US EPA and MARPOL Annex VI Air Pollution Updates

Presentation for

AAPA Cruise Seminar

Environmental Issues Impacting the Cruise Industry

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Overview

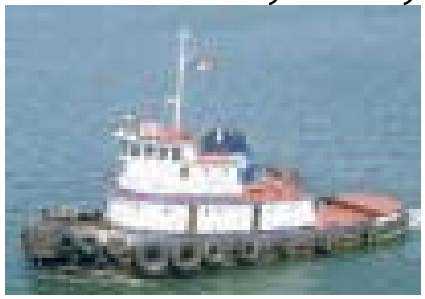
- **Background**
- **Air Quality Need and Emission Inventory**
- **US EPA and MARPOL Annex VI Air Pollution Updates**
- **Future Activities**
  - **EPA's Sustainable Ports Strategy**
- **National Clean Diesel Campaign**
  - **DERA (Clean Diesel Funding)**
  - **West Coast Collaborative Marine and Port Sector Efforts**

Background

- EPA addresses 3 types of marine diesel engines
  - **Category 1:** >37 kW, up to 5 liters per cylinder
    - » Similar in size to land-based nonroad engines
  - **Category 2:** 5 to 30 liters per cylinder
    - » Similar in size to locomotive engines
  - **Category 3:** at or above 30 liters per cylinder
    - » Very large engines for propulsion on ocean-going vessels

Background

- EPA has adopted emission standards for C1, C2, and C3 engines on U.S. vessels
  - **C1 & C2:** Engines below 2.5 liters per cylinder are subject to EPA Tier 2 standards beginning 2004
  - Engines at or above 2.5 liters per cylinder are subject to the MARPOL NOx limits beginning 2004 and more stringent Tier 2 standards beginning 2007
  - The standards cover NOx, PM, HC, and CO emissions



Background

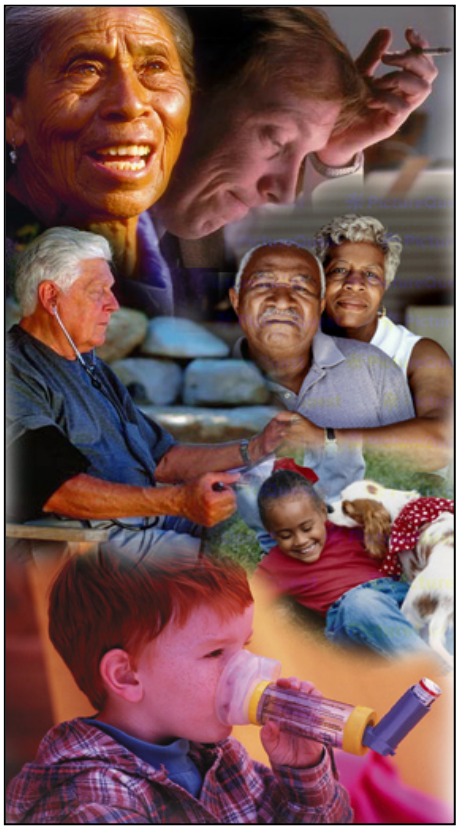
- **<u>Category 3:</u>** EPA adopted emission standards for C3 US flagged vessels in January 2003
  - In-cylinder controls to meet IMO NOx limits
  - We made a commitment to issue a second tier no later than April 2007 – we did not achieve that deadline
    - » Additional use and optimization of in-cylinder controls
    - » More advanced technologies (i.e., SCR and water injection)

Background

- We projected expected inventory reductions from combined Annex VI and Tier 2 standards in 2030 compared to uncontrolled:
  - **NOx: 26%**
  - **PM: 12%**

