



International Efforts to Improve Air Quality: Update on IMO MARPOL Annex VI

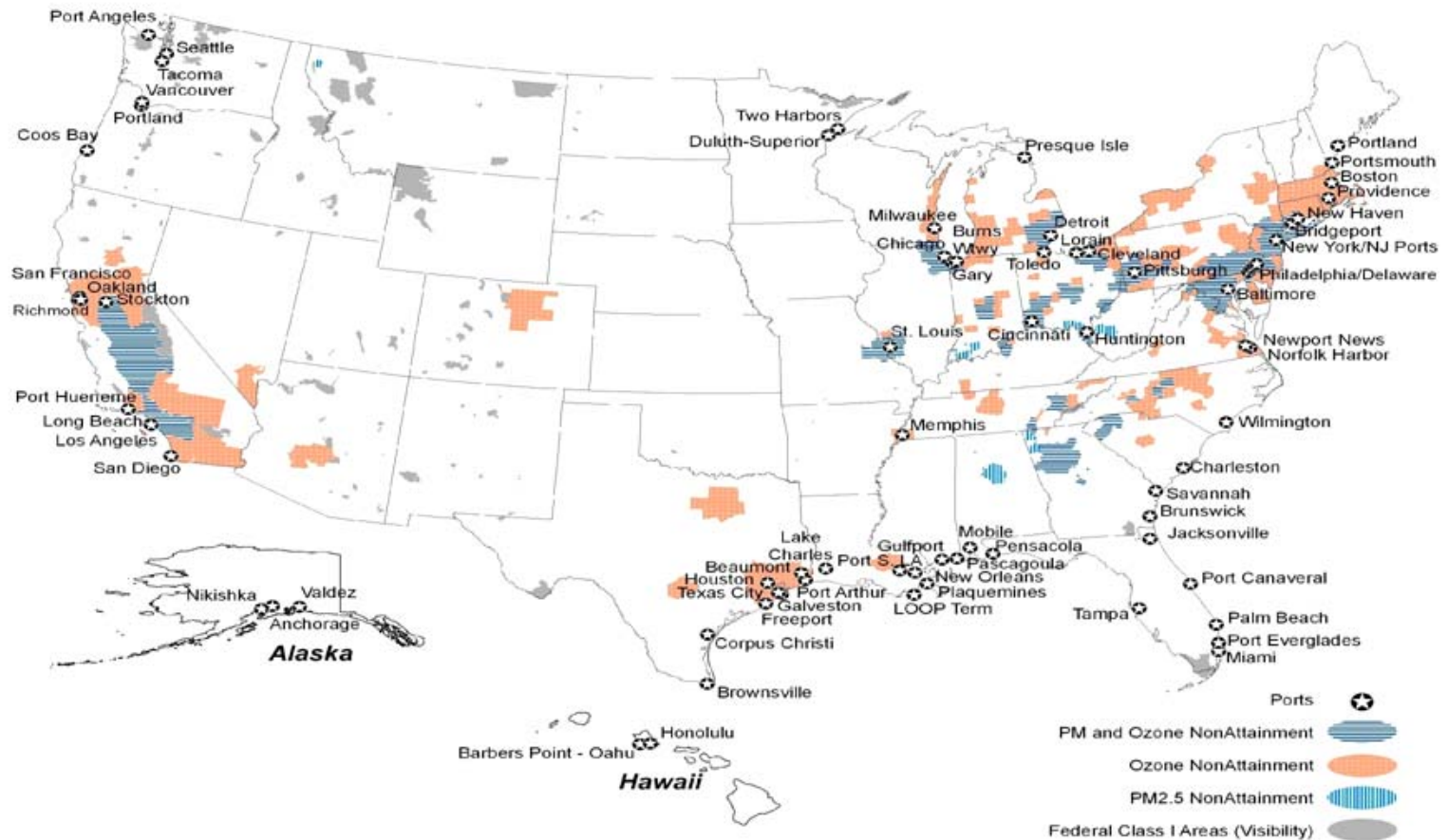
Byron Bunker
Center Director
U.S. Environmental Protection Agency
September 17, 2008

