National Clean Diesel Campaign

Clean Ports USA

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“Talking Freight Webinar” May 18, 2011
National Clean Diesel Campaign

Comprehensive EPA program to address diesel emissions across industry sectors
  • Regulatory and innovative programs

• EPA Regulations under Clean Air Act
  • On-highway Trucks
  • Nonroad Equipment
  • Locomotive and Marine Vessels
  • Ocean-Going Vessels (and international MARPOL treaty)

• Diesel Emission Reduction Program
  • Cost-effective, Verified Technologies
  • Funding, Recognition, Incentives
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

**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

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

**Ocean Going Vessels**
CAA Rule Dec 2009
IMO MARPOL Annex VI
ECA Controls
- Fuel Based 2015
- SCR Catalyst Based 2016

*These standard-setting rulemakings are key enablers for collaborative partnerships with industry and state & local governments*
Contributions to U.S. PM Inventory

2009 Mobile Source PM2.5 Inventory

- Diesel NR: 27%
- Other NR: 14%
- Diesel Marine <30 l/cyl: 7%
- OGV Marine: 17%
- Locomotive: 6%
- Highway: 24%
- Aircraft: 5%

2030 Mobile Source PM2.5 Inventory

- OGV Marine: 48%
- Highway: 20%
- Diesel NR: 5%
- Other NR: 15%
- Diesel Marine <30 l/cyl: 3%
- Aircraft: 7%
- Locomotive: 2%

Source of inventory estimates: C3 Marine NPRM (July, 2009)
Does not reflect IMO MARPOL Annex VI Amendments (October 2008)
Marine and Locomotive Engines

• Locomotive and Marine C1 and C2
  • March 2008 EPA adopted more stringent PM and NOx exhaust emission standards for locomotives and marine diesel engines.
  • EPA’s three-part program:
    • (1) Tightening emission standards for existing marine engines 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.
Comparison of Established Standards for Marine Diesels and Diesel Trucks

PM (g/hp-hr) vs NOx (g/hp-hr)

- 2007-2010 trucks
- Marine Tier 2 2004-2009
- Marine Tier 3 2009-2014
International Maritime Organization (IMO) Annex VI Amendments for Ships

- October 2008 Annex VI amendments approved
- December 2009 EPA adopted IMO Annex VI for US ships
- Global NOx Controls
  - Tier 2: 20% reduction from new vessels (2011)
  - Existing engine standards
- Global PM and SOx controls
  - 2012: 3.5% fuel sulfur
  - 2020: 0.5% fuel sulfur
    - Could be delayed to 2025; subject to 2018 fuel availability review
- A country (or countries) can propose to designate an Emission Control Area (ECA), where more stringent standards apply
Emission Control Area

- **ECA NOx Controls**
  - Tier 3 NOx  80% reduction new vessels (2016)

- **ECA PM and SOx Controls**
  - 1.00% Fuel Sulfur effective August 2012
  - 0.10% Fuel Sulfur 2015+
    - Up to 96% reduction in SOx
    - ~85% reduction in PM

An Emission Control Area should be considered for adoption by the Organization if supported by a demonstrated need to prevent, reduce, and control emissions of NOx or SOx and particulate matter or all three types of emissions … from ships. (Appendix III, para 1.3)
2020 Potential ECA PM$_{2.5}$ Reductions
2020 Potential ECA Ozone Reductions

Ozone (Smog) reductions from the proposed ECA reach well into the U.S. interior.
2020 Potential Sulfur Deposition Reductions

Improvements in deposition for marine and terrestrial ecosystems
Benefits and Costs of the Coordinated Strategy

By 2030, the emission reductions associated with the coordinated strategy for OGV will annually prevent:

- Between 12,000 and 30,000 PM-related premature deaths
- Between 210 and 920 ozone-related premature deaths
- About 1,400,000 work days lost
- About 9,600,000 minor restricted-activity days

![Chart showing benefits and costs of the coordinated strategy for different categories of vehicles. The chart compares the benefits in terms of avoided deaths and illness days against the costs, with ratios indicating the cost-effectiveness of each category. The total benefits are estimated to be $304 billion, and the total costs are estimated to be $15 billion, resulting in a benefit-to-cost ratio of 20:1.]
U.S. Ports and Nonattainment Areas

- More than 40 major ports are located in PM$_{2.5}$ or ozone nonattainment areas.
- About 88 million people live in 39 areas that do not meet the PM$_{2.5}$ NAAQS or that contribute to violations in other counties.
Targeting Clean Diesel at Ports