Air Quality Need and Emission Inventory

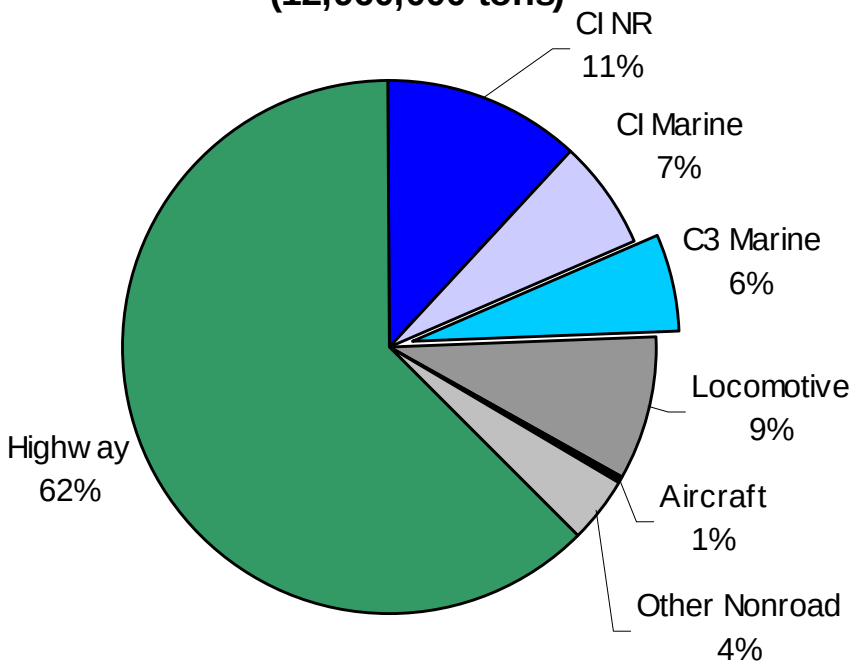
- Air Quality is a National Priority
- 75% of the nation's risk from PM2.5 is in CA - 50% is in the LA area alone
- Category 1, 2, and 3 marine diesel engines are significant contributors to our national mobile source emission inventory



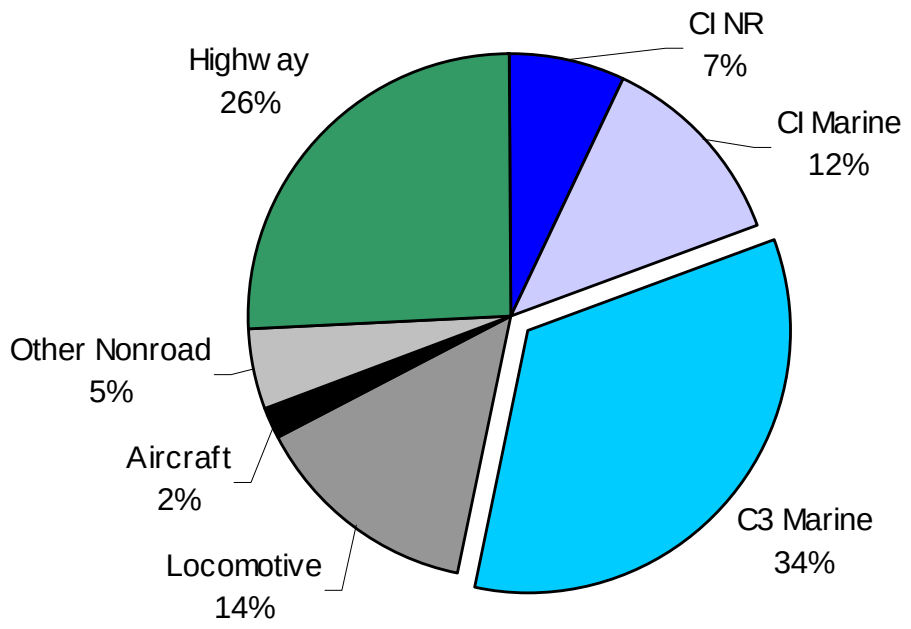
Inventory Overview for NOx

- Marine diesel engines contribute significantly to air pollution mobile sources in the United States