Overview



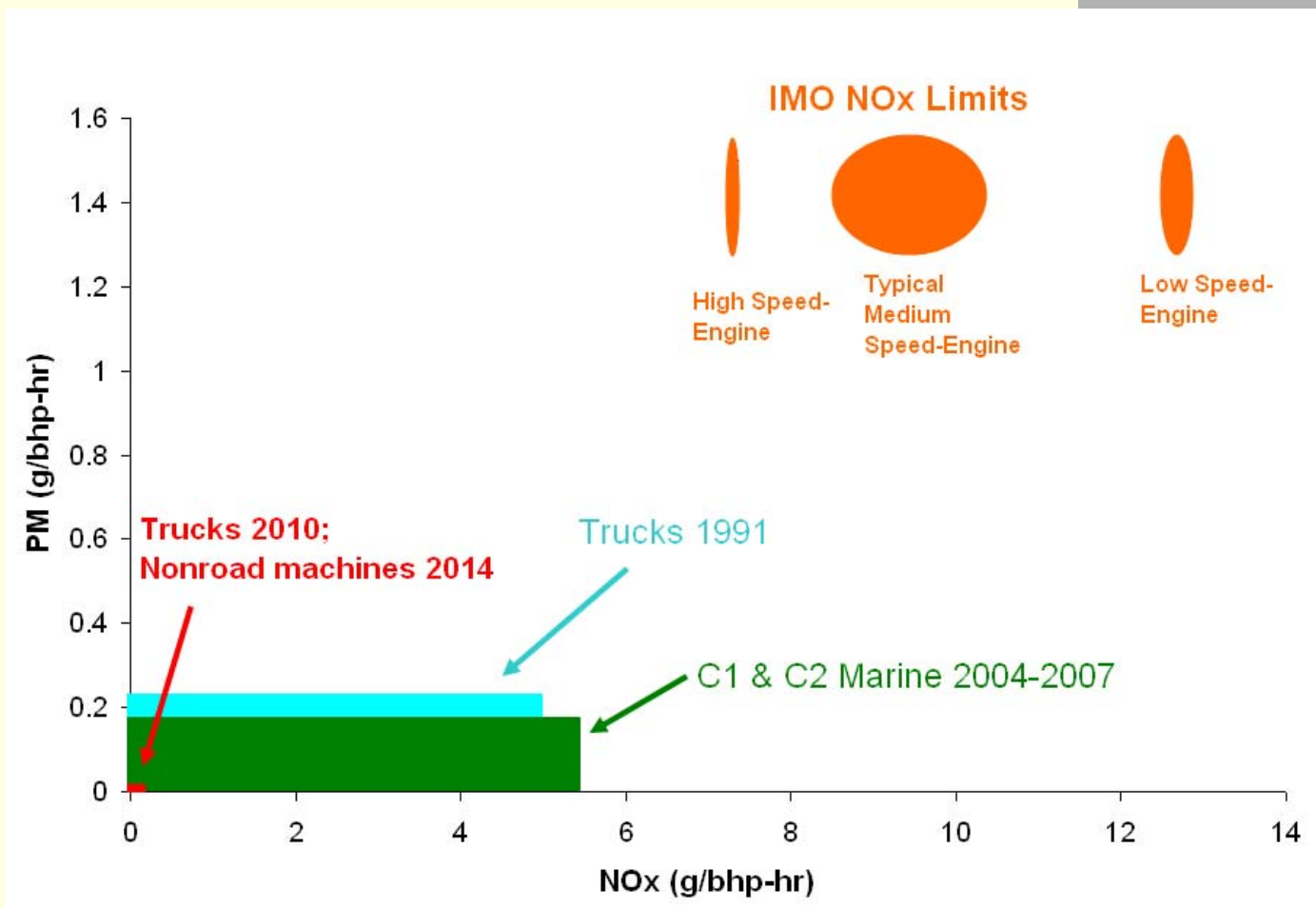
- Maritime Industry and Air Quality in U.S.
- IMO Status: MEPC 57 results
- Emission Control Area (ECA)
- Expected Air Quality Benefits of the IMO Program

Ports and Nonattainment Areas in the U.S.





EPA & IMO Tier 1 Standards



History of Annex VI Amendments

- 2005 MARPOL Annex VI came into effect
- July 2005 - Marine Environment Protection Committee (MEPC 53) agreed to begin negotiations on a new set of standards
- April 2007 – BLG 11 USG submitted a paper advocating a two Tier engine program and stringent new fuel standards for emission control areas
- April 2008 - MEPC 57 the parties agreed to the amendments described today
- October 2008 - MEPC 58 we expect the parties to formally adopt the amendments

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% 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% SO_x reduction & 85% PM reduction from today's levels

