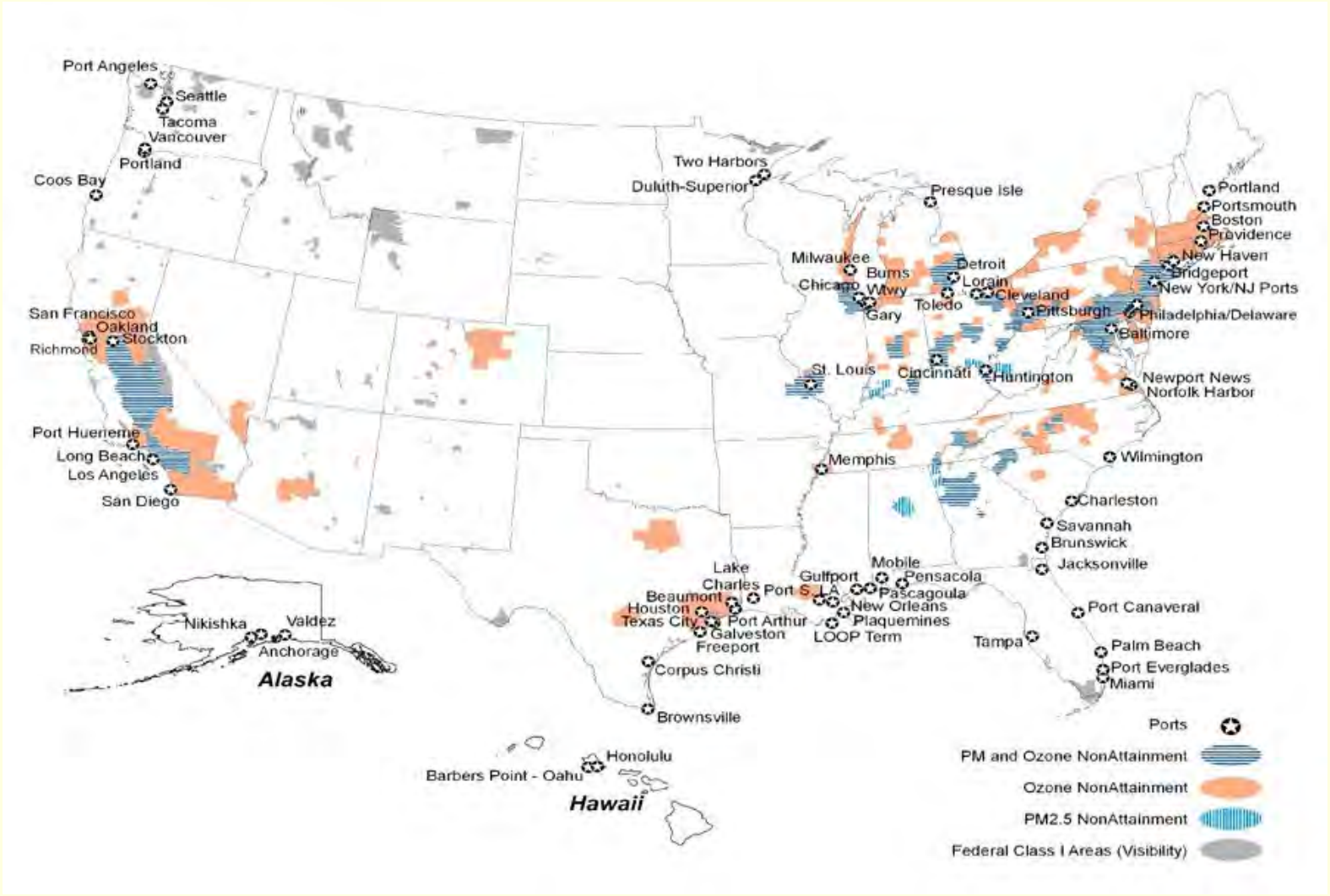
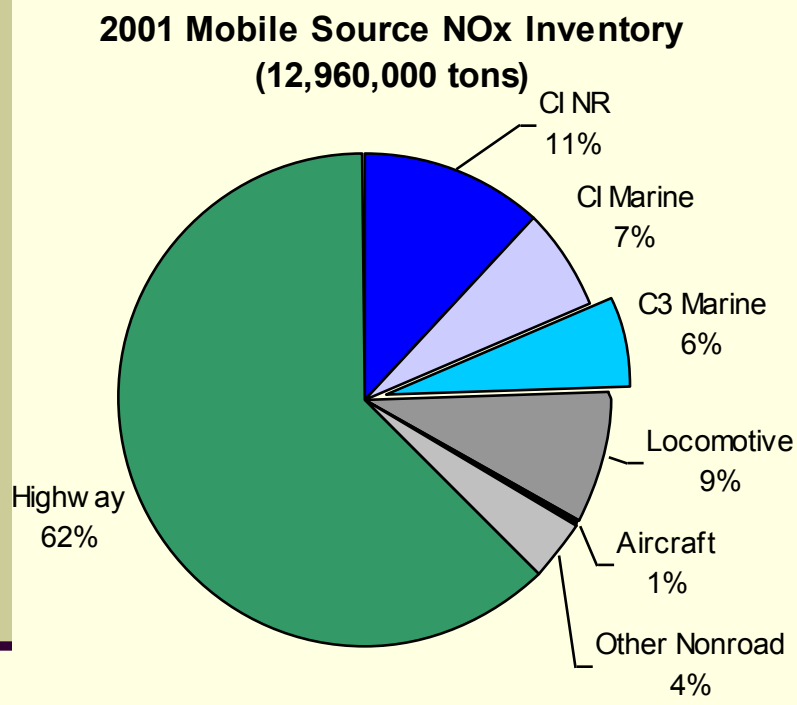
Ocean Going Vessels
International Regulatory Context

