NAS Recommendations: Federal Measures for Nonroad Engines & Vehicles

Mobile Source Technical Review Subcommittee Meeting

October 4, 2004

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Agenda

- Overview
- Existing control programs
- Emissions inventories
- Future control programs

NAS Recommendation

- ***"Expand Use of Federal Emission-Control Measures"***
  - *"Among the source categories that should be considered for national emission standards are nonroad mobile sources (for example, aircraft, ships, trains, and construction equipment)..."*

Nonroad Overview

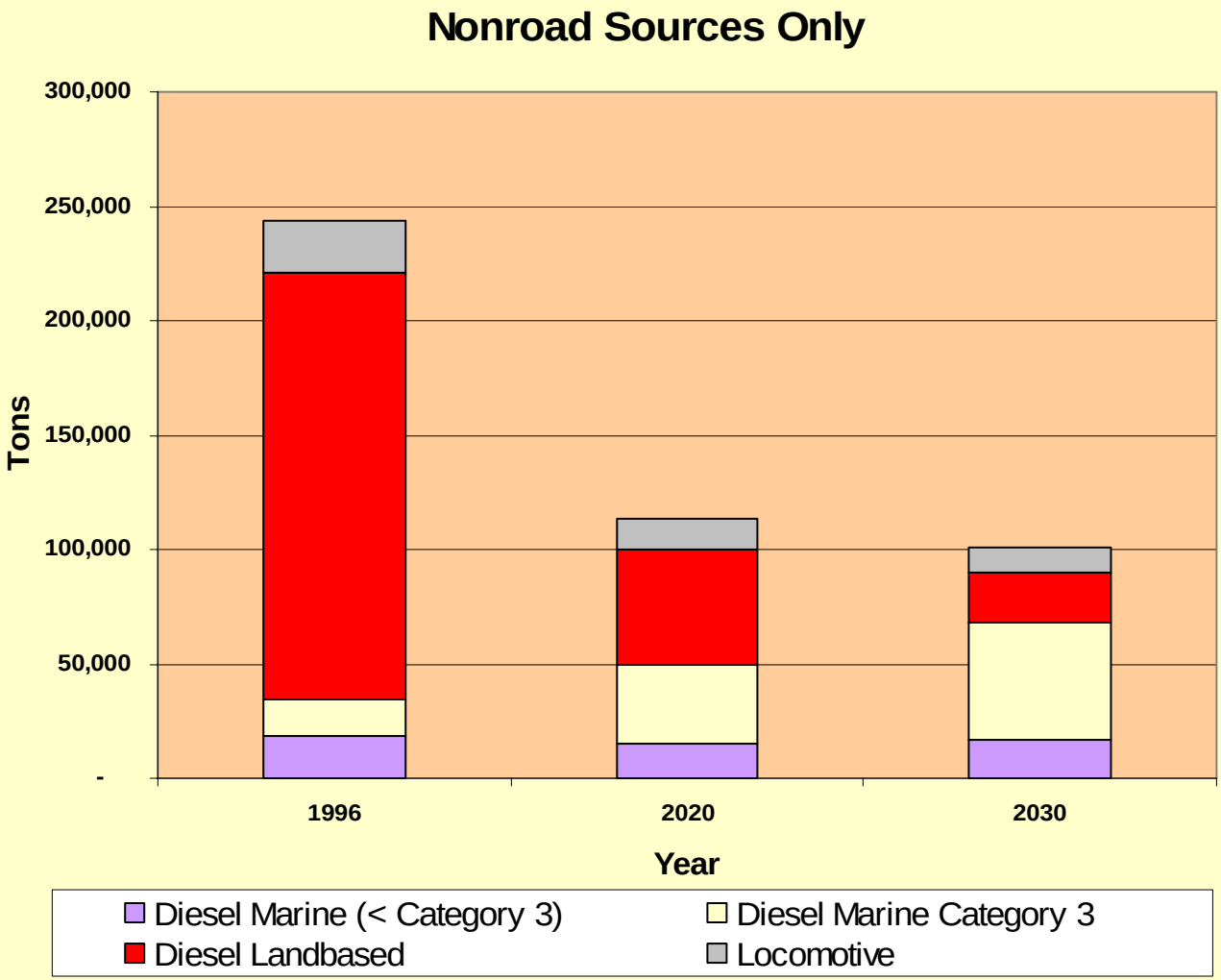
- Prior to 1990, EPA had no authority to establish emission standards for nonroad vehicles/engines
  - 1990 CAA Amendments provided EPA with mandate
- In last decade, EPA has promulgated standards for a wide range of nonroad sources
  - Millions of tons of NOx, PM, SO2, VOC, CO and air toxics reduction are being realized
- But, our work is not done ….