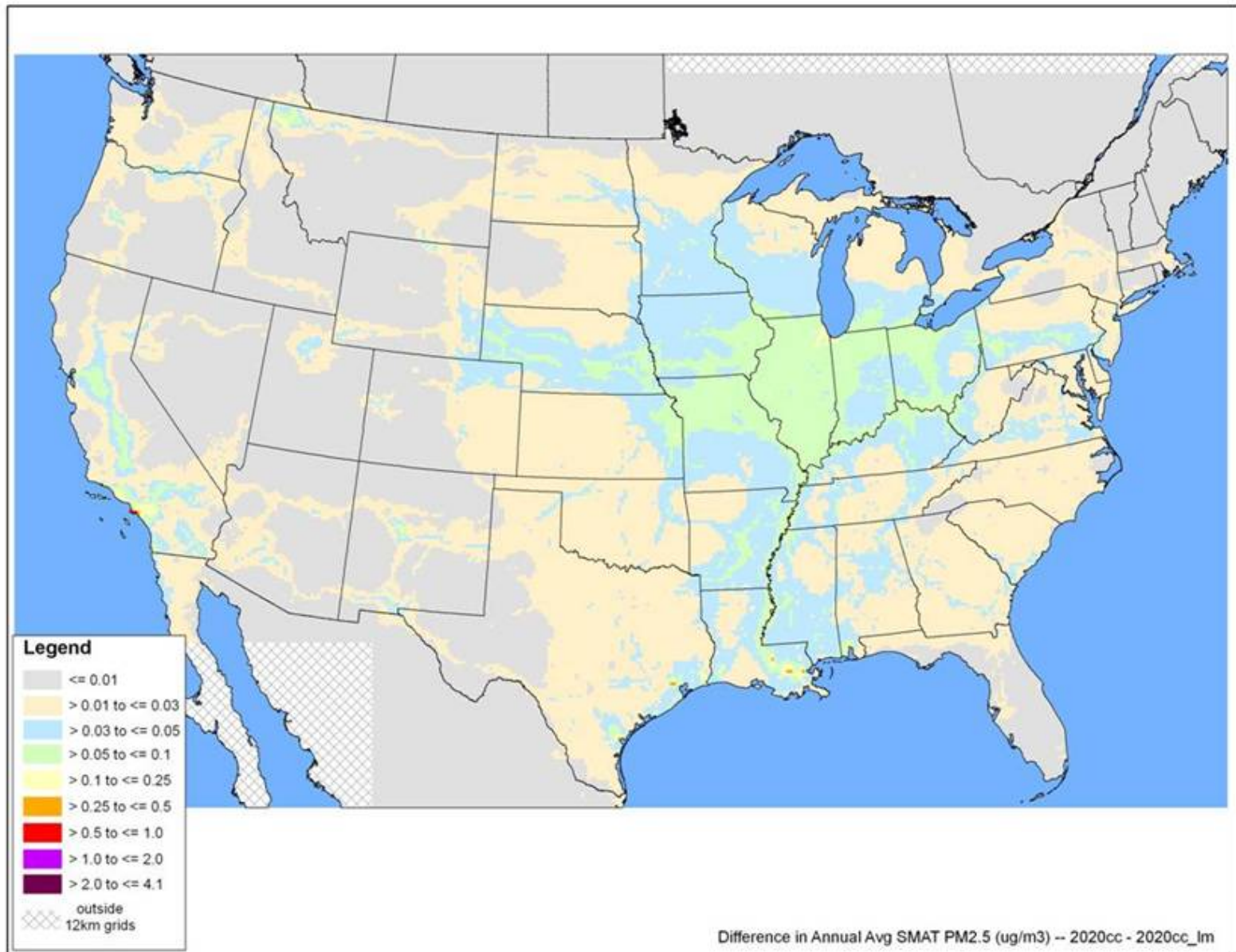
United States ECA



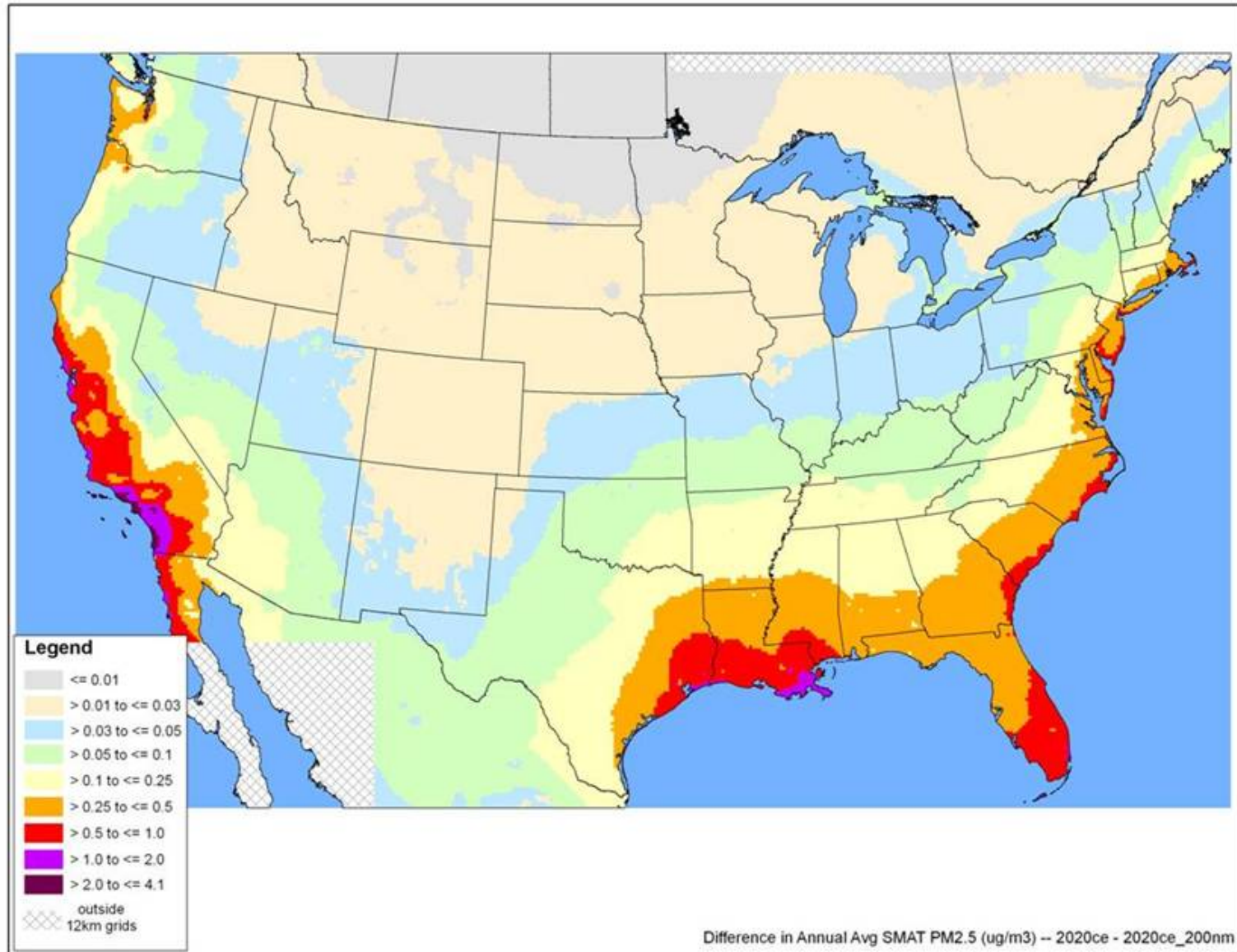
- The US needs to propose an amendment to MARPOL Annex VI in order to designate US coastlines as Emission Control Areas
 - More stringent fuel and engine standards would apply to all ships operating in the designated area regardless of flag

- EPA investigating the feasibility of an ECA designation
 - Contribution of ships: emissions, air quality impacts on human health and the environment
 - Technological feasibility
 - Air Quality Benefits
 - Economic impacts

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



Early Preliminary Estimates of PM2.5 Reductions Due to IMO Program in 2020



Conclusions


- Latest MARPOL Annex VI amendments have the potential to yield substantial public health and welfare benefits
- Those benefits will not only be significant in port communities but even in States well into the interior of the Country
- US must make seek an ECA designation to realize these benefits
- US is currently doing the analysis work necessary to seek such a designation

Additional Information



- More information about EPA's marine diesel engine emission control programs:
 - www.epa.gov/otaq/marine.htm
 - www.epa.gov/otaq/oceanvessels.htm

