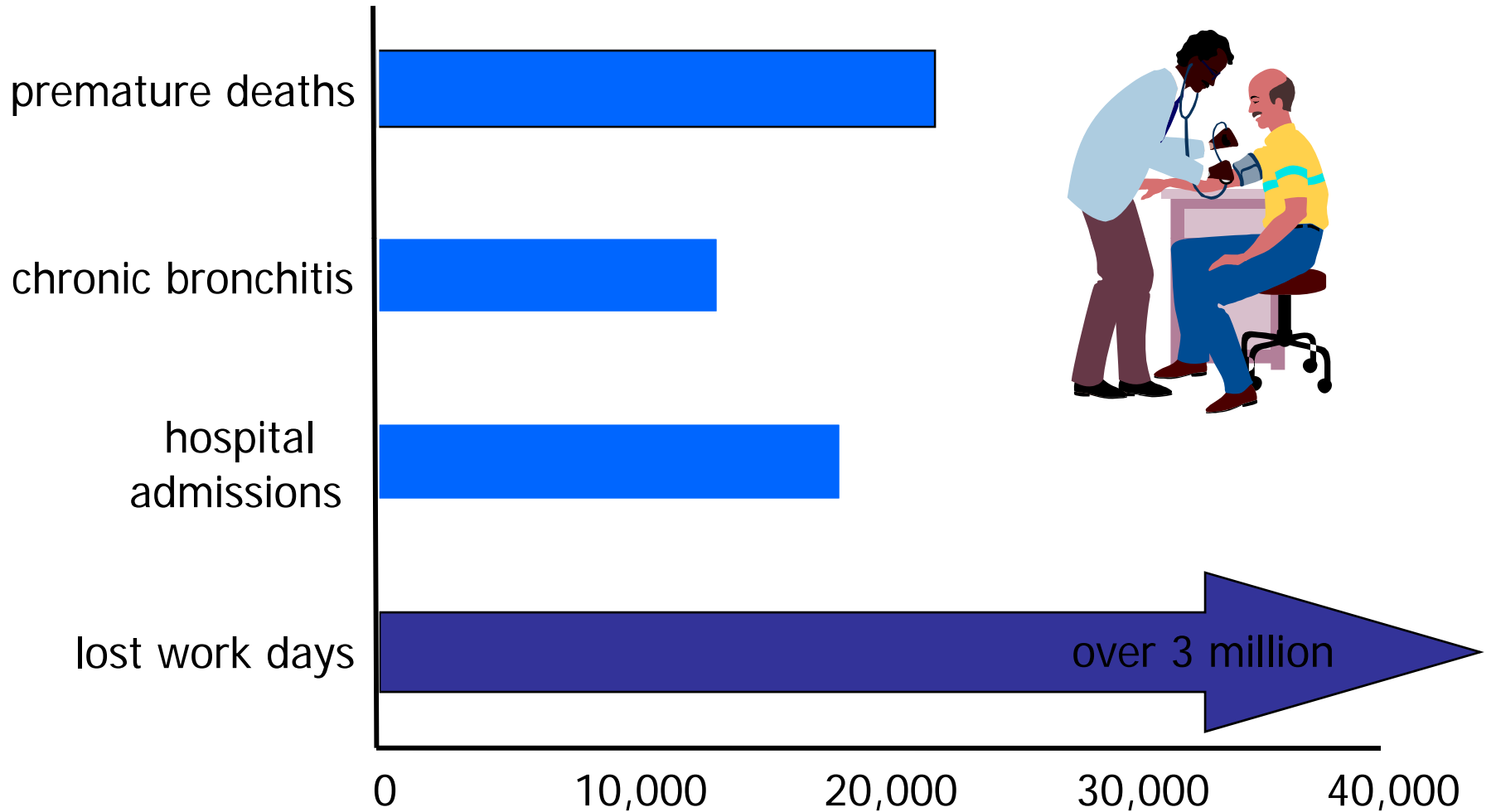
Diesel Fuel Yesterday, Today, and Tomorrow



* This figure is intended to illustrate the timeline for the final highway and nonroad diesel fuel sulfur control programs. It is not drawn to exact scale. Refer to 40 CFR Part 80 for specific program dates.

