EPA Mobile Source Rulemaking Update

Ozone Transport Committee Meeting

US EPA Office of Transportation and Air Quality

November *2003*

Presentation Overview

- Tier 2 Gasoline Rulemaking
- 2007 Highway Heavy-duty Diesel Program
- EPA Nonroad Diesel Proposal
- Locomotive and Marine Diesel Rulemakings
- Recreational Vehicle Rulemaking
- Highway Motorcycle Final Rulemaking

Tier 2/Gasoline Sulfur Program

- Tier 2 vehicle and gasoline program is now beginning
- This historic new program will result in cars, SUVs, pickups, and vans that are 77-95% cleaner than today's cars and trucks
- At the same time, the program will result in gasoline with 90% less sulfur, phasing in beginning in 2004
- For the first time:
  - All passenger cars and trucks will now meet the same average emission standard
  - Vehicles and fuel treated as a system, so cleaner vehicles will be fueled with the much lower sulfur gasoline they need
  - "Fuel neutral" program, so emission standards apply regardless of the fuel a vehicle uses

Tier 2/Gasoline Sulfur Program

- Industry meeting the challenge of these very stringent standards
  - Appears the auto industry will exceed the required number of very clean vehicles for Model Year 2004 (35% industry-wide vs. the 25% requirement)
    - Almost 60 vehicles already certified to “Bin 5” emission or better
  - Oil refiners have been making large investments, and several refiners are already introducing cleaner gasoline earlier than required

Tier 2/Gasoline Sulfur Program

The changes to vehicles and gasoline will be essentially invisible to consumers

- The performance and product selection of vehicles and fuels will not change
- The very large benefits of this program will cost about $70-250 per vehicle and less than 2 cents per gallon of gasoline

- For these costs, the health of Americans will be measurably improved
  - For example, the program will prevent 4,000 premature deaths; 10,000 cases of bronchitis; 3,000 hospital admissions; and 700,000 days of lost work

2007 Highway Diesel Program

- Applies stringent NOx and PM standards to heavy-duty engines and vehicles
  - Technology-neutral standards
  - 90%+ emission reductions-- gasoline-like levels
  - 100% PM standard in 2007 model year
  - Phase-in of NOx standards 2007-2010
  - Incentives for early technology introduction
- Reduces diesel fuel sulfur levels nationwide
  - Enables use of aftertreatment technology
  - Highway diesel fuel sulfur cap of 15 ppm by Sept 1, 2006
  - Voluntary temporary compliance option 2006-2010
  - Hardship provisions, small refiner options

Basic Program Requirements

	2006	2007	2008	2009	2010	2011	2012
PM		**100%** at **0.01** g/hp-hr					
NOx			**50%** at **0.20** g/hp-hr			**100%** at **0.20** g/hp-hr	
Fuel		**80%** at **15 ppm maximum sulfur** (under temporary compliance option)				**100%** at **15 ppm**	

Heavy-duty 2007:
Long-term Costs and Benefits

- Compliance costs
  - Estimated at $1200-1900 per engine (near-term costs ~ 2x higher)
  - 4-5 cents per gallon fuel, partially off-set by maintenance savings of ~ 1 cent per gallon
  - Total costs are $4.3 billion/year
- Health benefits

The program will prevent annually:

  - Over 8,300 premature deaths
  - Over 750,000 respiratory illnesses 1.5 million lost work days
  - 2.6 million tons of NOx, 110,000 tons of PM, and 17,000 tons of toxic pollutants
- Monetized benefits: $70 billion/year

Heavy-duty 2007:
Tracking Progress

- EPA undertaking a number of steps to ensure program goals are met:
  - Technology progress reviews
  - Company visits
  - In-house engine and systems testing
  - Participation in external test programs
  - 2002 Clean Diesel Independent Review
  - Refinery pre-compliance reports
  - Implementation workshops
- Members of the trucking industry are raising concerns about product readiness in 2007

Progress Toward 2007:
Engine Status

- 2002 → 2003
  - Focus has shifted from R&D programs to product development
- Engine companies have reached or are approaching technology down-select
  - Most companies have multiple technology paths capable of achieving 2007 standards
    - NOx control options being considered include engine-out, NOx adsorber, urea-SCR
  - Companies preparing for formal reviews to choose final 2007 package
    - Most companies will make decision in 4th quarter 2003 or 1st quarter 2004