• Clean Ports USA tailors DERA to port’s needs
• Working with port authorities, terminal operators, shipping, truck and rail companies
• Promote cleaner diesel technologies and strategies through education, incentives, and financial assistance for diesel emissions reductions at ports
• Grants and recognition to foster superior environmental performance
• Voluntary Diesel Retrofit Technology Verification
• Recognizing superior environmental performance
• SmartWay Transport Partnership program
  • Tools, information, and recognition to reduce carbon footprint
Air Emissions Reduction Strategies

Technology Strategies
- Refuel
- Retrofit
- Repair/Rebuild
- Repower
- Replace

Operational Strategies
- Improved Port Efficiency
- Using On-shore Power
- Considering Air Quality Impacts of Security Changes
Technology Verification

- Cost-effective verified and certified clean diesel strategies
  - Maximize public health benefits
  - Provide immediate, quantifiable emissions reductions
- Key technologies include:
  - Exhaust controls (DOCs, DPFs, CCVs, and SCRs)
  - Engine upgrade kits, engine repowers
  - Cleaner & alt. fuels
  - Vehicle replacements
  - Idle reduction technologies
  - Hybrid vehicle technologies
Diesel Emissions Reduction Program Funding

- National Clean Diesel Funding Assistance Program
  - Applying verified technologies to reduce most damaging emissions

- Emerging Technologies
  - Moving Innovations from concept to marketplace

- SmartWay Finance
  - Supporting low-cost loans for high-value technologies

- Foundation of State Clean Diesel Programs

### DERA Funding at a Glance in Millions

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<th>FY08</th>
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<th>FY09/10</th>
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<td><strong>Total</strong></td>
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ARRA Funding for Clean Diesel at Marine Ports

- Over $60 million in awards to marine port-related projects, putting Americans back to work to clean the air

Georgia Ports Authority
Port of Houston Authority
Port of Long Beach
Port of Los Angeles
Maryland Port Administration
Port of New York and New Jersey
Port of Oakland
South Carolina State Ports Authority
Tacoma Port Authority

Port of Virginia
Mississippi River Corridor
Great Lakes Commission
Cost-effective Marine Repowers

- Northeast States for Coordinated Air Use Management (NESCAUM)
- EPA awarded $4.45 M to NESCAUM for upgrades of 13 harbor craft vessels with some built as early as 1929, 1946, 1970, etc.

  - Estimated Annual Reductions
    - 113.4 NOx tons per year
    - 9 PM tons per year
    - 603.4 CO tons per year
    - Fuel savings: 53,000 gals per year

  - Representative Tug Cost-effectiveness of EPA funds
    - $2,200 per lifetime ton NOx
    - $38,500 per lifetime ton PM
Great Lakes: Repowering gen sets

- EPA awarded $1.21M ARRA grant to Great Lakes Commission
  - $403K match from American Steamship Company
- Repowering 1976 and 1979 service generator sets on 2 bulk carriers during winter off-season
- Improves air quality for 8 states
  - Estimated Annual Reductions
    - 36.4 NOx tons per year (40% reduction)
    - 0.4 PM tons per year (49% reduction)
    - Fuel savings: 8,500 gals per year

*The H. Lee White is one of two repowered bulk carriers on the Great Lakes.*
Emerging Technologies: Marine

- Repowering the *Champion Coal*, a Pittsburgh-based towboat

EPA awarded $1.5M to Pennsylvania Dept. of Environmental Protection for a marine engine overhaul known as Caterpillar’s Emission Upgrade kit. The towboat’s two Caterpillar 3500 series Tier 1 engines were rebuilt/upgraded to Tier 2 standards.

- Estimated Emissions Reductions
  - NOx by 25%
  - PM by 33%
  - HC by 4%
Port of Baltimore

EPA awarded $3.5 million grant and is leveraging $3.2 million in matching funds to repower, replace and retrofit:

- 83 units of cargo handling equipment,
- **50 drayage trucks**,  
- 7 locomotives and
- 2 tugboats

Estimated Lifetime Emission Reductions:
- 1,152.1 tons NOx
- 76.2 tons PM
Port Authority of NY & NJ Truck Replacement Program

- EPA supporting $28 million program with $7-million grant.
- Part of the Clean Air Strategy to implement a truck replacement program to replace pre-1994 vehicles
- Provide truck owners funding incentives (grants and financing) to replace their older drayage trucks with newer models
- Replace 1993 or older with 2004 to 2008
Port of Los Angeles -- ARRA Project

$2M to replace, repower, and retrofit a total of 24 pieces of equipment (27 engines), including harbor craft
Additional Information

- More information about Clean Ports Program: www.epa.gov/diesel/ports

- Clean Ports contacts:
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- North American ECA and supporting information are available at: www.epa.gov/otaq/oceanvessels.htm
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