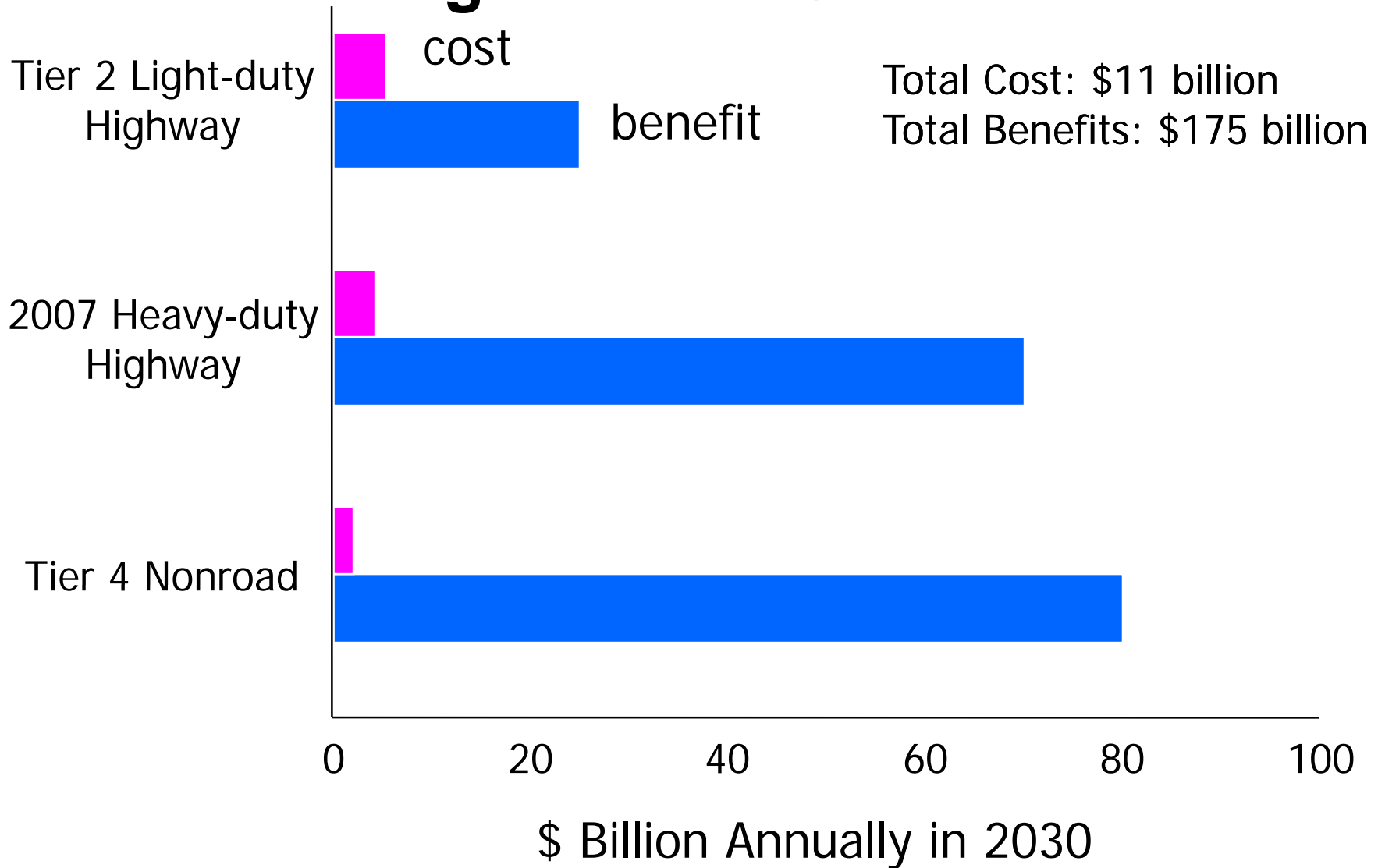
COSTS AND BENEFITS OF AN INTEGRATED APPROACH