Existing nonroad control programs

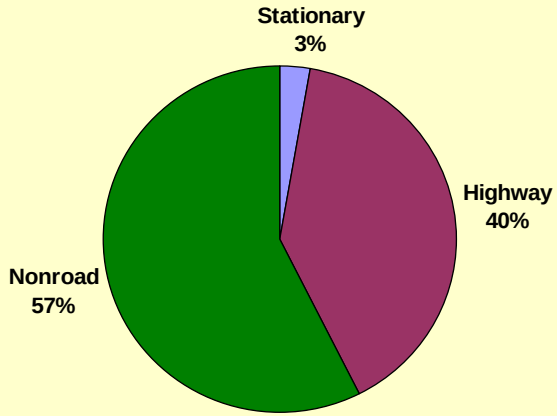
Final Rule	Category	Implementation
1994	Land-based diesel engines Tier 1	1996 - 2000
1995	<25hp gasoline engines Phase 1	1997
1996	Gasoline outboard & personal watercraft Phase 1	1998 - 2006
1997	Diesel locomotives Tier 0 - 2	2001 - 2005
1998	Land-based diesel engines Tier 2 & 3	2001 - 2008
1999	Commercial diesel marine engines, Categories 1 and 2	2004 - 2007
1999	<25hp gasoline nonhandheld engines Phase 2	2001 - 2007
2000	<25hp gasoline handheld engines, Phase 2	2002 - 2007
2002	Recreational diesel marine engines	2006 - 2009
2002	>25hp spark-ignition engines	2004 - 2007
2002	Recreational gasoline vehicles: ATVs & motorcycles	2006 - 2007
2002	Recreational gasoline vehicles: snowmobiles	2006 - 2012
2003	Commercial diesel marine engines, Category 3	2004
2004	Land-based diesel engines Tier 4	2008 - 2015

National Diesel PM Inventory

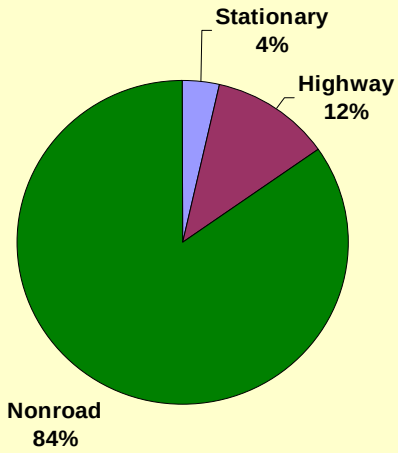
(48-state)