- Contact: Byron Bunker
 - Bunker.Byron@epa.gov
 - (734) 214-4155



Appendix – Backup Slides

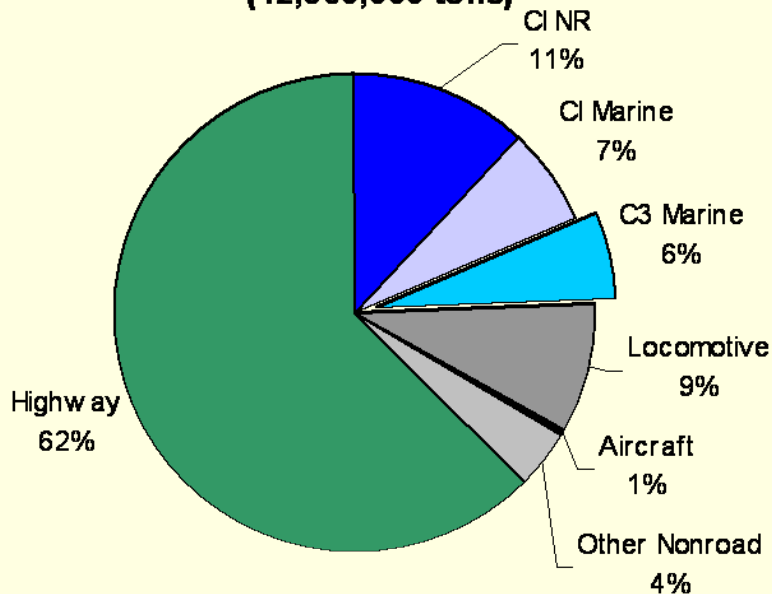


Inventory Overview of NOx

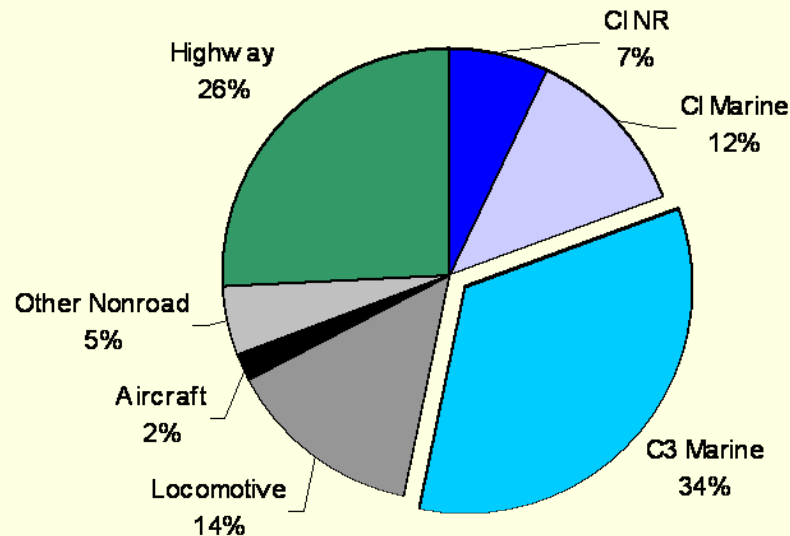


- Marine diesel engines contribute significantly to mobile source air pollution in the United States