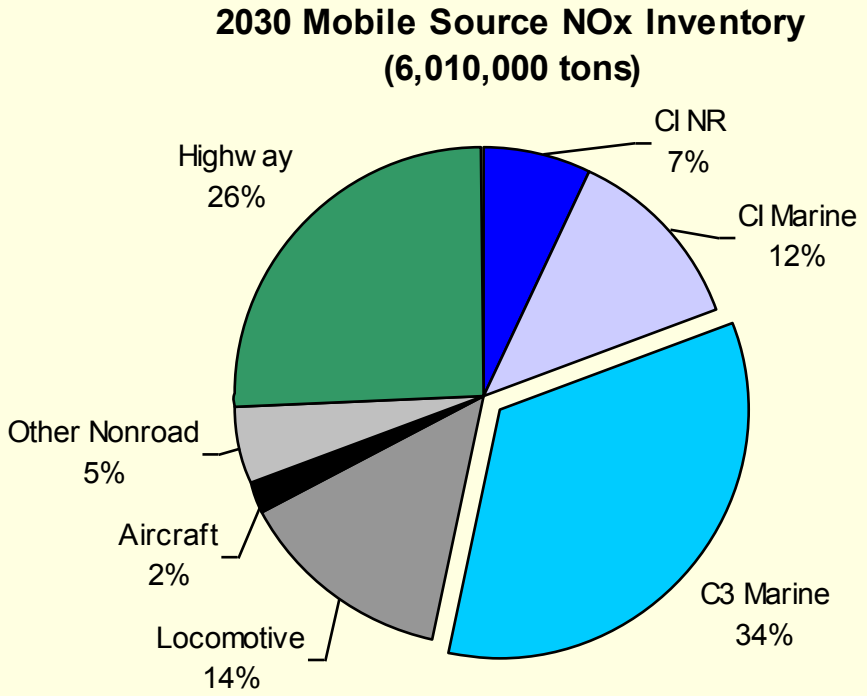
Gay MacGregor
U.S. Environmental Protection Agency
November 2008

Need for Control:
US Ports and Nonattainment Areas



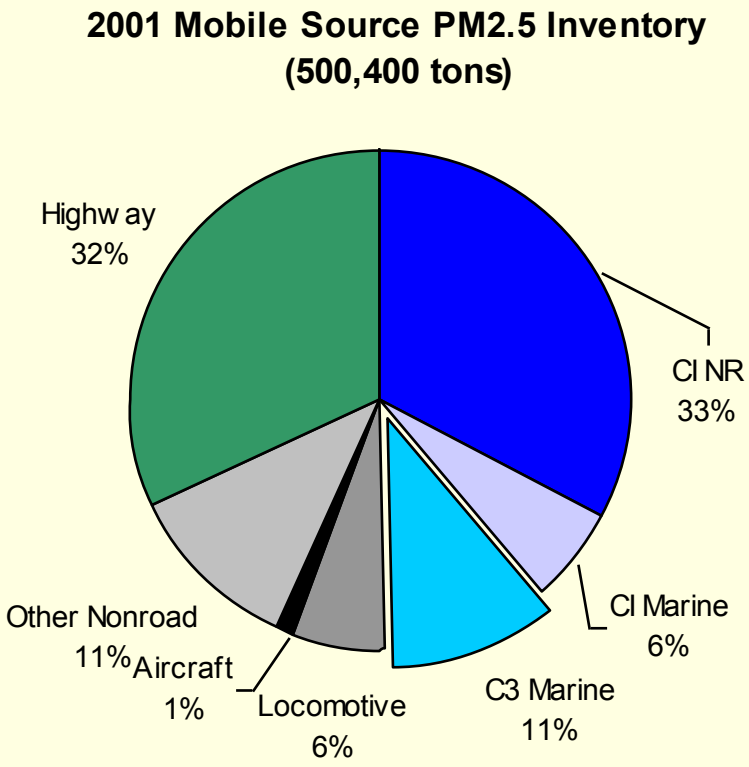
Need for Control:
C3 Marine Contribution to NOx Inventory

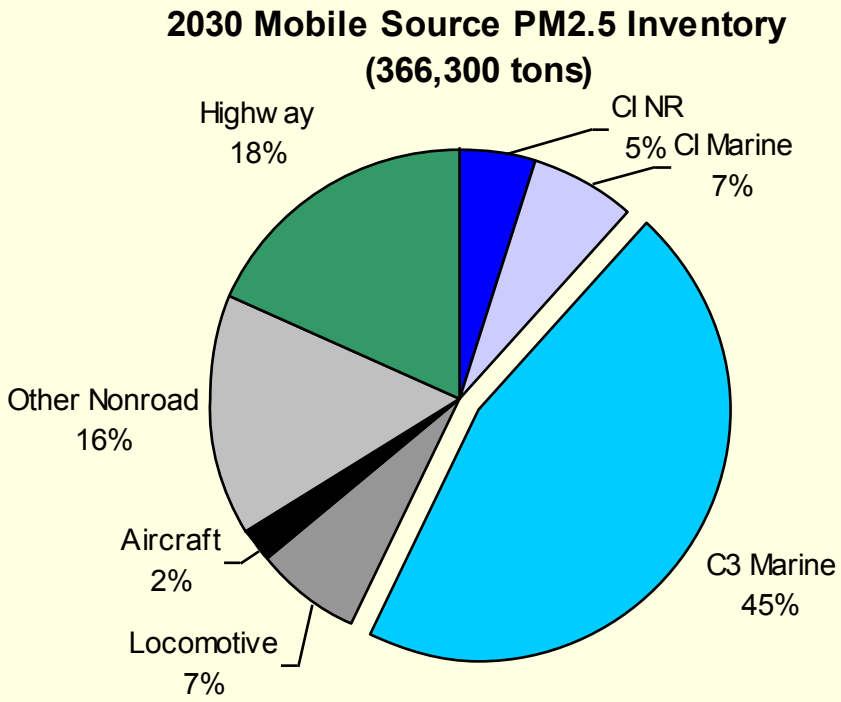




Source of inventory estimates: C3 Marine ANPRM, 72 FR 69522 (Dec 7, 2007)
Does not reflect IMO MARPOL Annex VI Amendments (October 2008)