2001 Mobile Source NOx Inventory (12,960,000 tons)



2030 Mobile Source NOx Inventory (6,010,000 tons)

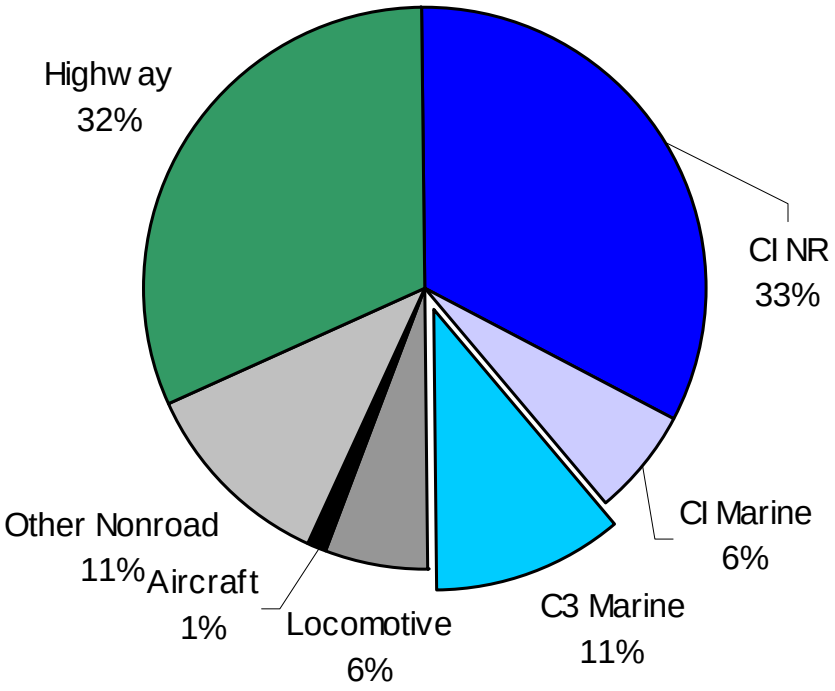


Source of inventory estimates: C3 Marine ANPRM, 72 FR 69522 (Dec 7, 2007)

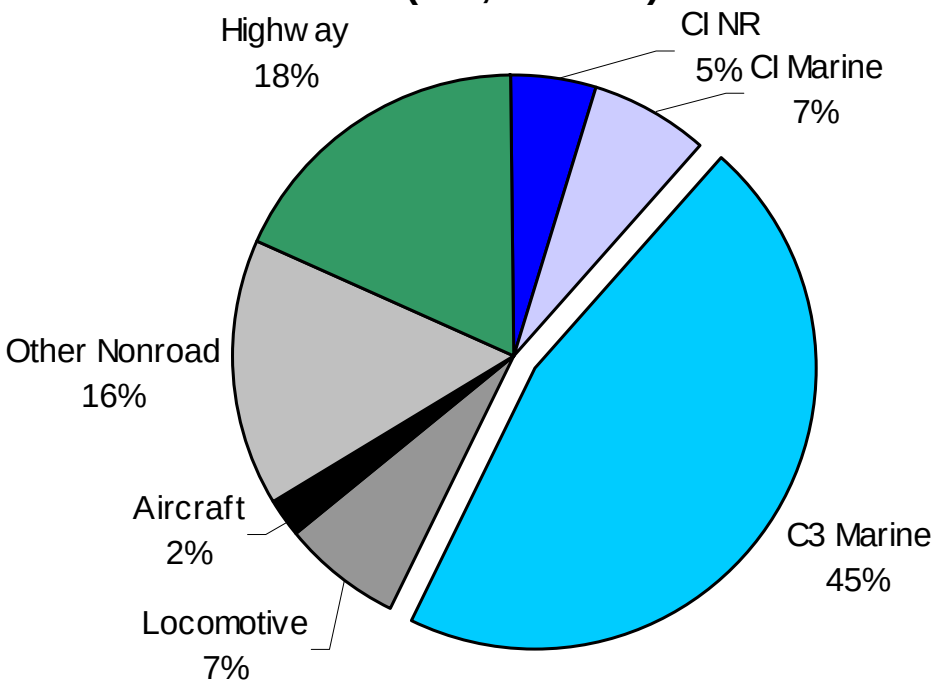
Inventory Overview for PM2.5

- The marine diesel contribution is expected to grow as emissions from other sources decrease