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



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

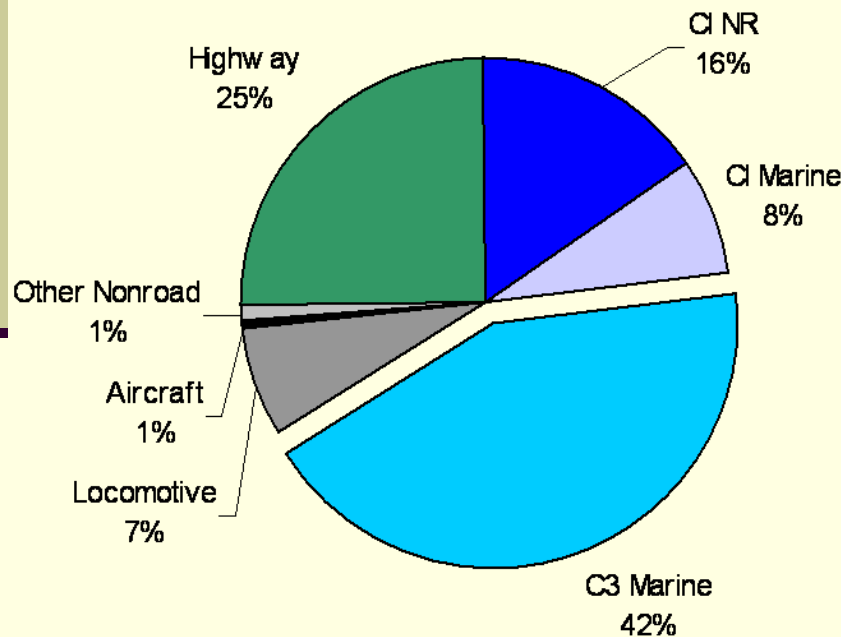


Inventory Overview of SOx

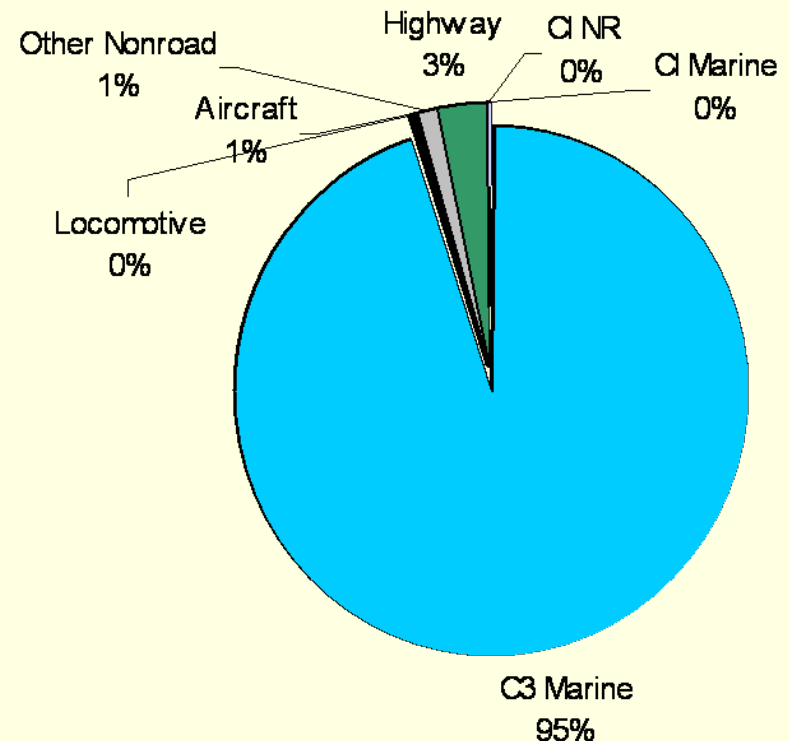


- SOx emissions are high due to the sulfur content of residual fuel used in C3 engines