Need for Control:
C3 Marine Contribution to PM Inventory





Source of inventory estimates: C3 Marine ANPRM, 72 FR 69522 (Dec 7, 2007)
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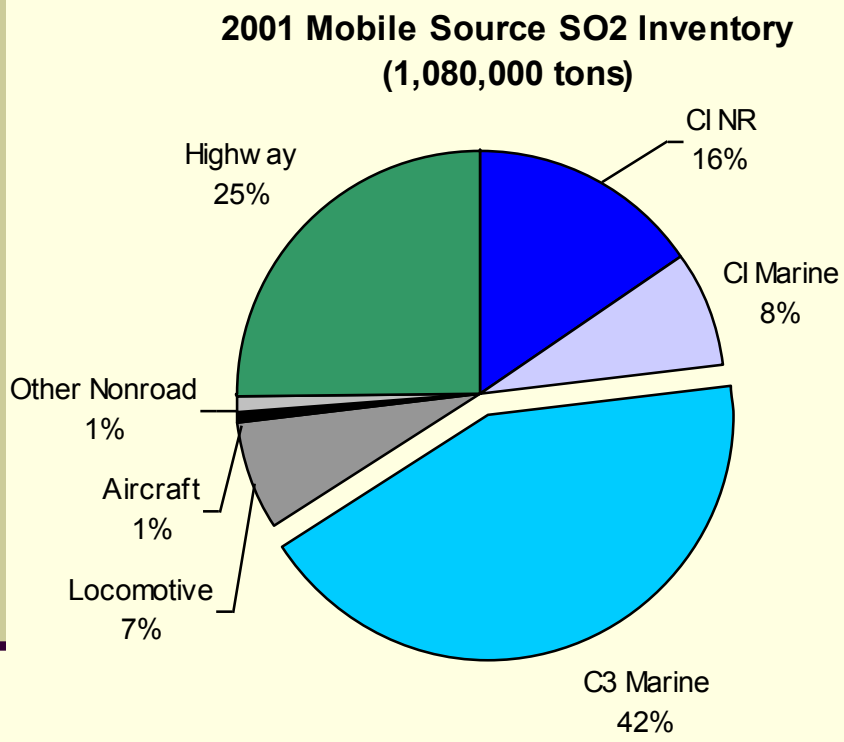
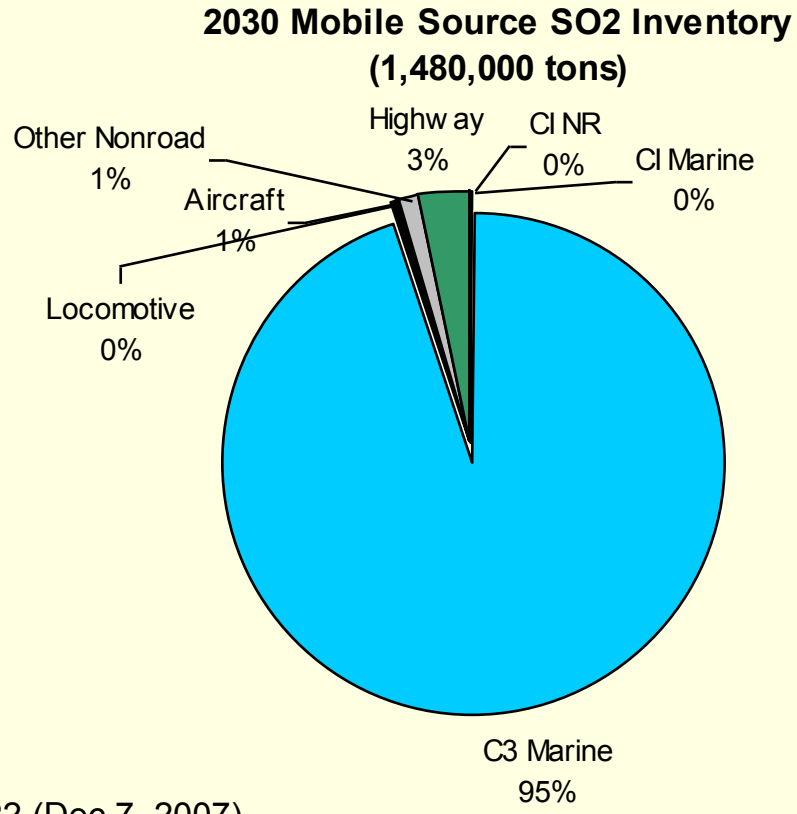
Need for Control:
C3 Marine Contribution to SOx Inventory





Source of inventory estimates: C3 Marine ANPRM, 72 FR 69522 (Dec 7, 2007)
Does not reflect IMO MARPOL Annex VI Amendments (October 2008)