2001 Mobile Source PM2.5 Inventory (500,400 tons)

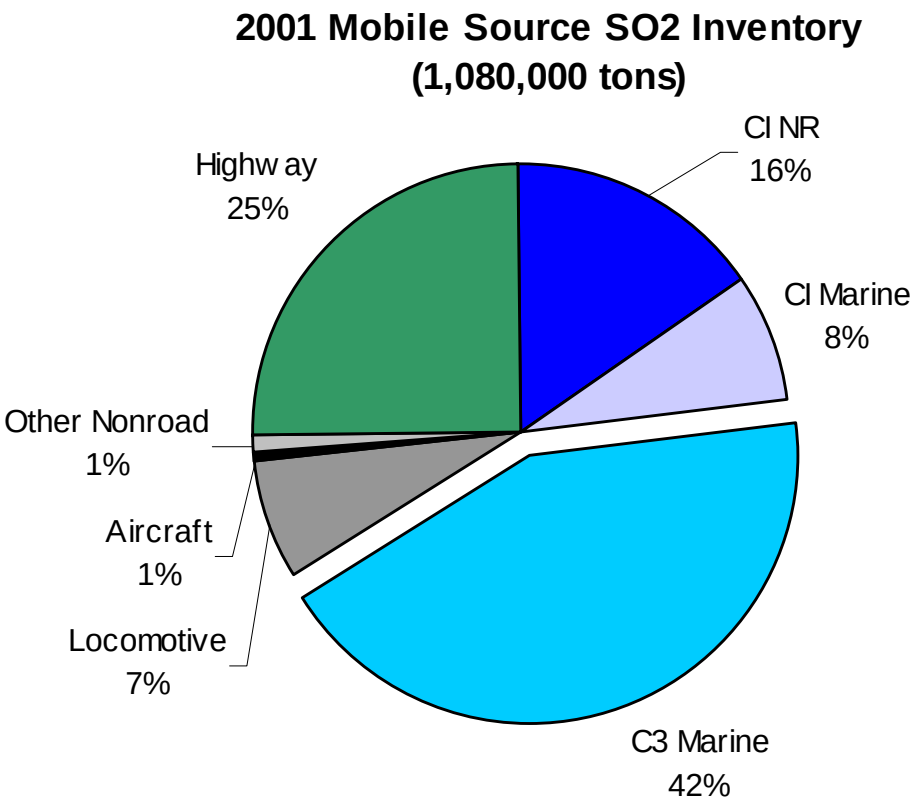


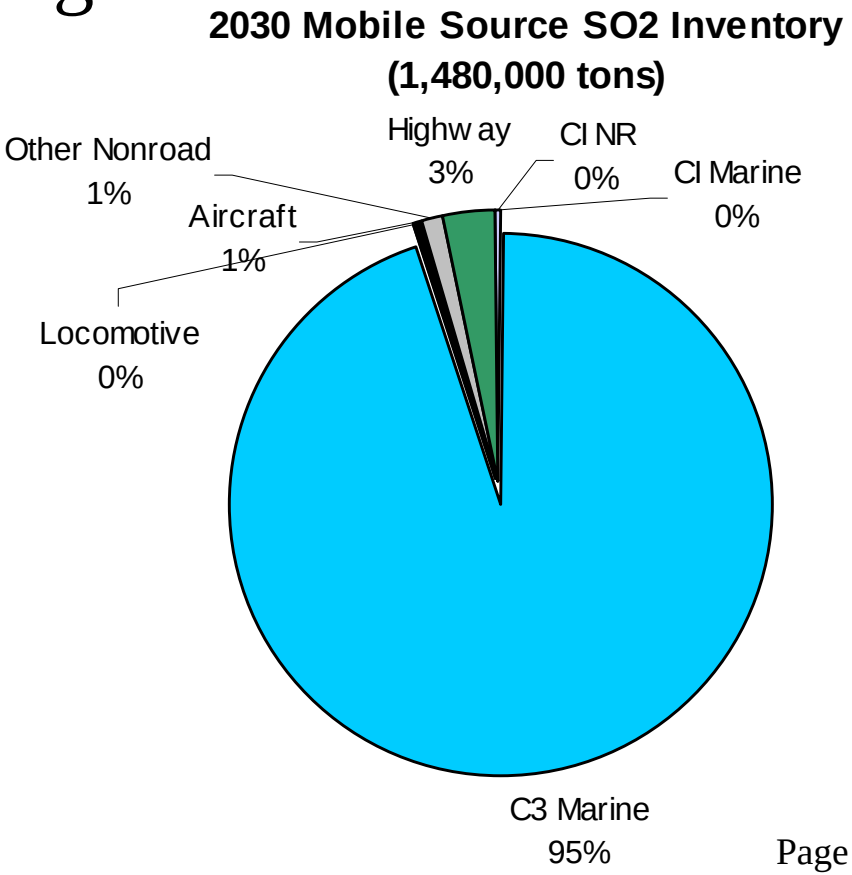
2030 Mobile Source PM2.5 Inventory (366,300 tons)