**2001 Mobile Source SO₂ Inventory
(1,080,000 tons)**



**2030 Mobile Source SO₂ Inventory
(1,480,000 tons)**

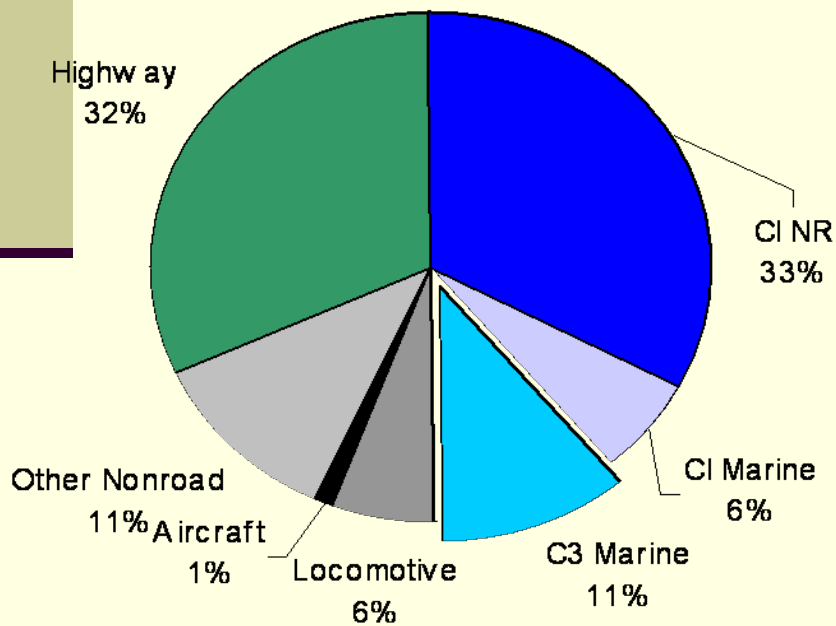


Inventory Overview of PM2.5

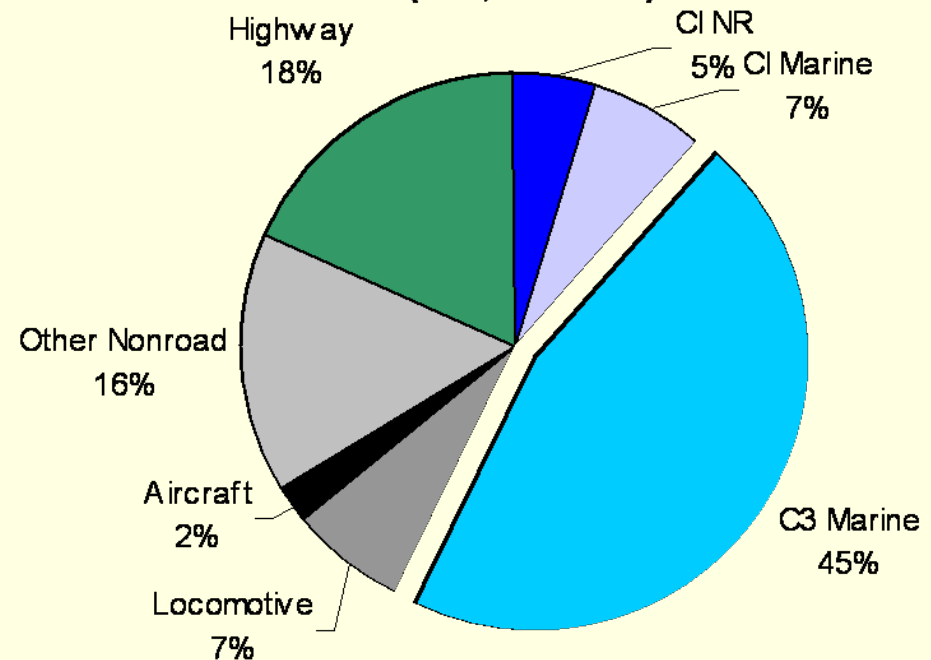


The marine diesel contribution is expected to grow as emissions from other sources decrease

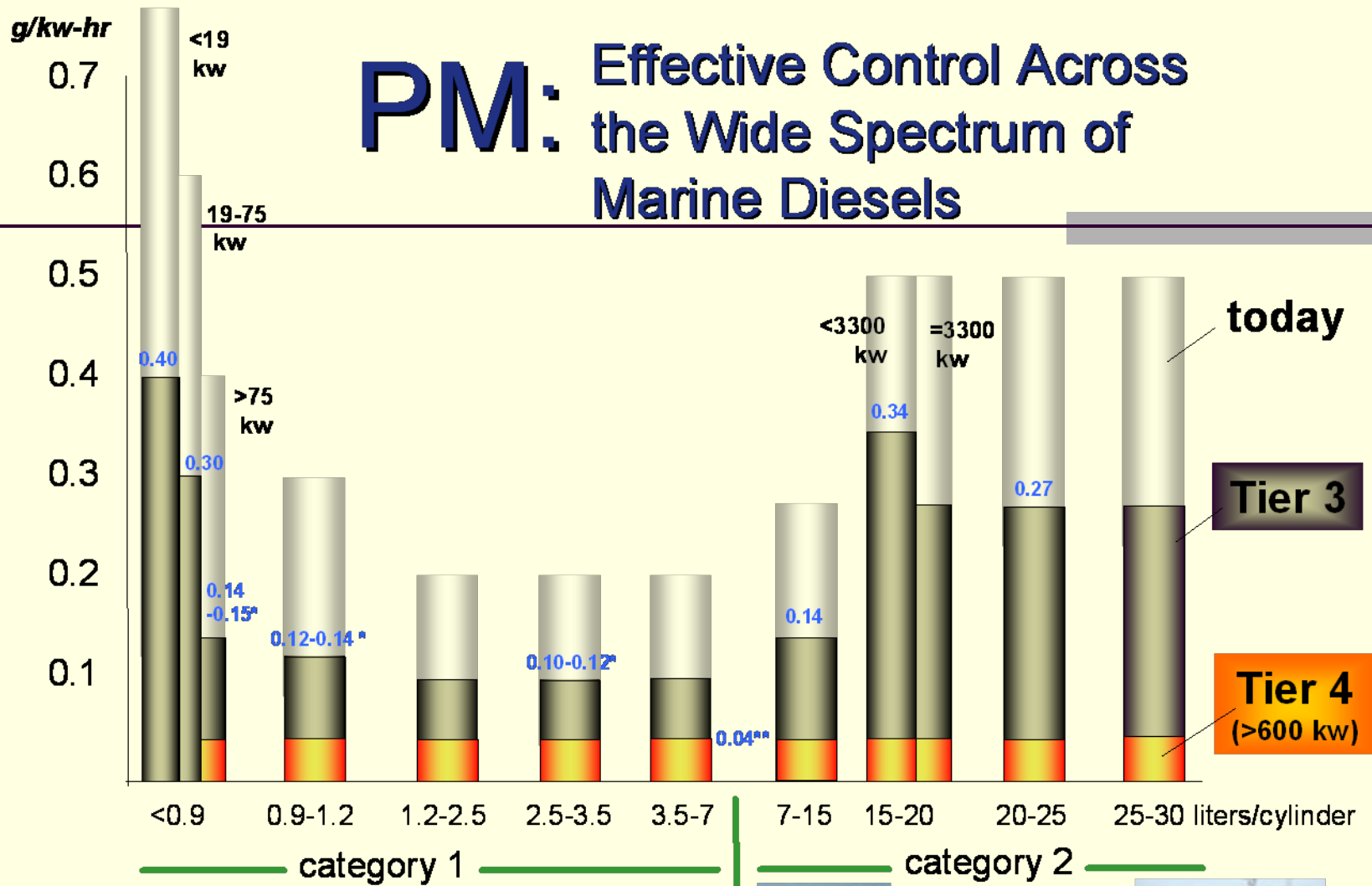
**2001 Mobile Source PM2.5 Inventory
(500,400 tons)**