Need for Emissions Reductions: Ship Contribution to Port Inventories

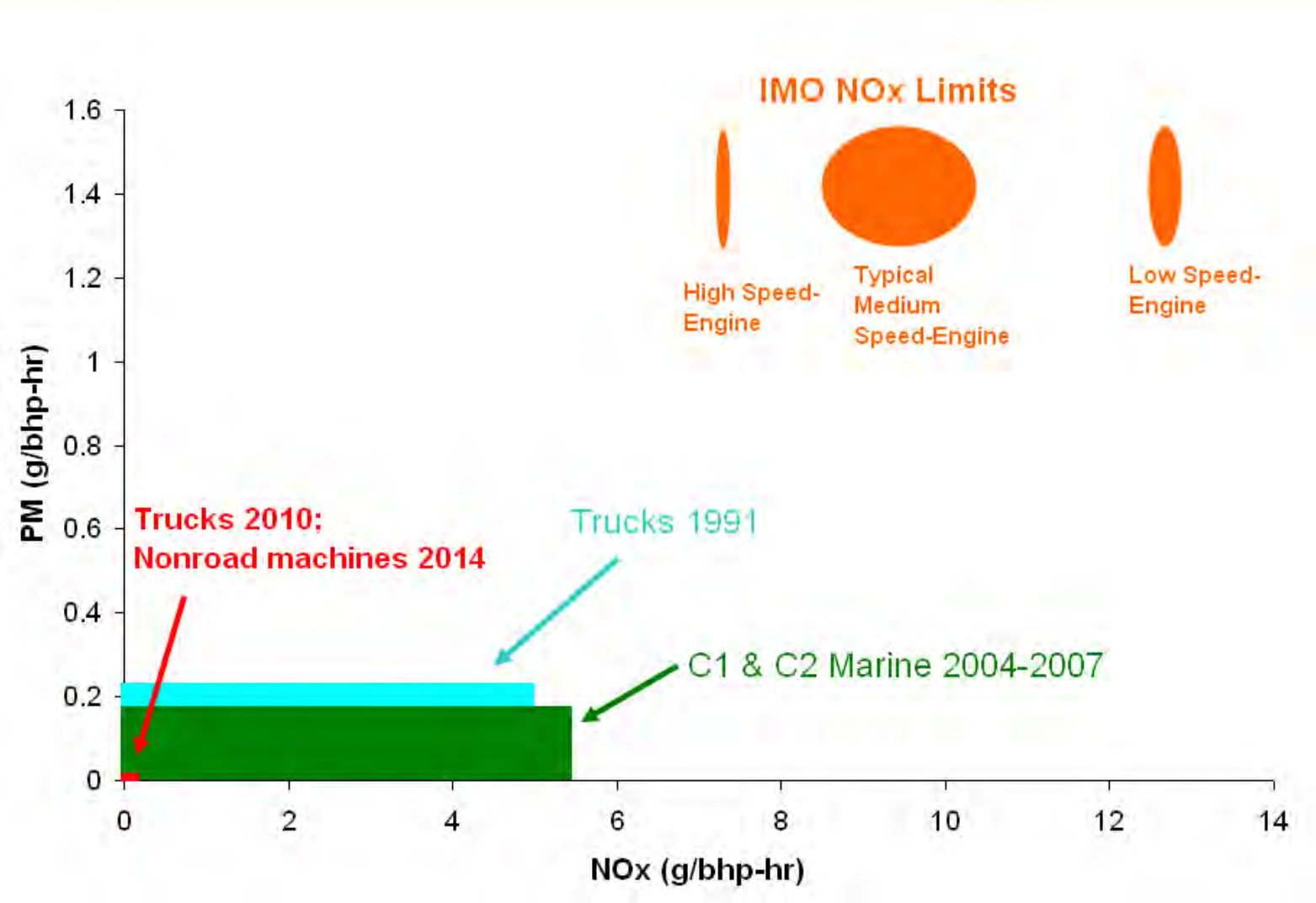
C3[a] Contribution to Selected Ports

Port Area	NOx	$PM_{2.5}$	SOx
Seattle, WA	10%	20%	56%
Tacoma, WA	20%	38%	74%
Oakland, CA	8%	14%	80%
LA/Long Beach, CA	5%	10%	71%

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

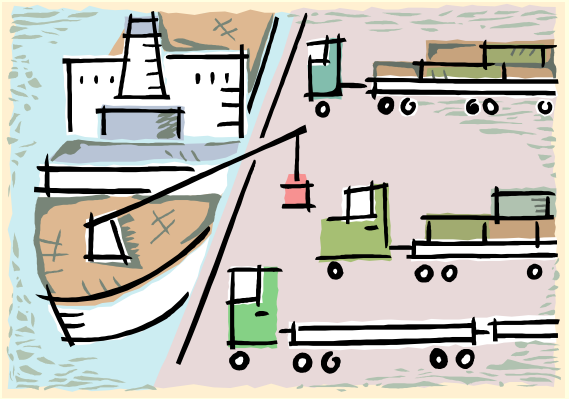
Source of inventory estimates: C3 Marine ANPRM, 72 FR 69522 (Dec 7, 2007)
Does not reflect IMO MARPOL Annex VI Amendments (October 2008)

Opportunity for Control: EPA & IMO Tier 1 Standards



National Clean Diesel Campaign
Our Roadmap

- Comprehensive EPA program to address diesel emissions across industry sectors
  - regulatory and voluntary programs
- Marine Regulations
  - Locomotive and Marine Rule
  - Ocean-Going Vessels
- Sustainable Ports
  - Strategies and Tools
  - Funding



CLEANPORTSUSA

EPA's National Clean Diesel Campaign Regulatory Roadmap

Tier 2 Light-Duty

final rule 1999

fully phased in 2009

Diesels held to same stringent standards as gasoline vehicles

These standard-setting rulemakings are key enablers for collaborative partnerships with industry and state & local governments

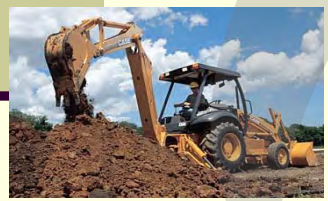
Heavy-Duty Highway

sales 800,000 / yr

40B gallons / yr

final rule 2000

fully phased in 2010



Nonroad Diesel

sales over 650,000 / yr

12B gallons / yr

final rule 2004

fully phased in 2015

Locomotive/Marine

sales 40,000 marine engines,

1,000 locomotives / yr

6B gallons / yr

final rule 2008

fully phased in 2017

Ocean Going Vessels

C3 Rule Dec 2009

IMO MARPOL Annex VI

ECA Controls

- Fuel Based 2015
- SCR Catalyst Based 2016

Note: sales and diesel fuel usage vary year-to-year; these figures are for comparison purposes only

EPA's National Clean Diesel Campaign: Technology Roadmap Mile Markers

- Year NOx Standards Premised on Diesel Aftertreatment Become Mandatory
  - 2009 Light-Duty Tier 2 Cars
  - 2010 Heavy-Duty Trucks
  - 2014 Nonroad Equipment
  - 2014 Largest C2 Marine
  - 2015 Locomotives
  - 2017 C1 Marine
  - 2016 C3 Ocean Going Vessels
    - IMO Annex VI Tier 3 standards

Regulatory Tool: EPA C3 Marine Rule

- **EPA developing a Clean Air Act rule for OGVs**
  - **C3 – Category 3 marine engines >30 l/cyl**
- **C3 Advanced Notice of Proposed Rulemaking**
  - Issued November 2007
  - Comment period closed March 2008
  - Mirrored our proposal to IMO submitted Feb 2007
  - Annex VI amendments approved October 2008 have same Tier 2 / Tier 3 structure as this ANPRM
- **C3 Marine Final Rulemaking**
  - by December 2009

