Trends in International, Federal, and Local Marine Emission Regulations

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Marine Transportation System: Major Themes

• Overarching trend: globalization and integration of transportation systems
• Modernization and expansion
• Multiple constraints and policy issues
  – ship air pollution only newest issue for industry
• Industry and government (MARAD) have central role to promote U.S. fleet potential
  – U.S. opportunity to be proactive, not left behind
Maritime Transportation is about global and regional mobility

- Provides unique service among transportation modes
- Can be leader in freight transportation
- One of the last unregulated modes for air pollution
- Aging U.S. fleet will need to modernize
  - U.S. cargo fleet average age = world fleet scrapping age
  - Ferries may modernize faster to increase regional transit
Ferries poised for dramatic growth

- World cargo fleet growth (average annual): 1.3%
- Container fleet growth (projected annual): 4-10%
- U.S. fleet historic annual replacement rate: <0.5%

- SF Bay Area ferry fleet growth (BAC projections): ~50% annually over the next 20 years
  - Currently ~12 ferries
  - Phase I growth: 75 ferries by 2010
  - Phase II growth: up to 125 ferries by 2020
Regulatory Trends:

• International standards (adopted but not yet ratified) sent a clear regulatory signal for new engine standards

• National and multinational regional air quality will continue to impose more stringent standards
  – U.S. EPA regulations, Baltic and North Sea Special Area designation, Sweden’s Market-based Approach

• State and local requirements to meet clean air standards will continue to focus regulatory action
  – address existing engines through retrofit standards, emissions trading incentives, and operational requirements
Federal and Multinational Efforts

Harmonize International Standards with Specific Local Air Quality Impacts

– State Implementation Plans (SIPs) and regional air quality issues look for maritime reductions
– National Inventory, improving detail and accuracy of regional and local inventories
– Uncertainties are being reduced, picture becoming clearer
  • Inventories becoming more accurate (lower in TX)
  • Monitoring protocols under development (USCG, CMU/UDel, MARAD)
  • Impacts modeling becoming more focused (Ozone, Regional haze, etc.)
## Marine emission standards and comparisons (g/kw-hr)

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<th>Name</th>
<th>Start</th>
<th>HC</th>
<th>NO\textsubscript{X}</th>
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<tr>
<td>&lt; 130 rpm</td>
<td>2000</td>
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<td>17.0</td>
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<td>17.0 – 9.8</td>
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<td><strong>EPA Locomotive</strong></td>
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<tr>
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<td>0.4</td>
<td>7.4</td>
<td>2.0</td>
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| **EPA on-road diesel engines**|            |        |                     |       |       |
| Tier 1                        | 2000       | 1.3 (HC)| 11.4               | 0.54  |
| Tier 2                        | 2001-06    | 6.4 – 6.6| 3.5               | 0.20  |
| Tier 3                        | 2008-10    | 4.0     | 3.5                 | 0.20  |

| **EPA Non-Road**              |            |        |                     |       |       |
| **EPA Marine Diesel**         |            |        |                     |       |       |
| Tier 1                        | 2000       | 7.2    | (MARPOL) 2.0 – 3.5  | 0.20 – 0.30 |
| Tier 2                        | 2004-06    | 4.0 – 5.0| 2.0 – 3.5  | 0.20 – 0.30 |
| Tier 3                        | 2008-10    | 4.0     | 2.0 – 3.5          | 0.20 – 0.30 |

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* MARPOL is the main international maritime treaty addressing air pollution from ships. When ratified, Annex VI will apply to all marine engines built after 2000.

Ferries caught in the middle? Or caught in the lead?

– Not the largest source in a given region, but must be part of SIP air quality efforts
– Great potential to help increase regional mobility, mitigate congestion problems
– New paradigm: ferries now compared with autos
– Regulated like other ships, ferries cannot compete with cars on a per passenger basis

Ferries: the “lead dog” for clean marine demonstrations
Automobile Emissions reduced by 99% over 35 years

California Automobile Standards
\( \text{g/mi. NOx + VOC} \)

1960 to 2006 comparison
- 80 times lower
- 99% emissions reduction
Opportunities to Reduce Emissions

• Short-term: Operational measures, limited potential
  • IMO study showed potential for slower speeds to reduce emissions

• Near-term: After-treatment retrofits, cleaner diesels
  • This is being done in Europe, demonstration projects in U.S.

• Long-term: Alternative fuels for diesels, advanced engine technologies, alternative propulsion
  • Ferries responding to new standards, modernization, expansion
Bottom line

Modernization and expansion with new constraints
  – not simply address regulatory process
  – more than new engine compliance

• Ferries are in a unique position to lead industry

• A true OneDOT issue: FHWA, FTA, and MARAD

• Industry has opportunity to fill a proactive role

_Ferries must focus on the long-term_