1996: All Man-made Sources
400k tons total



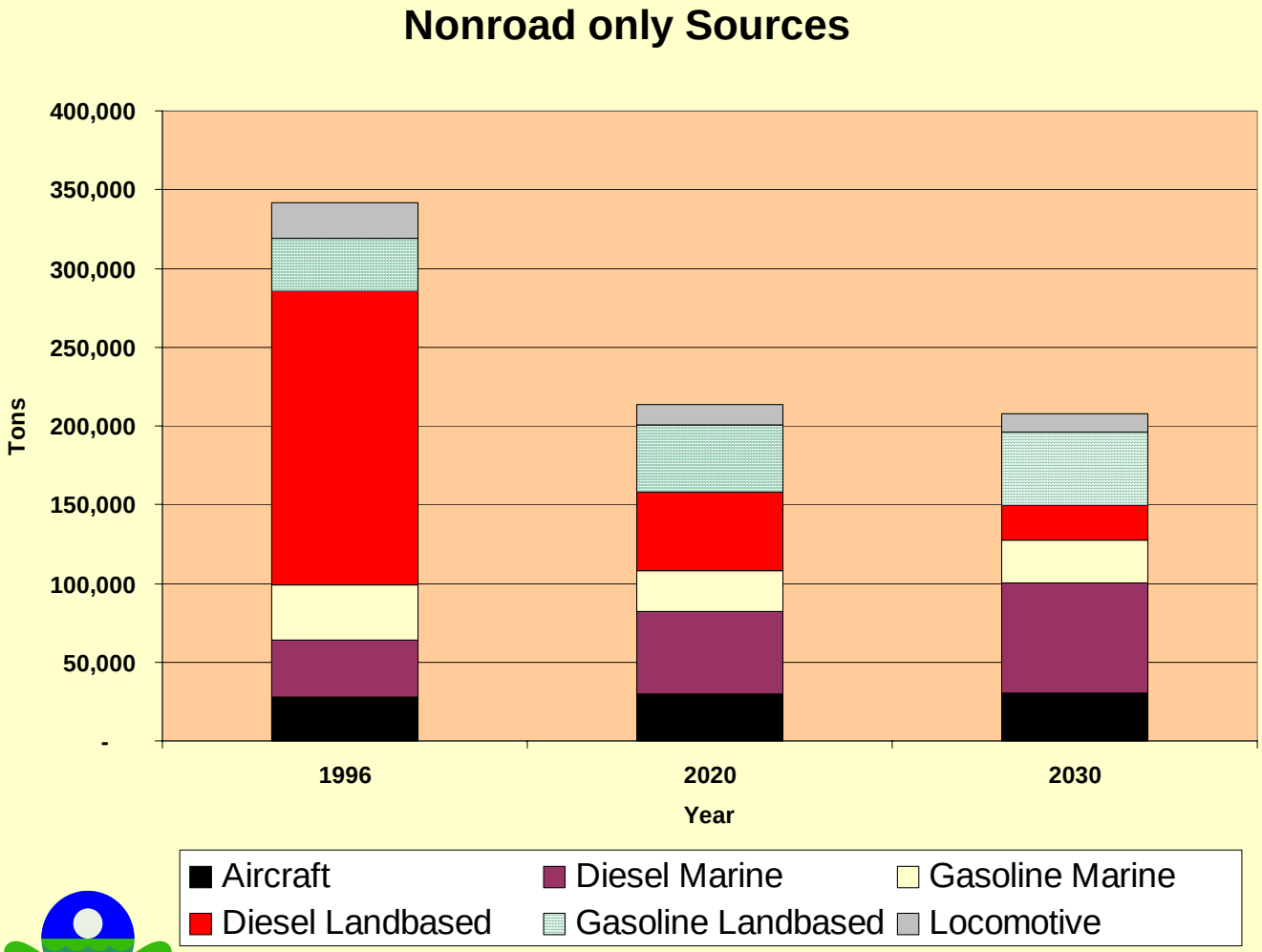
2030: All Man-made Sources
69k tons total