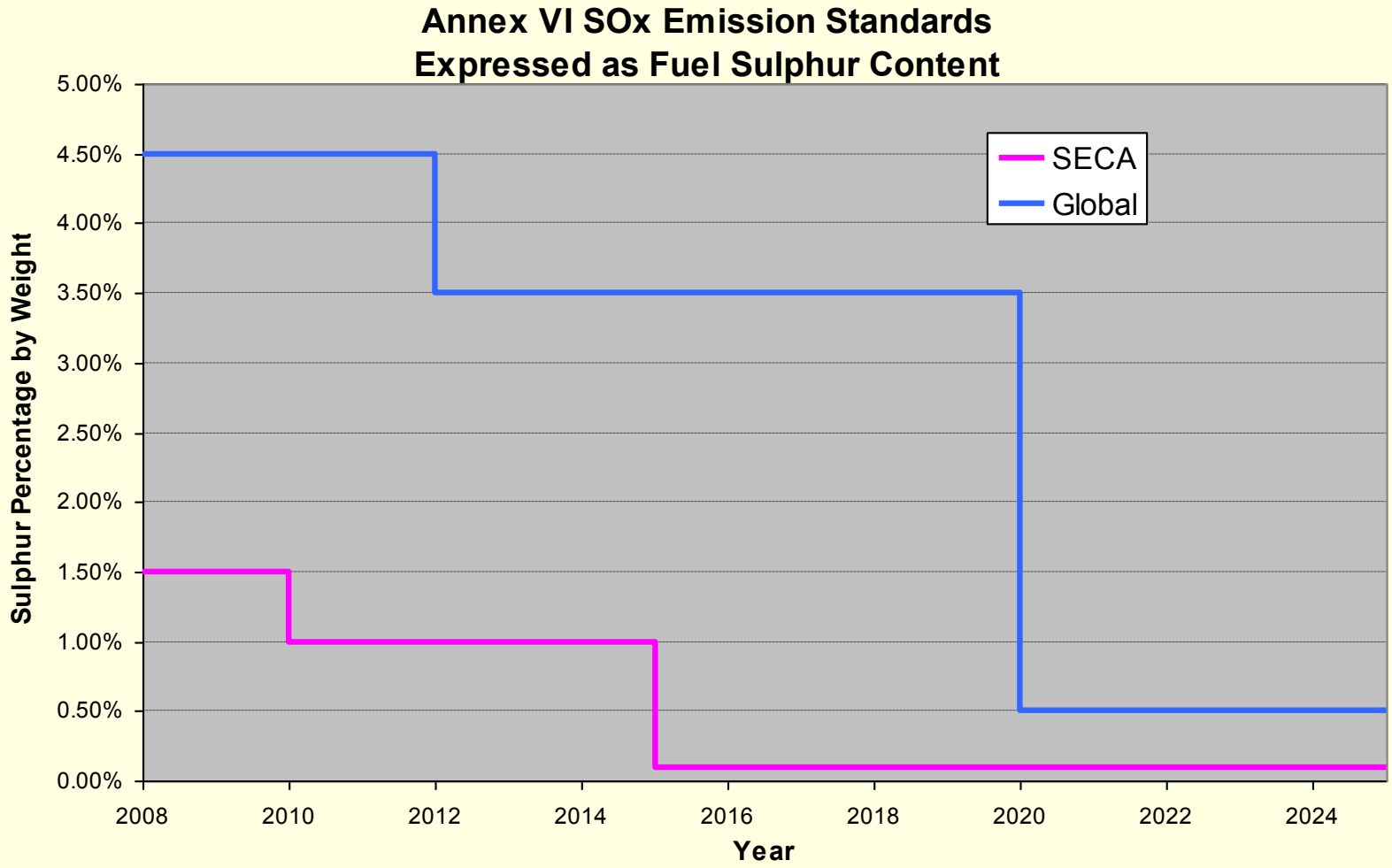
MARPOL Annex VI Amendments: Global Standards

- New engines
  - Tier 2: 20% reduction from Tier 1 NOx standard in 2011
- Fuel Quality Standards
  - 2012: Sulfur limit of 3.5%
  - 2020: Sulfur limit of 0.5%
    - subject to a review in 2018; if review indicates fuel will not be available, the date defaults to 2025
- Existing engines
  - Tier 1 applies to engines above 5,000 kW and 90 l/cyl installed on ships constructed on or after 1/1/90 through 12/31/99, if a certified system is available
  - Installation of certified system would occur at the first renewal survey that occurs 12 months after the system is certified
- Program allows alternative measures to be used (e.g. scrubbers) for all of the emission limits

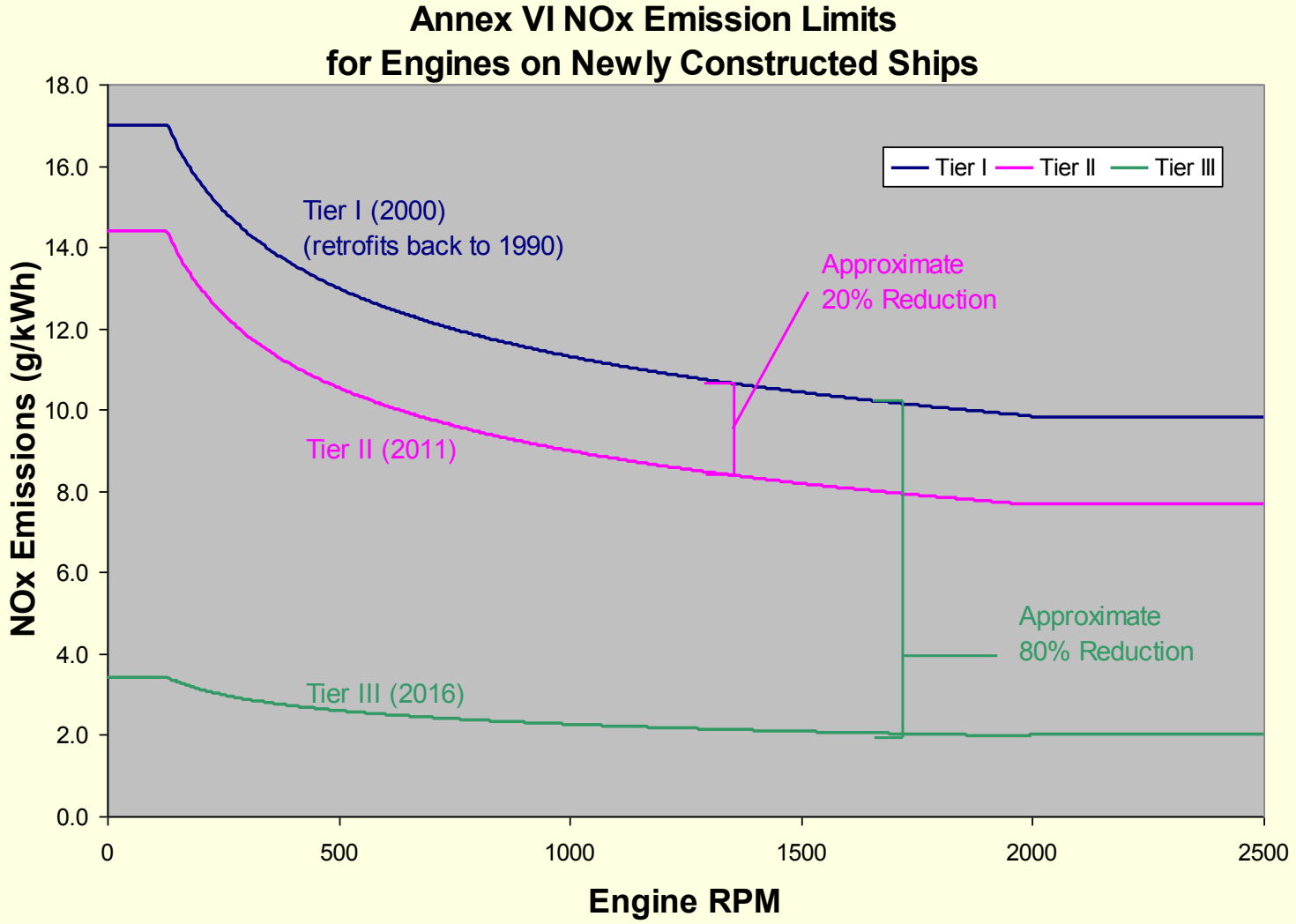
MARPOL Annex VI Amendments: Emission Control Area Standards