Health Benefits Are Tremendous



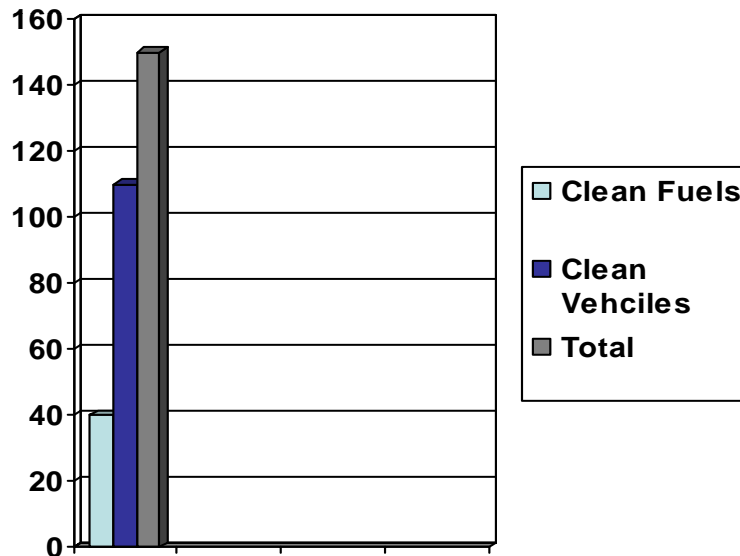
number prevented annually (in 2030)

EPA Programs Are Cost-Effective



What if...China adopted Euro V Vehicle and Fuel Standards?

Net benefits in
2030 (billion U.S.
dollars)



Benefits: costs = 20:1

Avoided Health Impacts 2008-2030

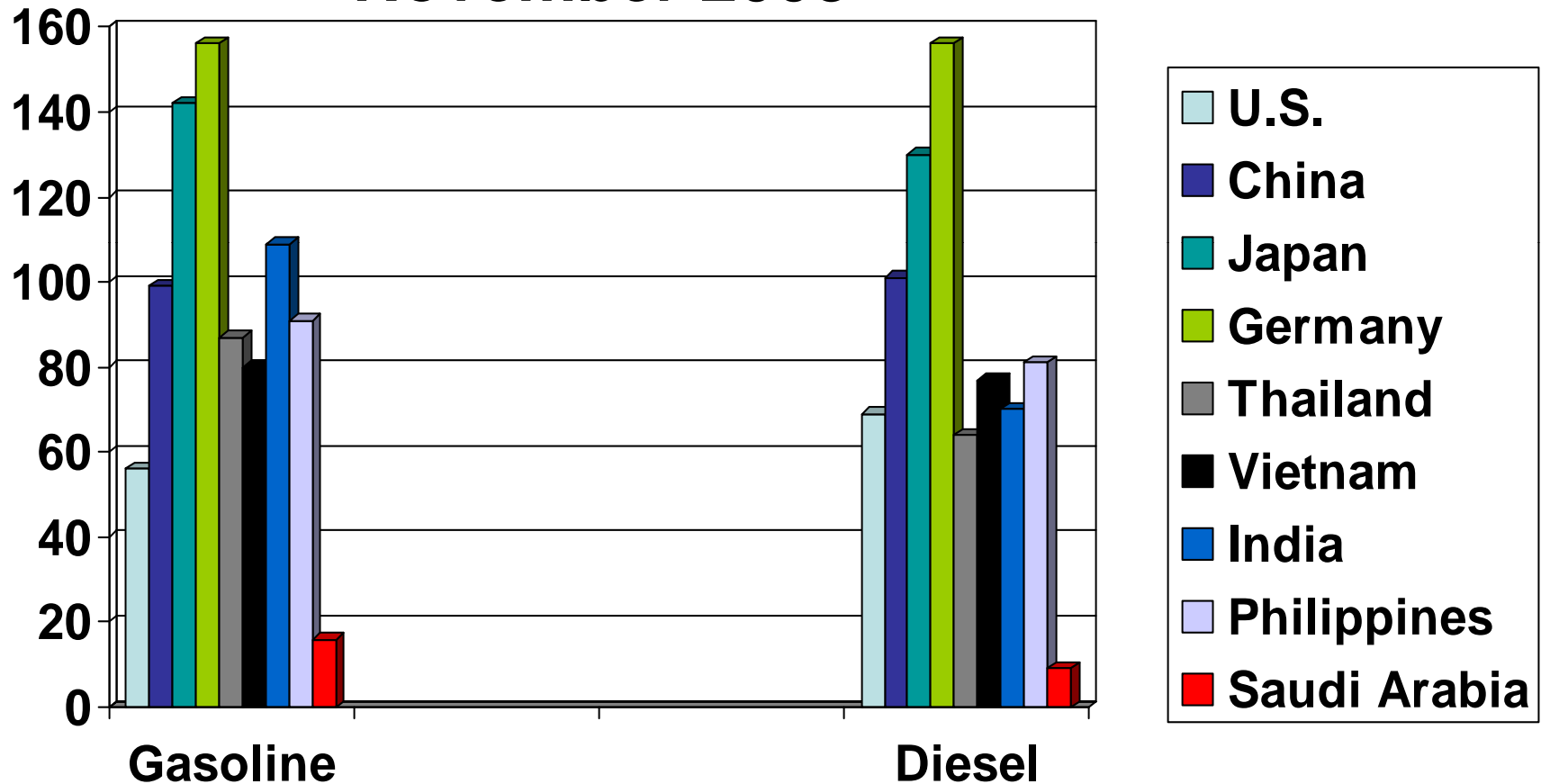
Health Outcome	Improved Vehicles	Improved Fuels	Total Avoided Incidences
Total Mortality	1.1 million	370,000	1.5 million
Chronic bronchitis	2.8 million	930,000	3.7 million
Acute Bronchitis	79 million	27 million	106 million
Asthma	10 million	3.5 million	14 million
Restricted Activity Days	740 million	250 million	990 million