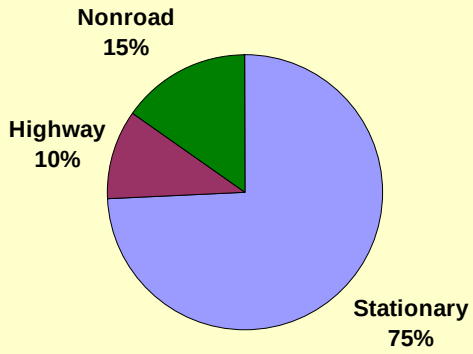
Source: Nonroad Tier 4 Final Rule

National PM2.5 Inventory

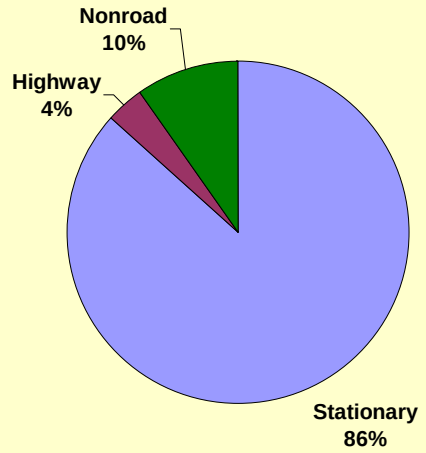
(48-state)



1996: All Man-made Sources
2.2M tons total



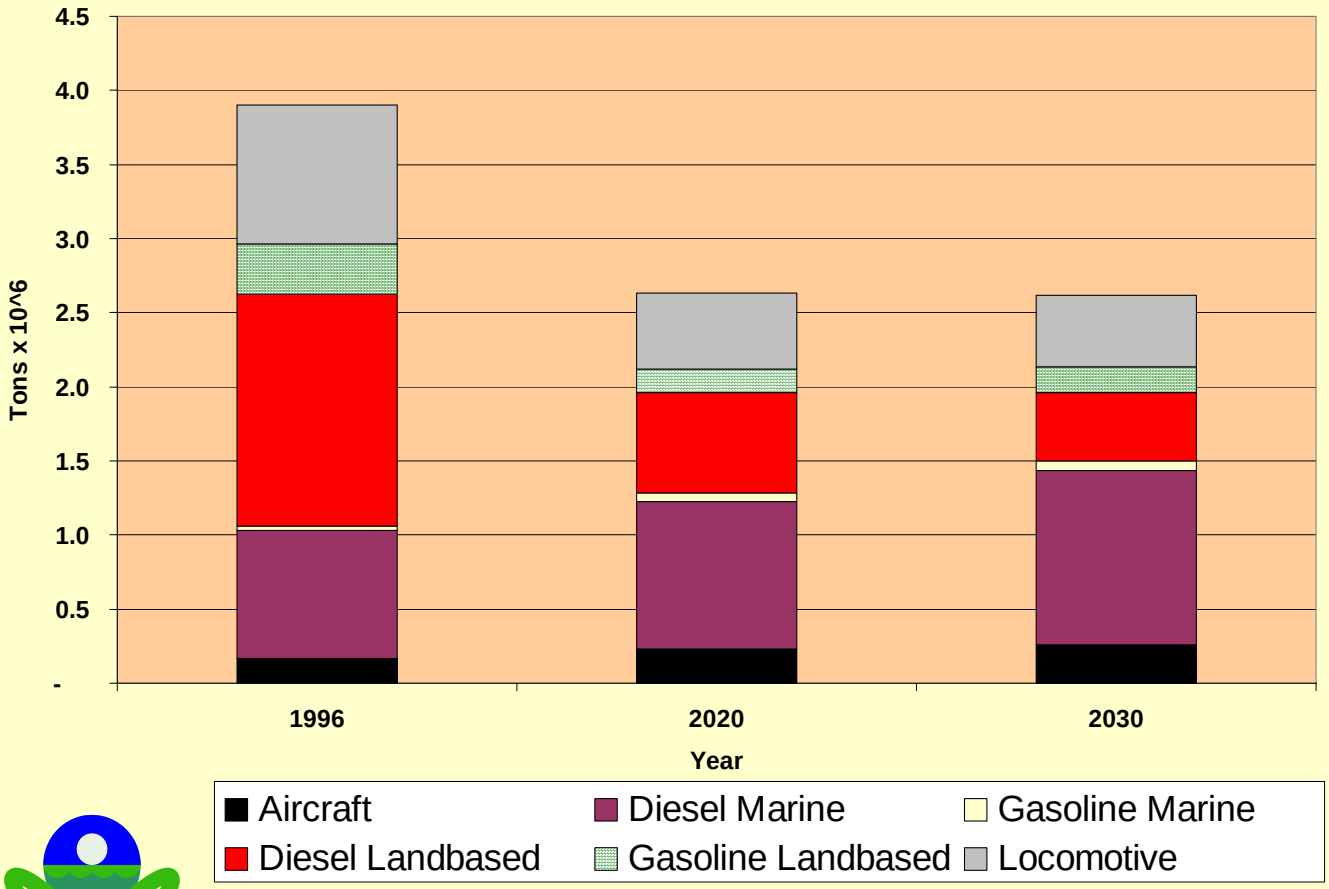
2030: All Man-made Sources
2.1 M tons total