- Applicable only in designated Emission Control Areas
- New engines
  - Tier 3: 80% NOx reduction from Tier 1 in 2016
    - Premised on the use of Urea SCR catalyst technology
- Fuel Quality Standards
  - March 2010: 1.0% Sulfur
  - 2015: 0.1% Sulfur
    - 96% SOx reduction
    - 85% PM reduction from today's levels

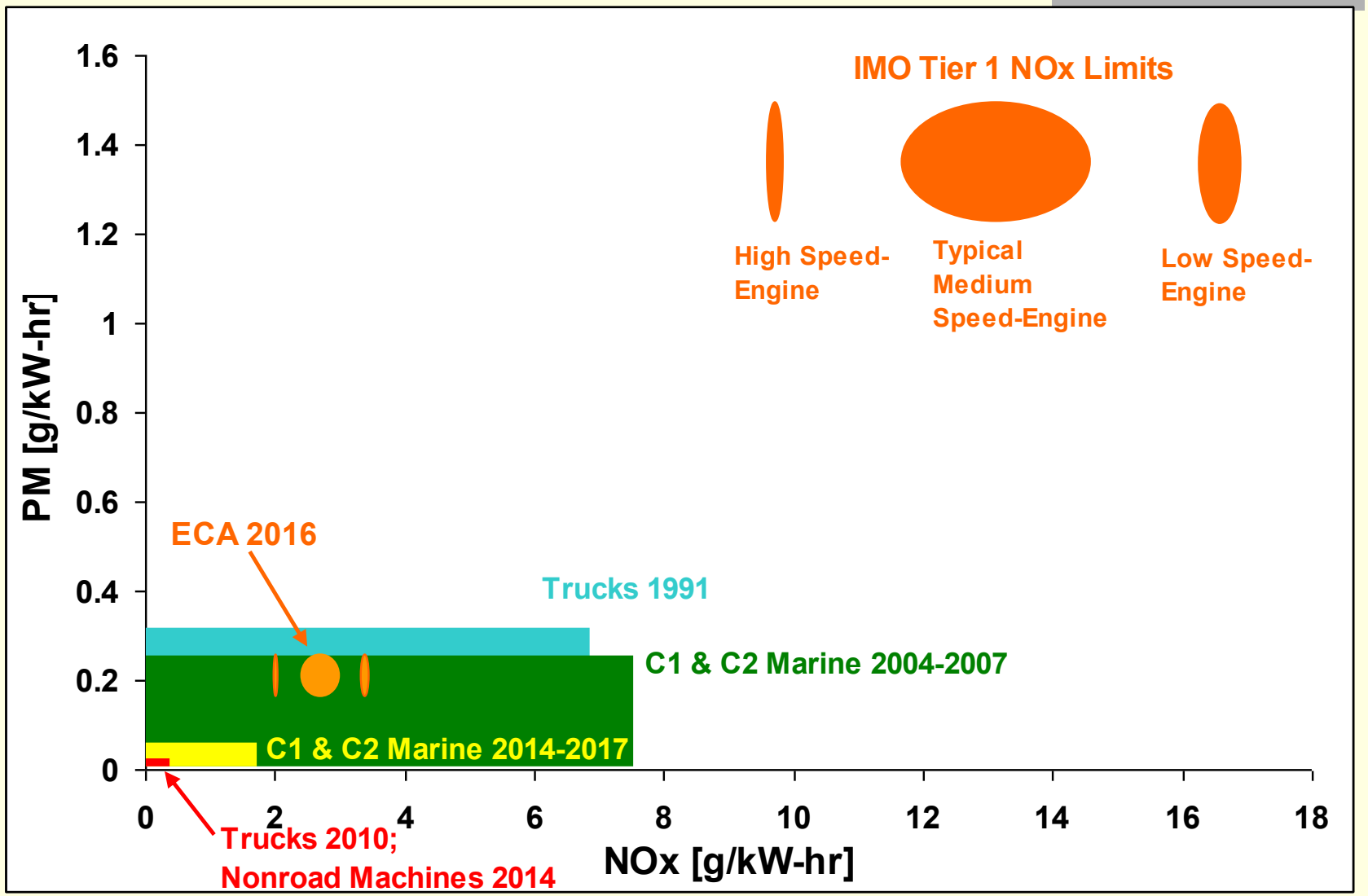
Regulatory Tool: Annex VI Fuel S Standards