Source: Costs and Benefits of Reduced Sulfur Fuels in China (International Council on Clean Transportation, 2006)

http://www.theicct.org/documents/Reduced_Sulfur_China_ES_Chinese_ICCT_2006.pdf

FUEL TAXES and PRICES

Fuel Prices (U.S. cents/liter) November 2008



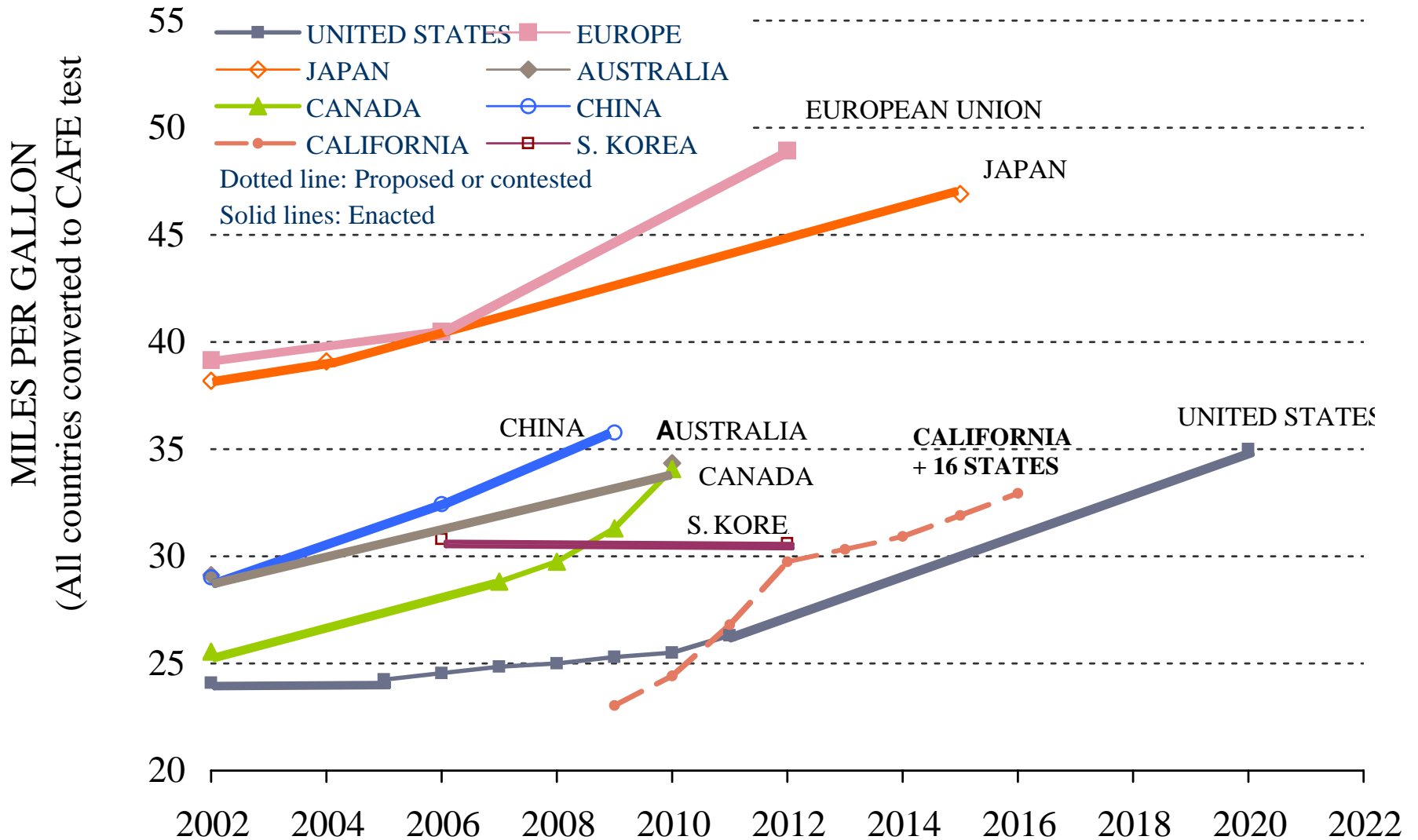
Data Source: GTZ "International Fuel Prices 2008"

FUEL ECONOMY AND GREENHOUSE GAS EMISSION STANDARDS

U.S. Fuel Economy Standards

- Established in 1970's in response to oil embargo, rising fuel prices
- Established separate set of standards for light-duty passenger vehicles and light-duty trucks
- Growing popularity of light-duty trucks has kept average down
- 2007 energy legislation established target of 35 miles per gallon by 2020 for passenger cars, a 40 percent increase over current 27.5 mpg standard (light trucks face increasing, but still lower standards)
- The EU has adopted CO₂ standards and California is pursuing GHG standards for automobiles; changing the metric from km/l or miles per gallon to CO₂ or CO₂ equivalent emission standard (to account for emissions from not only tail pipe but other sources, including air conditioning)

Standardized Comparison of International Fuel Economy and GHG Standard



TAX INCENTIVES

Tax Incentives: Examples

- Taxing smaller vehicles lower than larger vehicles
- Tax credits for purchasing cleaner and/or more fuel efficient vehicles
- Tax credits for purchasing alternative fuel vehicles
- Incentives to trade in older, dirtier, less efficient vehicles (“cash for clunkers”)

Observations

- There are serious health consequences from air pollution resulting from emissions from the transportation sector
- Some of these emissions also contribute to acid deposition
- Fuels and vehicles need to be looked at as one system to allow for maximum benefit
- Low Sulfur levels of 50 ppm or less in both gasoline and diesel allow for the deployment of advanced emission control devices
- Tax/pricing policies on fuels and vehicles can help stimulate demand for cleaner vehicles
- Greenhouse gas emission standards could have significant future impact on the development of transportation technologies

Thank you!

For more information:

www.epa.gov/otaq

leaf.dennis@epa.gov