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



PM: Effective Control Across the Wide Spectrum of Marine Diesels



* higher #s are for hi-power density engines.
 ** 0.06 for the very largest (>3700 kw) engines.

g/kw-hr

NOx: Effective Control Across the Wide Spectrum of Marine Diesels

12

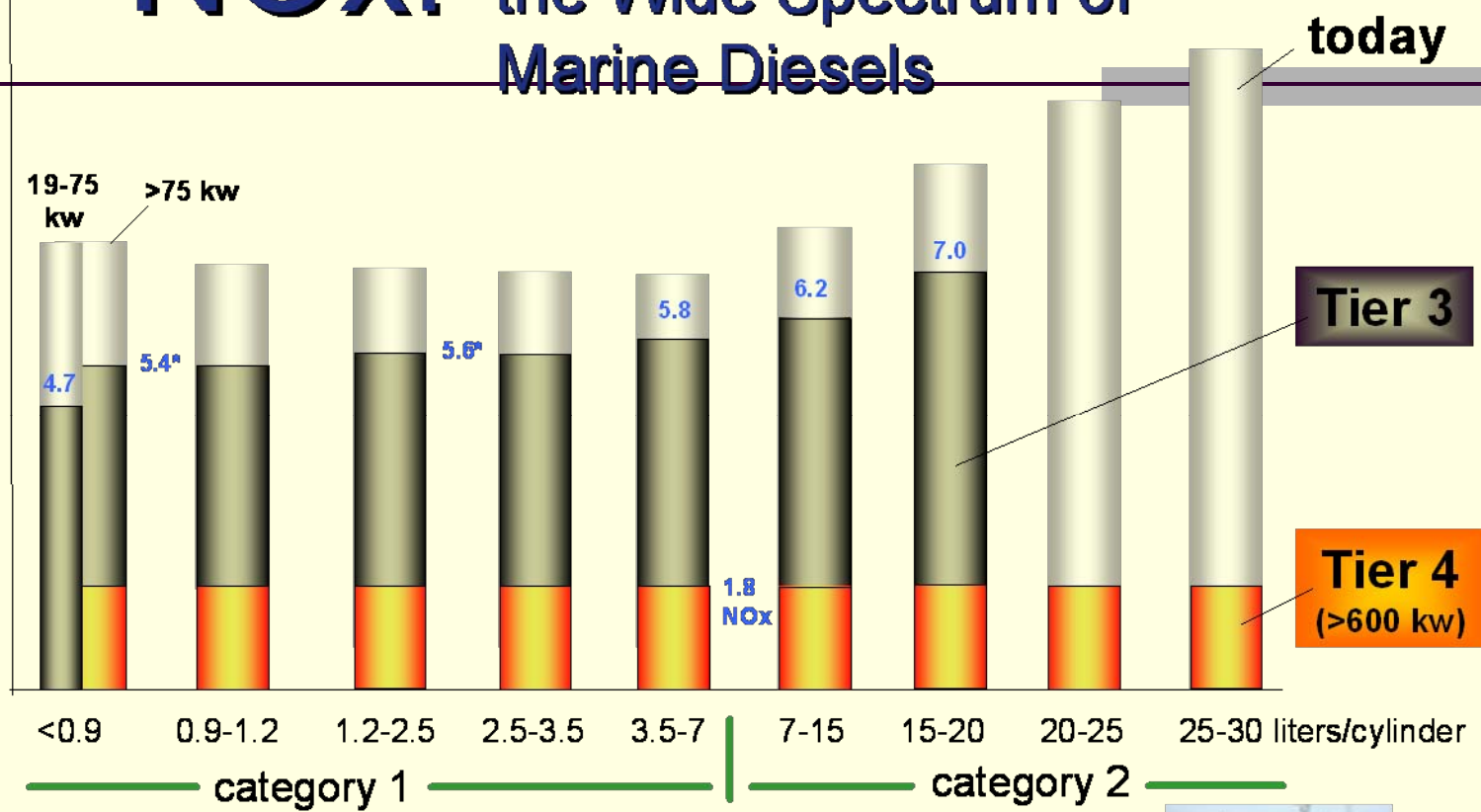
10

8

6

4

2



Standards are NOx+HC except Tier 4 (NOx).
Tier 3 NOx replaced by early Tier 4 for >2000 kw.
* 5.8 for hi-power density engines.