Inventory Overview for SOx

- SOx emissions are high due to the sulfur content of residual fuel used in C3 engines





Ocean-Going Vessels

C3[a] Contribution to Selected Ports

Port Area	NOx	$PM_{2.5}$	SOx
Valdez, AK	4%	10%	43%
Seattle, WA	10%	20%	56%
Tacoma, WA	20%	38%	74%
San Francisco, CA	1%	1%	31%
Oakland, CA	8%	14%	80%
LA/Long Beach, CA	5%	10%	71%
Beaumont, TX	6%	20%	55%
Galveston, TX	5%	12%	47%
Houston, TX	3%	10%	41%
New Orleans, LA	14%	24%	59%
South Louisiana, LA	12%	24%	58%
Miami, FL	13%	25%	66%
Port Everglades, FL	9%	20%	56%
Jacksonville, FL	5%	11%	52%
Savannah, GA	24%	39%	80%
Charleston, SC	22%	33%	87%
Wilmington, NC	7%	16%	73%
Baltimore, MD	12%	27%	69%
New York/New Jersey	4%	9%	39%
Boston, MA	4%	5%	30%

- Emissions from OGVs can be important in specific ports (2002; source: 2007 ANPRM)

[a] This category includes emissions from Category 3 (C3) propulsion engines and C2/3 auxiliary engines used on ocean-going vessels.

Cruise Ships

- Engines on cruise ships are a subset of all marine diesel engines
  - Cruise ships have all three types of engines
    - » C3 for propulsion power
    - » C1 and C2 for auxiliary power

- Virtually all cruise ships that use U.S. waters and ports are flagged outside the U.S.

US EPA Update

- Soon to release tighter standards for Locomotive and Marine C1 and C2 final rulemaking

- Released Final rule in November 2007 to extend the regulatory deadline for C3 marine engines from April 27, 2007 to December 17, 2009

- Advanced Notice of Proposed Rulemaking for C3 marine engines released in November 2007
  - Comments due March 6, 2008

What our Rules Cover--

Marine Diesels

Category 1 (<5 liter/cylinder)

Commercial

workboats

police boats

fishing vessels

sailboats

gen sets

Recreational

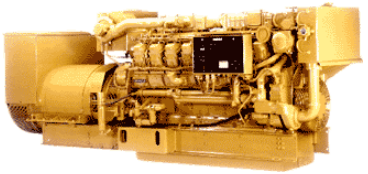
cruisers

yachts

Category 2 (5 to 30 liter/cyl)

tugboats

ferries



auxiliary power for ocean-going vessels

Great Lakes freighters

Category 3

(>30 liter/cyl)

ocean-going ships

(separate rule)

US EPA Updates

- **Locomotive and Marine C1 and C2 rulemaking**

  - Final rule soon to be released

  - March 2007 we proposed more stringent PM and NOx exhaust emission standards for locomotives and marine diesel engines.

  - We proposed a three-part program:

    - (1) tightening emission standards for existing locomotives when they are remanufactured,

    - (2) setting near-term engine-out emission standards (Tier 3), for newly-built locomotives and marine diesel engines; and

    - (3) setting longer-term standards (Tier 4), for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency aftertreatment technology.