Progress Toward 2007:
Fuel Status

- Refiner/Importer Pre-Compliance Reports
  - Annual pre-compliance reports due June 1, 2003-05
  - Plans can change
- Industry is On Target to Comply with 15 ppm Fuel Requirements

Results from 2003 reports:

- 15 ppm Fuel Will be Widely Available
  - Over 95% of highway diesel fuel volume produced in 2006 is projected to meet the 15 ppm sulfur standard
- Highway Diesel Fuel Supply Will be Sufficient
  - Refiners/Importers plans are in line with projected demand — highway diesel fuel supply will be sufficient

2WD tractor
130 hp

combine 285 hp

backhoe
loader 80 hp

trencher
50 hp

utility vehicle
18 hp

skid steer
loader
80 hp

light
tower 10
hp

genset
20 hp

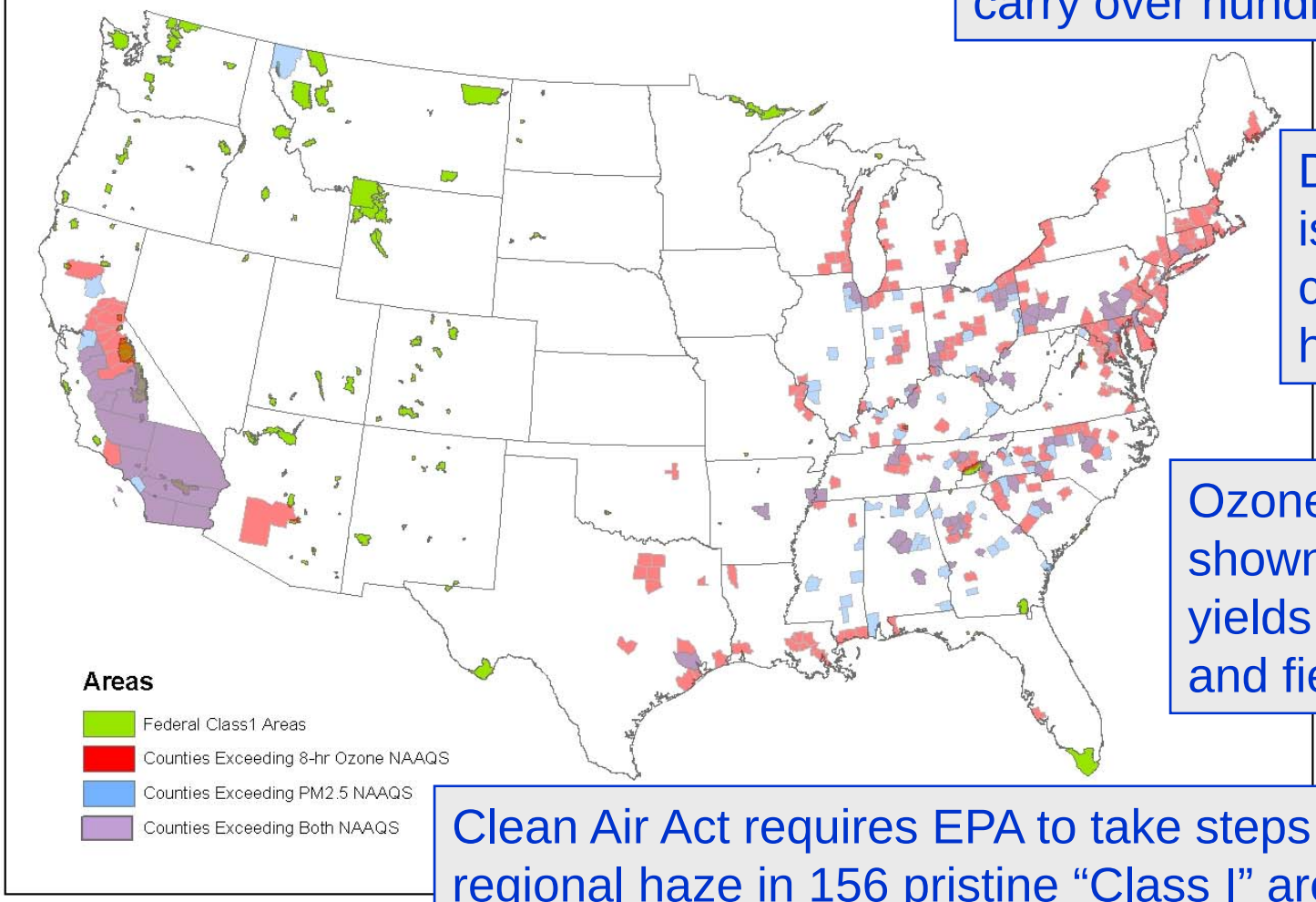
mini-track
loader
20 hp

off-highway truck
1000 hp

Widespread Need for Air Pollution Reductions

127 million people live in 353 counties that exceed the air quality standard for ozone or fine PM, or both

Fine particles from diesel exhaust can remain in the atmosphere for weeks, and carry over hundreds of miles