Regulatory Tool: Annex VI NOx Standards



Regulatory Tool: Marine Tier 3 Controls (ECA 2016)



Regulatory Tool:
US / Canada Emission Control Area (ECA)

- Full benefits of Annex VI program realized through designation of Emission Control Areas (ECAs)
- US President Bush and Canadian Prime Minister Harper committed to work together on an ECA designation for North America at the Security and Prosperity Partnership meeting in March 06:

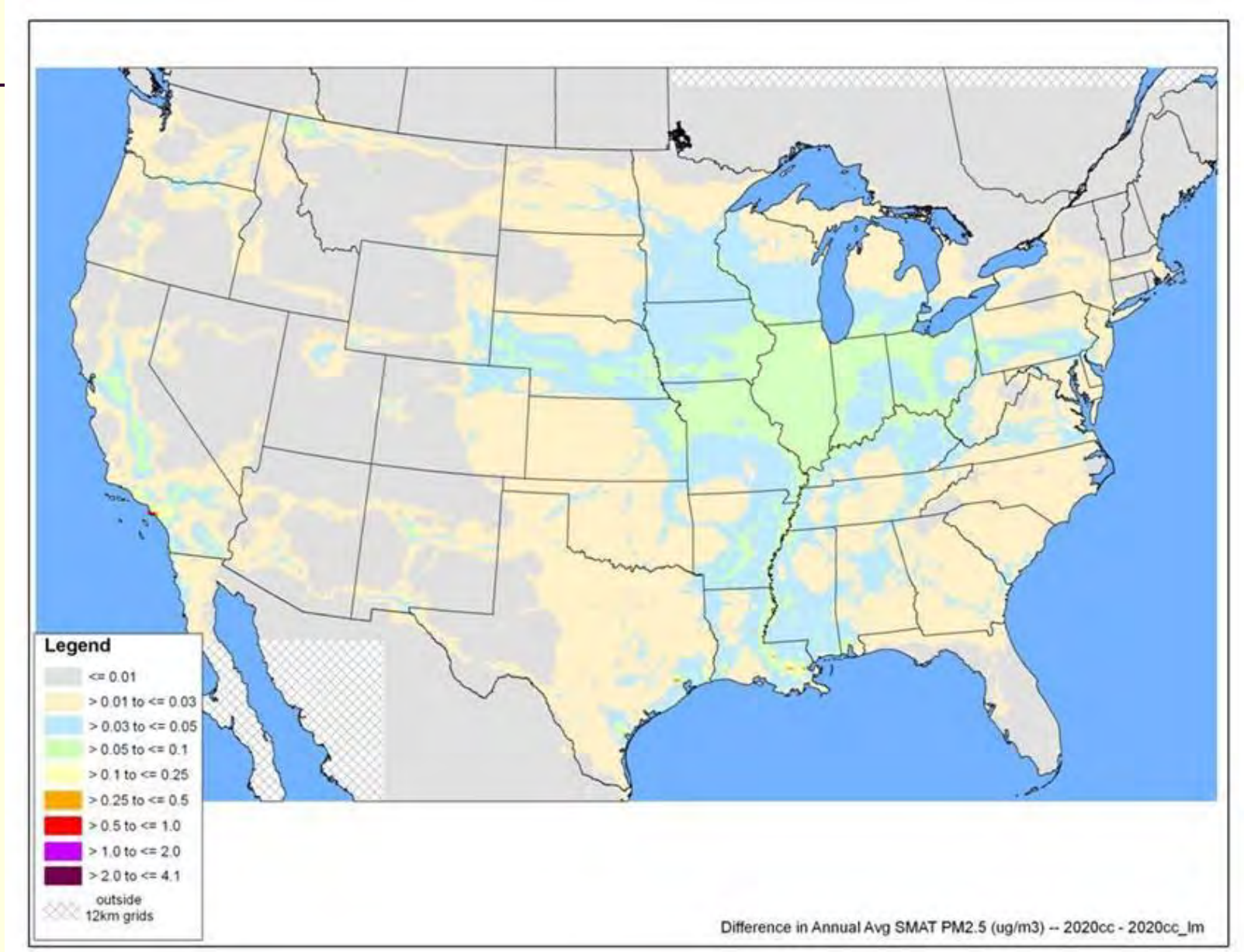
  – ***To reduce marine air pollution …. Our two countries are preparing to approach the International Maritime Organization to designate special areas for controlling sulfur emissions from marine vessels.***"

- A joint US – Canada ECA will provide improved air quality for both countries and a level playing field for our ports

