

Shoreside Power for Marine Vessels Environmental Perspective



California Air Resources Board
Public Consultation
Nov. 9, 2004



General Recommendations

We strongly support the shoreside power initiative and recommend that ARB consider the following:

- Study ocean-going vessels and harborcraft as candidates, military shoreside operations
- Adopt regulations requiring that 80 percent of ship calls utilize shoreside power at retrofitted and new terminals
- Establish deadline for hook-ups at all terminals – 50 percent - 5 years; 100 percent – 10-15 years



Shoreside Costs and Funding

- Cost-benefit analysis should consider health and environmental costs of exposure to marine diesel exhaust
- Funding sources should be analyzed:
 - Private-public partnerships
 - Incentive programs
 - Port-specific and statewide port fees to pay for infrastructure



Window of Opportunity

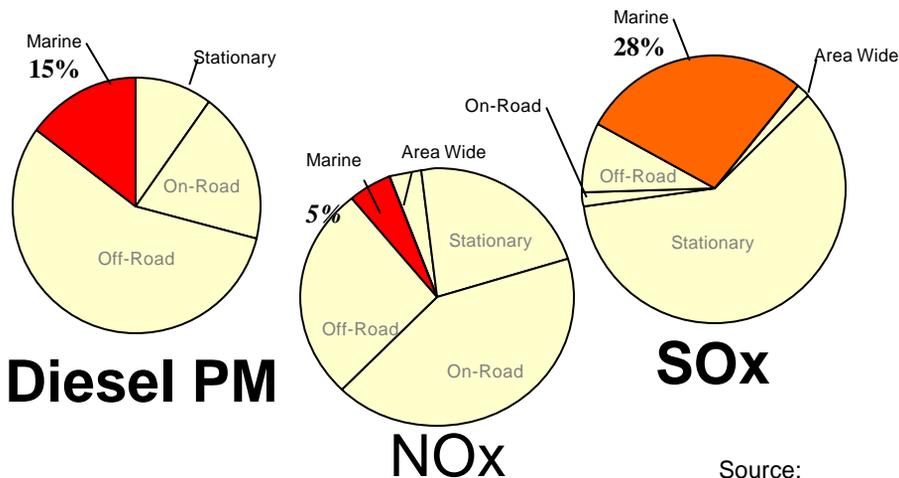
- Ports and shipping expanding now
- Lack of action could delay chance to install dockside power by decades
- Ports and shipping more receptive than ever due to regulatory focus



- Shoreside power projects are already underway



Commercial Marine Vessel Contribution to Statewide 2010 Emissions



Source:
ARB



Public Health Risks

- In California, 70 percent of increased cancer risk due to air toxics is from diesel exhaust exposure
- Ports are located next to communities, often low-income communities of color – environmental justice
- Elevated cancer rates in port communities such as Long Beach, 1,500 in a million



Port of Los Angeles/Long Beach

- Cargo ships each day produce as many smog-forming emissions as 1 million cars.
- C3 NOx to grow from 2 to 8.6 percent of mobile inventory by 2020
- C3 PM to grow from 4 to 11 percent by 2020



Cruise Ship Air Pollution

A cruise ship in port for one day =
12,400 cars

Monterey Air Pollution Control District, 1.5 tons of nitrogen oxides
Includes emissions from maneuvering, berthing and auxiliary
power generators while "hoteling" at anchor in Monterey Bay.
Equal to 12,400 cars operating for same period (on-road
inventory). This does not include entry from shipping lanes.



San Francisco Bay

INCREASE in DAILY emissions from cruise ships at the new cruise terminal are equal to those of the Hunter's Point Power Plant. 1 ship per day.

Based on one extra ship per day. This includes emissions entering the bay, cruising and maneuvering, boilers and tug escorts, all of which add to the air emissions inventory in SF Bay.



	<u>Hunters Point Power Plant</u>	<u>SF Cruise Ships</u>
Particulate Matter	80 lbs per day	87 lbs per day
NOx	1200 lbs per day	1153 lbs per day



Benefits of Switching to Bunker Fuels to Shoreside Power Emissions Reductions Hoteling

- ✓ **NOx emissions 99 percent**
- ✓ **PM emissions 83-97 percent**
- ✓ **Greenhouse gas emissions 66 percent**
- ✓ **SOx emissions nearly 100 percent**

Sources: Environ for the Port of Long Beach, West Coast Governor's Global Warming Initiative Ports Working Group Report

California's power generated without use of high-sulfur fuels



PM Reductions underestimated?

- Environ underestimated the PM benefits and cold ironing is more cost effective than the study concludes
- Nine of the 12 ships instead of 5 of 12 should have been found to be cost effective based on the study's threshold criteria



ARB should analyze PM reductions and cost effectiveness



Shoreside power projects

- Port of Long Beach – BP two oil tankers by 2006
- Port of Los Angeles – NYK terminal, also China Shipping
- Swedish port of Gotenborg reduced emissions from ferries and cargo vessels by 80 tons of NO_x, 60 tons of SO_x and 2 tons of PM per year



Cruise Ships – priority candidates

- Juneau, AK, Princess, \$2.5 dockside costs
- Seattle, WA, Princess, \$1.8 dockside costs (\$50,000 EPA grant)
- San Francisco, \$50,000 shoreside power study due early 2005
- Port of Los Angeles and San Diego considering cruise ship hook-ups (Cruise Industry News Fall 2004)



Electricity vs. bunker fuel

- Cost of switching from bunker fuel to electricity reasonable compared to total cost of fuel per voyage
- BW estimated that for cruise ships, electricity in port could cost about the same per hour as bunker \$400 per \$500 per hour
- Burning CARB diesel \$787 per hour
- Based on 5 MW hotel load, 2.5 tons per hour fuel, \$90 to \$110 per MWh for electricity; \$170/ton bunker
- Doesn't include savings of \$60 to \$90 per hour on-board electricity generation



Installing dockside infrastructure

- Cruise industry has paid for its installations, but paid back by city and utility over time based on revenue credits
- Costs could be offset or paid for by private and public energy conservation and clean air programs
- Shoreside power could be required as air mitigation for port projects, built into costs



Technologies

- Besides direct hook-up to municipal power grids, ARB should also consider:
- Modular hook-ups that would remove need for ship retrofits
- Fuel cell power generation systems for smaller vessels at berth
- Power barges fitted with fuel cells or generators operating on clean fuels



Safety and Interruptible power

- Safety should be considered, but not seen as an obstacle
- No problems in Juneau
- In emergency, ships could pull away under diesel power even if still hooked up
- Power should be “interruptible” so if energy is not available, ships simply utilize on-board engines



Conclusions

- Shoreside power can significantly reduce marine diesel emissions in port
- Shoreside power is feasible for California ports
- Cost effectiveness can be achieved
- ARB should adopt regulations requiring that 80 percent of ship calls utilize dockside power
- ARB should set deadlines for new and existing terminals to install shoreside power in California



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