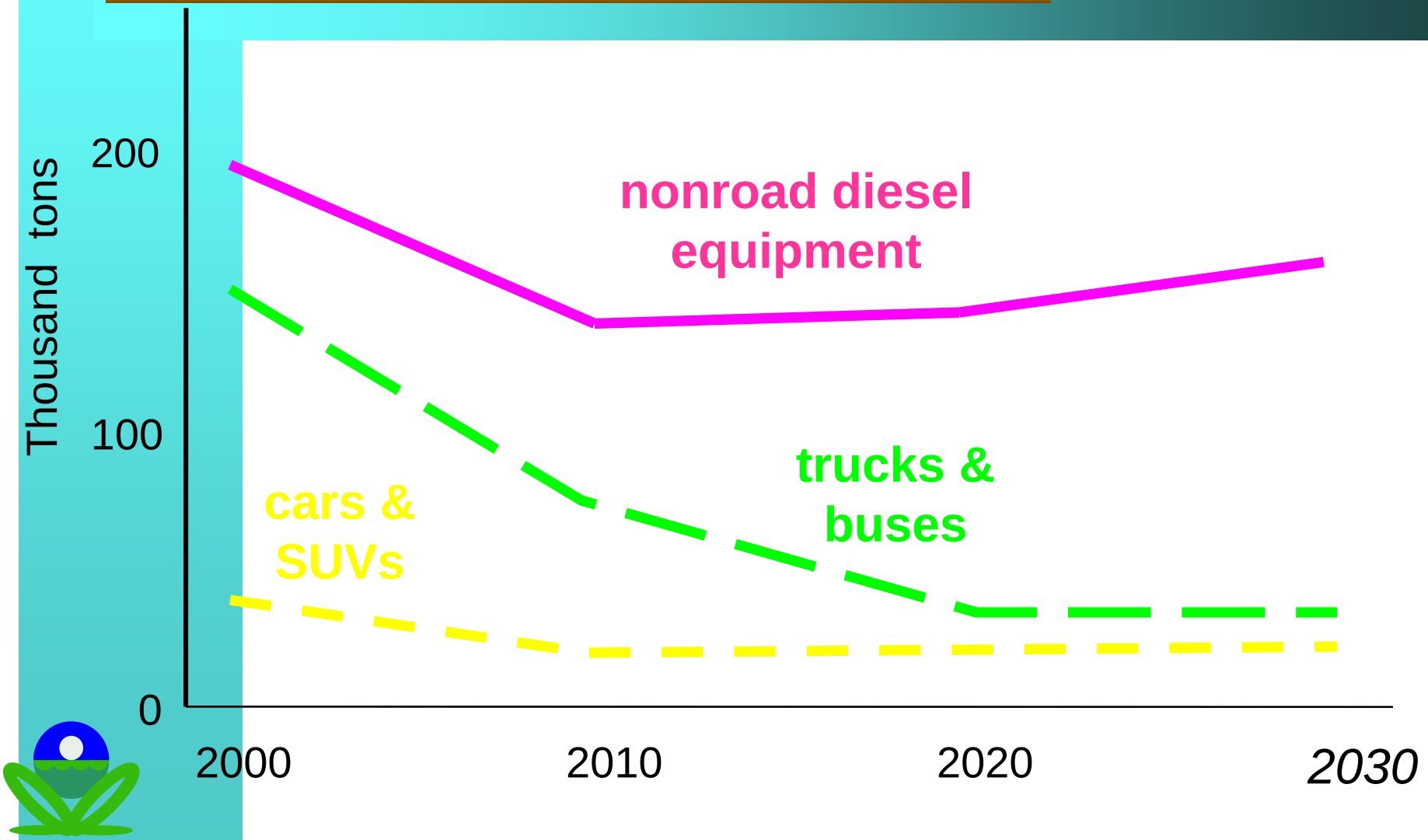


Diesel exhaust is likely to be carcinogenic to humans

Ozone has been shown to reduce yields of vegetables and field crops

Clean Air Act requires EPA to take steps to remedy regional haze in 156 pristine “Class I” areas

Mobile Source PM



Nonroad Proposal Overview

- A systems approach of reducing nonroad fuel sulfur levels to enable advanced emission control technology
- 500 ppm maximum sulfur nonroad, locomotive and marine diesel fuel in 2007
- 15 ppm nonroad fuel in 2010
- Engine standards representing reductions of >95% PM and ~90% NOx
  - Standards phase in starting in 2008, fully phased in by 2014
  - Expect similar technologies that will be used on highway engines