US EPA Update

C3 ANPRM

- Comments due March 6, 2008

- Significant contributors to our national mobile-source emission inventory

- Largely based on a proposal submitted by the United States government to the 11th meeting of the Subcommittee on Bulk Liquids and Gases at the International Maritime Organization, held in April 2007. The standards under consideration consist of two tiers of NOx emission standards and performance-based SOx and PM standards, could began as early as 2011

C3 Final Rulemaking

- New deadline has been established for a final rule: December 2009

IMO Annex VI Update

- MARPOL
  - International Convention for the Prevention of Pollution from Ships, 1973, as Modified by the Protocol of 1978 Relating Thereto (MARPOL 73/78)

- Annex VI
  - Regulations for the Prevention of Air Pollution from Ships (1997 Protocol)

Annex VI Update

- MARPOL Annex VI entered into force as of May 19, 2005.
- Senate gave advice and consent on April 6, 2006.
- House passed H.R. 802, an Act "To amend the Act to Prevent Pollution from Ships to implement MARPOL Annex VI" on March 26, 2007.
- H.R. 802 is presently before to the Senate Commerce, Science, and Transportation Committee for consideration.

Annex VI SOx Limits

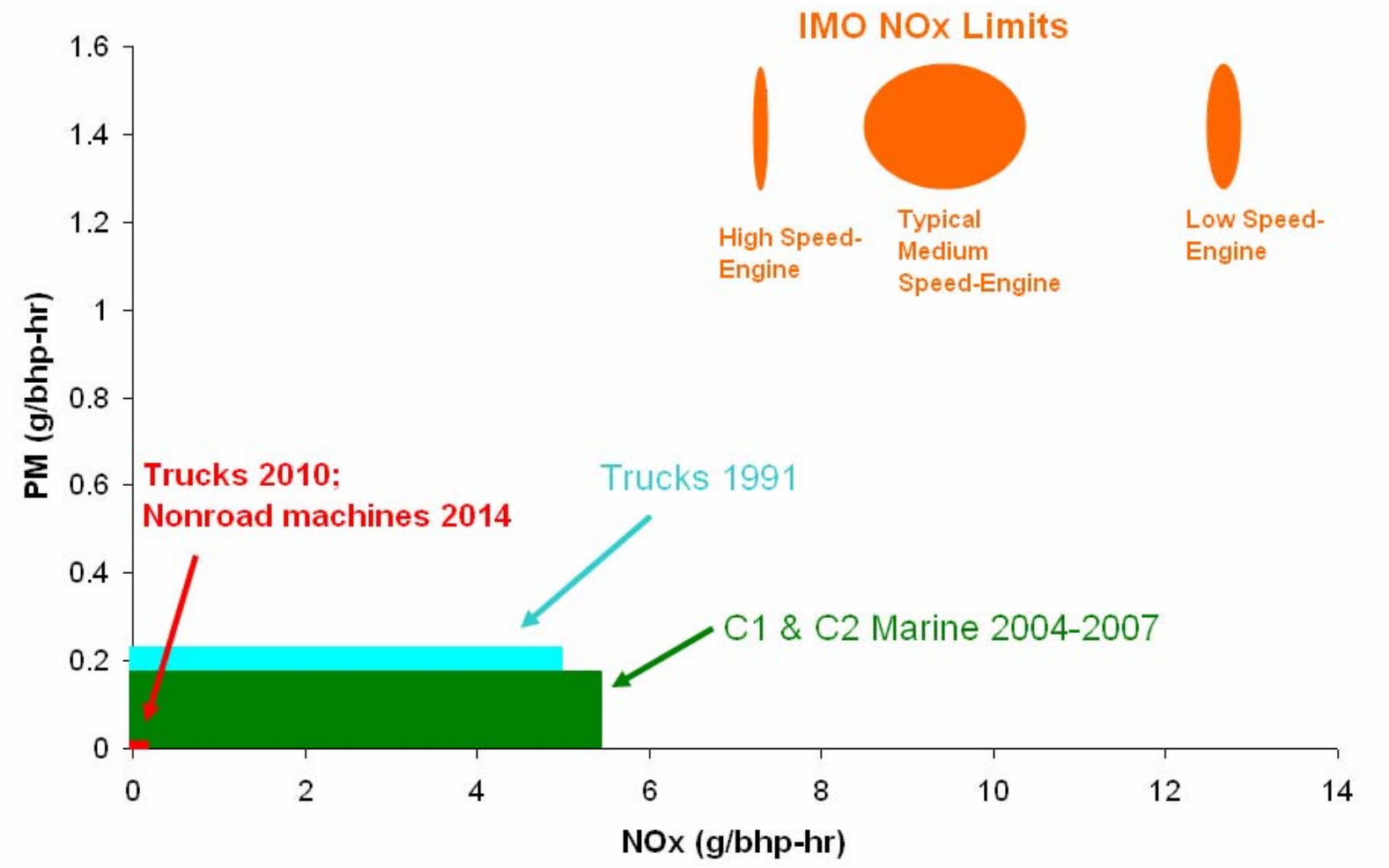
- **The Annex also contains fuel sulfur content limits**
  - 45,000 ppm generally
  - 15,000 ppm for SOx Emission Control Areas (SECAs)
    - » Two areas so far: Baltic Sea and North Sea
  - Current global average is about 27,000 ppm
  - A SECA is a mechanism available under Annex V1
  - EPA, in cooperation with a number of stakeholders, including CARB and Environment Canada, is perfromin the technical background work necessary for the US to make a decision regarding applying to IMO in the future for a SECA designation