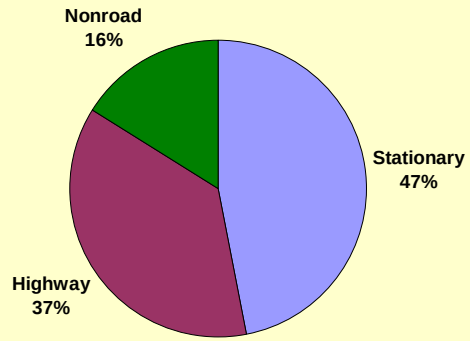
Source: Nonroad Tier 4 Final Rule

National NOx Inventory

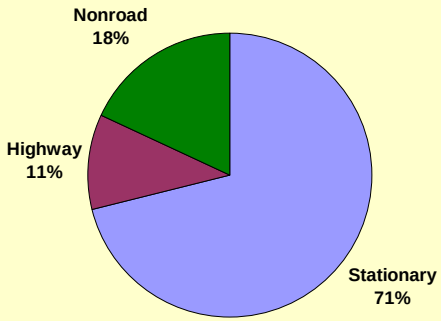
(48-state)



1996: All Man-made Sources
24M tons total



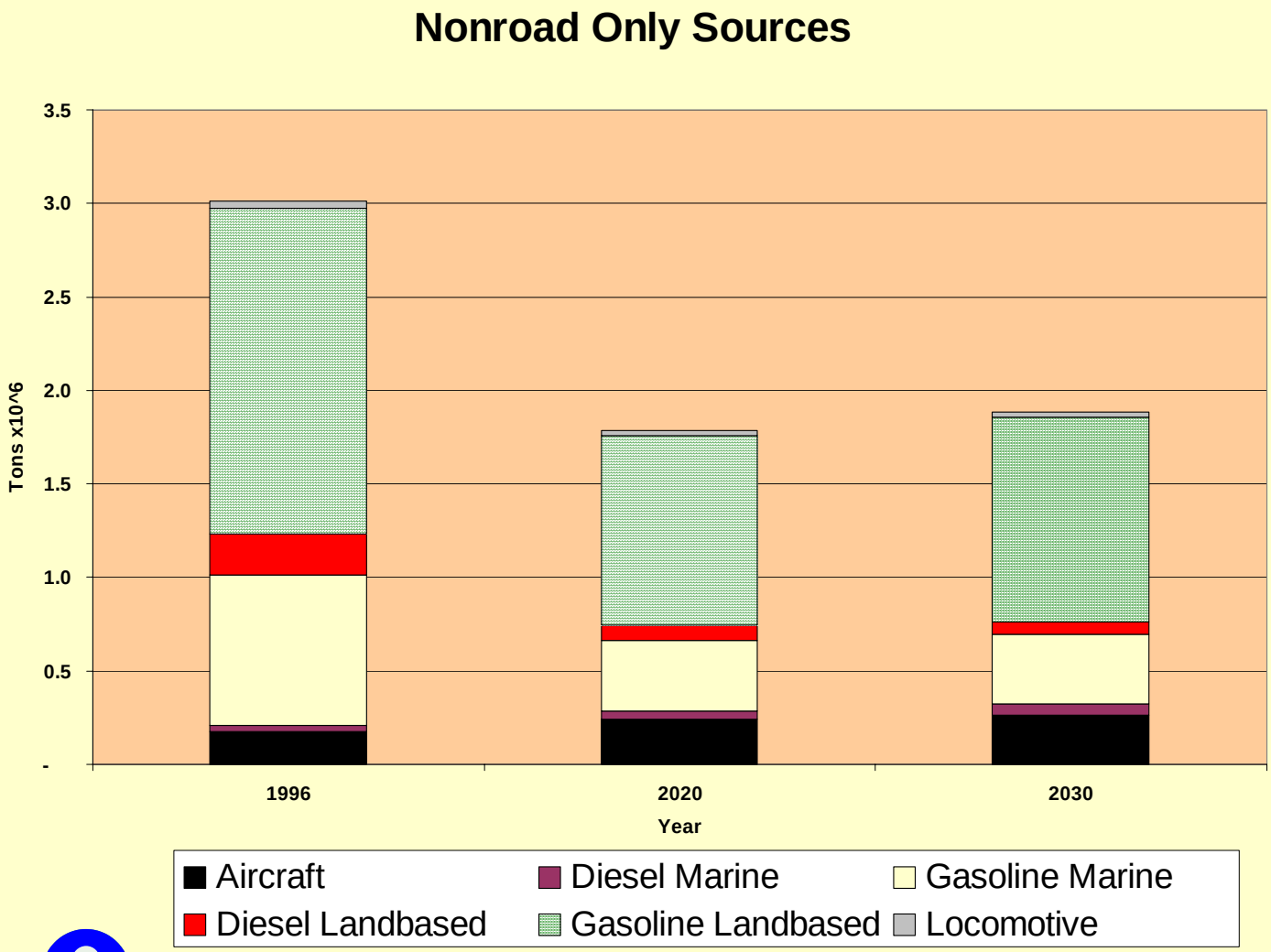
2030: All Man-made Sources
15M tons total

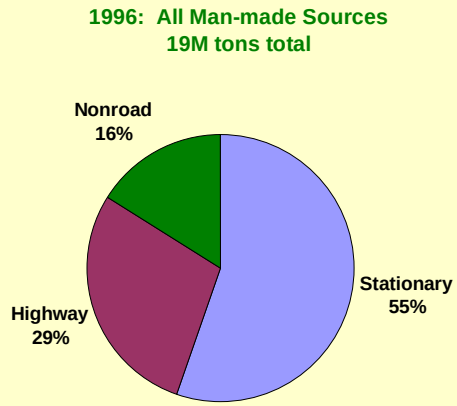


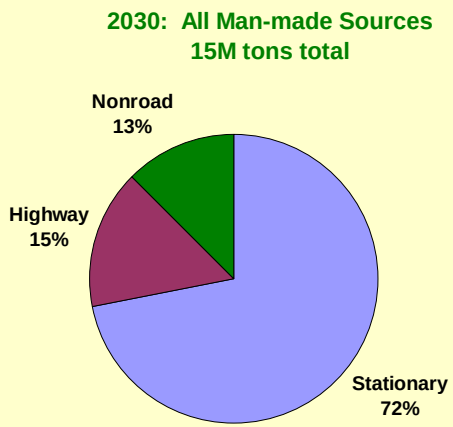
Source: Nonroad Tier 4 Final Rule

National VOC Inventory

(48-state)







Source: Nonroad Tier 4 Final Rule

Future Nonroad Work

- Implementation of land-based diesel Tier 3 & 4
- Gasoline engine controls
- Locomotive & marine diesel engines
- Air toxics
- Marine SOx Emission Control Areas (SECA)
- Aircraft
- Ocean-going marine diesel engines

Implementation of land-based diesel Tier 3 & 4

- NRT3 phasing in 2006-2008
- NRT4 finalized in May 2005, implementation 2008-2015
- Will result in enormous public health benefits
- Technology-forcing requirements
- Tier 4 Rule is complicated, and implementation will require significant EPA involvement, e.g.
  - Nonroad equipment manufacturer flexibilities
  - Workshops, guidance for refiners/distributors

Future gasoline control stds.