- Enhanced testing requirements to ensure in-use emissions reductions
- Program will prevent 9,600 premature deaths; 16,000 nonfatal heart attacks; & nearly 1 million lost work days on an annual basis in 2030
- Total annual benefits exceed $80 billion/year in 2030, annual costs less than $2 billion/year

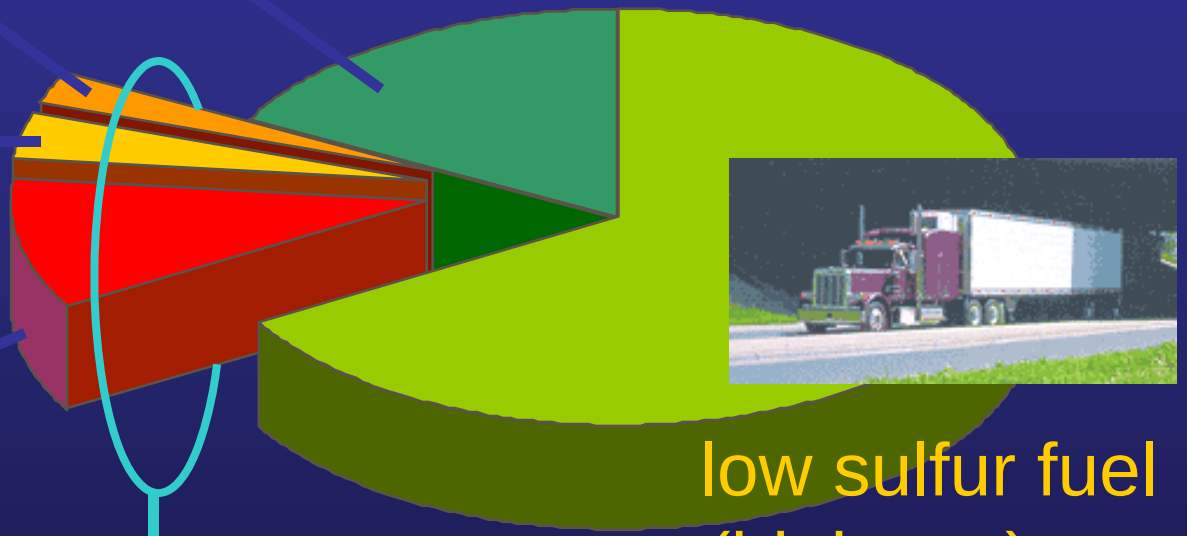
Distillate Fuels

home heating, etc 17%
not covered

marine 2.5%

locomotive 3.5%

nonroad equipment 10%



low sulfur fuel (highway) 67%
regulated since 1993

covered by the proposal

Nonroad Diesel Proposal Status

- Received over 150,000 comments
- Reflected widespread support from a range of stakeholders
- Working with farming community to address misunderstandings about proposal
- We are committed to completing this effort by April 2004