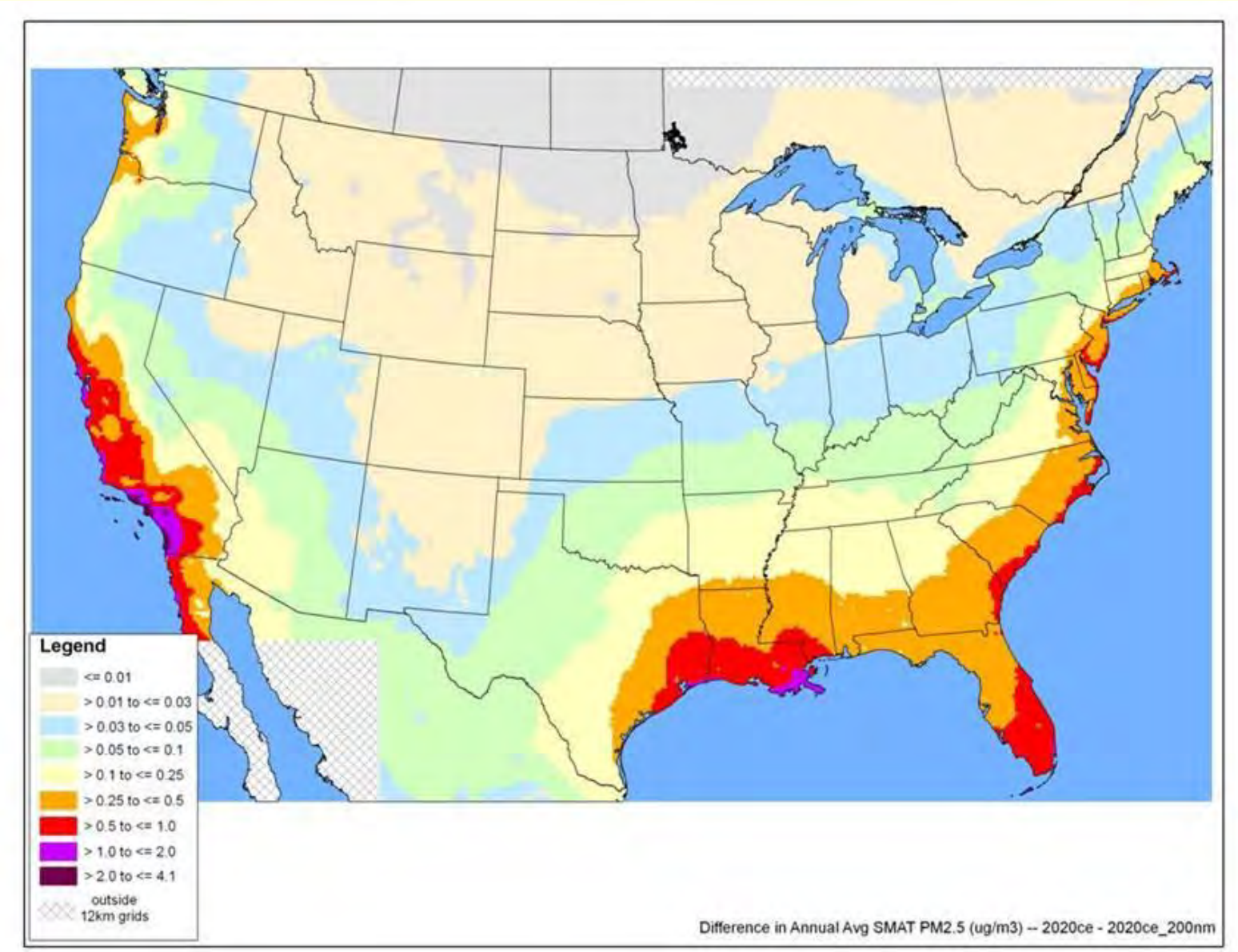
Regulatory Tool: ECA Application Requirements

- delineation of the proposed area of application
- description of the human populations and environmental areas at risk from the impacts of ship emissions;
- assessment of contribution of ships to ambient concentrations of air pollution or to adverse environmental impacts.
- relevant information pertaining to the meteorological conditions in the proposed area of application to the human populations and environmental areas at risk
- description of ship traffic in the proposed ECA
- description of the control measures taken by the proposing Party or Parties
- relative costs of reducing emissions from ships when compared with land-based controls, and the economic impacts on shipping engaged in international trade

Impact of New Locomotive and Marine Diesel Engine Rule on $PM_{2.5}$ levels in 2020



Potential Benefit for US of US/Canada ECA:
Early Preliminary Estimates - 2020 PM2.5 Reductions from IMO Program



Addressing GHGs from OGVs

- Similar approach to criteria pollutants
  - Voluntary programs – NCDC & SmartWay
  - Regulatory programs
- Regulatory Tools
  - Clean Air Act (CAA)
    - EPA has received 3 petitions demanding action to address GHGs from OGVs under the CAA
  - International Maritime Organization (IMO)

GHG Regulatory Tool: Clean Air Act ANPRM

- EPA Advanced Notice of Proposed Rulemaking (ANPRM) for GHGs
  - Signed July 11, 2008
  - Explores relevant sections of the CAA and implications of possible regulations of stationary and mobile sources
  - Solicit public input and relevant information
    - Best available science relevant for endangerment finding
    - EPA's first responses to 7 nonroad petitions

Approaches Discussed in ANPR for Building an Effective GHG Program

Operations-based measures—

- used in voluntary EPA programs (such as Smartway)
- may provide good opportunity to gain credits
- greater human element-- reductions must be verifiable
- provides many more options—
  speed reduction, idling reduction, system efficiency improvements, …

Vehicle-based measures—

- (or —equipment”-based, or —vessel”-based)
- has been EPA approach for LD highway – —g/mi”
- aligned with new vessel Energy Efficiency Design Index considered at IMO

Engine-based measures--

- traditional EPA standards-setting for HD highway and nonroad sectors – —g/bhp-hr”
- rewards only engine design improvements
- similar to Annex VI approach for NOx

GHG Regulatory Tool: International Action at IMO

- Many countries (US included) have emphasized need for IMO to have a leading role to address OGVs
- Many countries (US included) recognize need to take environmentally effective action to address GHGs
- Many countries (US included) recognize marine transport is fundamental to global economy and most GHG efficient way of transporting goods
- Many countries (US included) want to ensure results are economically sustainable and don't cause goods to be transported to less efficient types of transport.
- THERE IS BROAD AGREEMENT ON MANY OF THE MOST IMPORTANT ISSUES

IMO MEPC:
Lots of Work Still to Be Done

- Principles for action and other steps made at MEPC 58 are very important, but many questions remain unanswered.
  - What are our objectives?
  - How do we ensure consistency of action?
  - How do we ensure consistency with IMO principles?
  - How do we balance competing priorities among countries/groups of countries?
  - What level of action?
  - How to get better emissions data?
  - What is the most cost-beneficial way to reduce emissions and ensure a strong maritime sector?

OGV GHG Conclusions

- US takes climate change seriously for all sectors.
- US believes that IMO is the right international forum to address GHG emissions for OGVs
- Achieving right solution for maritime will require innovative and constructive approaches.
- US believes that the Energy Efficiency Design Index from MEPC 58 is an important step forward and we look forward to finalizing the index.

National Clean Diesel Campaign Guides for the Roadmap

- More information about EPA's NCDC Regulatory Programs
  - www.epa.gov/otaq/marine.htm
  - www.epa.gov/otaq/oceanvessels.htm

  - Contact: Michael Samulski
    - Samulski.Michael@epa.gov
    - (734) 214-4532

- More information about EPA's NCDC Clean Ports USA Program
  - www.epa.gov/cleandiesel/ports

  - Contact: Trish Koman
    - Koman.Trish@epa.gov
    - (734) 214-4955