- NPRM in Spring of 2005
- Will likely cover;
  - <25 hp “Phase 3”
  - Outboard & personal watercraft marine engines “Phase 2”
  - Marine sterndrive & inboard engines “Phase 1”
- EPA considering new/revised NOx, VOC, CO, PM standards
- Exhaust and evaporative controls
- Implementation in ~ 2008-2010 time frame

Future Locomotive & Marine Diesel Stds.

- Locomotive/marine diesel engines will be the largest diesel PM source
  - 2007 highway and nonroad Tier 4 rules were # 1 & 2 (but not anymore)
  - 2030, loco/marine will be 45% of mobile diesel PM and 27% of mobile NOx emissions
- Nonroad Tier 4 rule
  - requires 15ppm fuel for loco/marine in 2012
- Loco/Marine ANPRM
  - published in May, comment period closed in August
  - covers locomotives and marine categories 1 & 2
  - EPA considering high-efficiency aftertreatment-based stds.
- NPRM - planned for mid-2005

Air toxics

- Mobile sources, including nonroad engines, are key sources of air toxics
- Diesel PM is an air toxic, which will be reduced substantially by new engine standards
- VOC emission standards also reduce VOC-based air toxics, including benzene, 1,3-butadiene, and formaldehyde
- New mobile source air toxics rulemaking considering options related to gasoline nonroad engines
  - Potential gasoline fuel requirements such as additional benzene control. Such controls lower emissions from nonroad equipment and reduce operator exposure
  - We're also considering controls for gas cans, used to fuel lawn and garden and other types of nonroad equipment
- NPRM - planned for mid-2005

Sulfur Emission Control Area (SECA)

- MARPOL Annex VI SOx Emission Control Areas (SECAs)
  - SECAs can be set up pursuant to MARPOL Annex VI
  - Sulfur content of fuel used by any ship while operating in a SECA cannot exceed 15,000 ppm (1.5%)
  - Two SECA's have gone through the process
    - Baltic Sea SECA
    - North Sea SECA has been submitted and will likely be approved very soon
- One or more SECAs adjacent to North America are an important part of our ship emission control strategy
  - EPA considering West, East, and Gulf Coasts, Great Lakes
  - Work with Canada and Mexico, too
  - Broad designation targeted to avoid trade distortions
- Current goal: submit an application to the March 2006 Marine Environment Protection Committee meeting at IMO
- Work is beginning to assemble required environmental and economic data

Aircraft

- EPA aircraft emission standards for jet engines which power commercial aircraft have been in place for about twenty years
  - Includes small regional jets, single-aisle aircraft, twin-aisle aircraft, & larger aircraft
- The International Civil Aviation Organization (ICAO) is chartered to develop international aircraft standards that each sovereign country may then adopt
- ICAO aircraft emission standards are modest since most engines meet these standards
  - EPA has adopted standards equivalent to ICAO (FAA enforces these standards)
- Currently, we are developing a final rule to adopt the existing ICAO NOx standards
- In the future, we intend to adopt the tighter NOx standards that ICAO approved earlier this year
  - These stds. are also fairly modest, and are not technology-forcing

Ocean-going marine vessels

- Category 3 engines (>30 liters/cylinder)
- >95% of these vessels in U.S. are foreign flagged
- Current international standards based on Tier 1 type NOx control technologies
  - EPA adopted these standards in 2003
- We are interested in additional standards that reflect more advanced control technologies
- We will pursue international stds. through the IMO, but this process is slow
- We also made a regulatory commitment to finalize additional standards for this category by mid-2007