Locomotive Standards

- Current regulations have standards for “new” locomotives
  - 34-65% NOx reductions, up to 50% PM and HC reductions
  - Includes retrofit standards for existing locomotives when remanufactured
- Long engine life (~40 years) leads to slow turnover
- Current standards expected to reduce NOx emissions over 300,000 tons/yr by 2005
- Projected long-term reductions are:
  - 650,000 tons/yr NOx
  - 13,000 tons/yr PM
  - 18,000 tons/yr HC

Diesel Marine Standards

- Scope: Commercial C1, C2, Recreational, small engines <37 kW on boats (Ocean-going (C3) recently regulated)
- Current standards
  - Tier 1: adopted international (MARPOL) NOx caps
  - Tier 2: modest engine improvements
    - Category 2: similar to locomotive standards
    - C1, rec, and small diesel marine engines: similar to Tier 2 nonroad standards
    - comparable technology to 1990 on-highway diesel
  - Lead time delay between land-based nonroad and marine requirements

Locomotive and Marine Diesel Fuel

- Distillate
  - Marine engines below 30 l/cyl and Locomotives use distillate
    - Typically nonroad fuel
    - Tier 1 and Tier 2 standards do not depend on fuel improvements
  - Recent nonroad proposal would extend 500 ppm fuel sulfur cap to locomotive and marine engines
    - Considering extending 15 ppm cap as well
- Residual
  - Ocean-going marine engines above 30 l/cyl use residual fuel
  - We will implement the 4.5 percent cap on sulfur in marine diesel fuel once Annex VI goes into force
  - We are exploring the possibility of requesting that U.S. coastal areas be designated as SOx Emission Control Areas under Annex VI

Marine Diesel and Locomotive Standards

- Considering new standards for future marine diesel and locomotive standards modeled after land-based nonroad diesel and heavy duty highway diesel approach
  - Potential for large reductions if aftertreatment based standards are implemented in these categories
- Fuel control options discussed in the land-based nonroad diesel proposal
- ANPRM planned for Spring 2004 within the same timeframe as the nonroad diesel FRM
- Ocean-going marine diesel engines above 30 l/cyl
  - New CAA rule to be finalized by April 2007 (regulatory deadline)
  - We will also work with IMO toward more stringent international limits for NOx, SOx, PM

Recreational Vehicles

- Covers Snowmobiles, All-Terrain Vehicles (ATVs), & Off-road Motorcycles
- Snowmobiles previously unregulated; ATVs and off-road motorcycles are regulated in California
- Vast majority of recreational vehicles use 2-stroke engines which emit high levels of HC, CO, & PM
- Main emission control strategies are the use of direct injection with 2-stroke engines and the replacement of 2-stroke engines with 4-stroke engines
- Permeation standards for plastic fuel tanks and rubber fuel lines
- Program achieves significant HC reductions through standards phased in over next nine years

Highway Motorcycle Final Rule

- NPRM published Aug. 14, 2002
  - Was originally part of recreational vehicle rule
- Proposed program is closely aligned with California's program, but with 2 extra years of lead time
- First update of street bike standards since 1980
- Current motorcycles pollute far more per mile than cars and even large SUVs
- New standards will lead to increased use of cleaner technologies on motorcycles
- Manufacturers are not expected to oppose
- Significant opposition has come from some rider groups
- Final rule is currently under OMB review

For More Information…

- www.epa.gov/otaq
- Specific questions:
  - Karl Simon (202) 564-1106
  - simon.karl@epa.gov
  - Paul Machiele (734) 214-4264
  - e-mail at machiele.paul@epa.gov
  - William Charmley (734) 214-4466

Proposed Engine Standards Program

500 ppm NR fuel \ 15 ppm NR fuel \

hp	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<25	Tier 1				PM *(reductions w/oxidation catalysts or engine-based control)*							
25-75					PM *(reduction w/oxidation catalysts or engine-based control)*					**PM: 100%** NOx		
75-175	existing Tier 2				existing Tier 3				**PM:100%** **NOx: 50%**	**50%**	**100%**	
175-750								**PM: 100%** **NOx: 50%**	**50%**	**50%**	**100%**	
>750	Tier 1				existing Tier 2			**PM &NOx: 50%**	**50%**	**50%**	**100%**	

Percentages indicate portion of sales required to meet advanced emission control technology standards