Annex VI - Enforcement

- We are engaged in the IMO Annex VI negotiation process

- The standards can be enforced against any ship that visits a port of a country that is a party to the convention after that port state ratifies the Annex, whether or not the flag state of the ship has ratified

US Standards Comparison - Ships vs. Other Sources



Climate Change

- IMO has a separate agenda item for climate change within the Marine Environment Protection Committee

- The U.S. government is involved in these discussions

Strategy for Sustainable Ports

- EPA has developed a **Strategy for Sustainable Ports** to help guide the agency as it continues to engage public port authorities and other stakeholders in voluntary efforts to reduce the environmental impacts associated with moving goods through the marine transportation system.

- The Strategy supports existing and new EPA programs and projects that will produce measurable results in 2008 and beyond.

- EPA headquarters and regional offices have made commitments to work with others to implement specific actions in the Strategy based on their priorities.

National Clean Diesel Campaign

- **Two components**
  - Regulatory
  - Innovative

- **Technology-driven**
- **Cost-effective**
- **Helping communities achieve public health goals**

West Coast Collaborative Innovations in Clean Diesel

» Approximately $500K for projects that reduce diesel emissions within the jurisdiction of Region 9 (California, Nevada, Arizona, Hawaii, and the U.S Pacific Islands)

» All projects must demonstrate applications, technologies, methods or approaches that are new, innovative or experimental.

» EPA anticipates awarding approximately 2-3 assistance agreements under this announcement

Marcus Peacock (EPA Deputy Administrator) and Wayne Nastri (EPA R9 Administrator) present $300,000 award to Port of Long Beach for Hybrid Yard Hostler Project.

» Proposals are due **February 15, 2008**

» For more information, visit:
http://www.epa.gov/region09/funding/cleandiesel.html

WEST COAST COLLABORATIVE
Public-private partnership to reduce diesel emissions

Diesel Emission Reduction Act Program Overview FY08

National Clean Diesel Program

$50 Million for FY08

National Program

70% of total funding

- Clean Diesel Grants Program
- Clean Diesel Finance Programs
- Clean Diesel Emerging Technologies Grants

State Program

30% of total funding

- State Clean Diesel Grants Program

Clean Diesel Funding: Energy Policy Act of 2005

Authorization

- Diesel Emissions Reduction Program (also known as The Clean Diesel Programs)
- Sub-title G, Sections 791-797
- $200M per year for five years
- Separate authorization, not CAA 103 or 105
- Allows for “implementation” rather than “demonstration”

Additional Information

- More information about EPA's marine diesel engine emission control programs can be found on our website:
  - www.epa.gov/otaq/marine.htm
  - www.epa.gov/otaq/oceanvessels.htm

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