WRITTEN TESTIMONY
PREPARED BY THE STAFF OF FRIENDS OF THE EARTH U.S. AND CLEAN AIR TASK FORCE

LEGISLATIVE HEARING ON THE MARINE VESSEL EMISSIONS REDUCTION ACT OF 2007, S. 1499

BEFORE THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

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INTRODUCTION

Chairman Boxer, Ranking Member Inhofe, thank you for the opportunity to submit written testimony to the record.

THE PROBLEM

Historically, large vessels such as container ships, tankers, bulk carriers, and cruise ships have operated virtually unregulated, with few or modest standards to regulate their emissions, and very little oversight even of those. This may be the last genuine Wild West industry on the planet.

In the vast majority of cases, the enormous engines that power large vessels burn residual fuel oil or "bunker fuel".[1] Bunker fuel contains far higher pollutant levels than other fuels, including higher levels of particulate matter, ash, sulfur, and nitrogen, as well as more heavy metals and other toxic substances such as aldehydes, benzene, and polycyclic aromatic hydrocarbons ("PAHs").[2] Bunker fuel, the bottom of the barrel in the refining process, has the consistency of mud and must be heated so that it can flow through engine fuel lines.

Bunker fuel causes a wide array of harmful human health impacts. For instance, combustion of this fuel in a diesel engine produces fine particulate matter that leads to increased cancer risk and adverse health effects such as respiratory illness, impaired lung and heart function, and premature mortality. The negative health impacts of bunker fuel are magnified because large

[1] In 2007, 84 percent of fuel consumed by vessels above 400 gross tons was bunker fuel. *IMO panel gives new bunker consumption estimate*, SUSTAINABLESHIPPING.COM, Jan. 30, 2008, available at http://www.sustainableshipping.com/news/2008/01/70558?gsid=f1f40e4c818411cfb42c353fad22bac1&asi=1

[2] US EPA (2002), *Health Assessment Document for Diesel Engine Exhaust*, U.S. EPA, Office of Research and Development, National Center for Environmental Assessment, Washington Office, Washington D.C., EPA/600/8-90/057F (2002), at 1-1, available at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.

vessel emissions are concentrated in port areas where ships transit and dock, disproportionately impacting disadvantaged communities and communities of color,[3] while also impacting coastal cities and towns along busy shipping corridors.[4]

Today, shipping accounts for about a quarter of the world's nitrogen oxide emissions, which causes smog,[5] and shipping emissions are growing significantly (at a rate of 4.1 percent per year through 2040)[6] as marine transportation increases.[7] Smog causes harmful respiratory effects including shortness of breath, coughing, decreased lung function, inflammation of the lung tissue, aggravation of existing respiratory diseases, and may impair the body's immune system.[8] Children and the elderly are most severely affected by these health effects. Exposure to smog leads to increased hospital admissions and emergency room visits and increases the use of medications.[9]

Ozone and $PM_{2.5}$ emitted by large ocean-going vessels can also have severe public welfare effects. Exposure to fine particles can lead to aggravation of the respiratory system, cardiovascular disease, increased asthma, difficulty breathing, chronic bronchitis, and premature death.[10] Particulate matter also causes soiling and erosion damage to materials, including culturally important objects, increases the corrosion of metals, degrades paints, and deteriorates building materials.[11] Emissions from large marine diesel engines also harm the environment by impairing visibility, contributing to haze, acid rain, eutrophication, and nitrophication, and reducing crop yields and productivity of forest ecosystems.[12]

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[3] While the impacts from marine diesel emissions can affect all people, those most likely to live and work near pollution sources such as ports and their transportation corridors also confront the challenges of poverty, limited access to medical care, low rates of insurance coverage, and virtual exclusion from the public policy decisions that most affect them. Environmental justice communities often suffer from disproportionately high cancer, disease, and mortality rates as they are exposed to the highest levels of carcinogenic, toxic, and hazardous chemicals. Friends of the Earth International, "Air Pollution from Shipping Emissions – Environmental Justice: Public Health and Community Impacts," submitted to the IMO's Marine Environment Protection Committee, May 12, 2005 ("FOEI Environmental Justice Report").

[4] The Santa Barbara Air Quality Management District has determined that, if Category 3 marine engines are not regulated, by 2020 marine vessel pollution will constitute 75 percent of the District's nitrogen oxide inventory and may cause the District to be classified as in nonattainment for the federal ozone standard. Complaint for Declaratory and Injunctive Relief, Santa Barbara Country Air Pollution Control District, U.S. District Court for the District of Columbia, Filed Dec. 26, 2007, at 4.

[5] A reaction of NOx and volatile organic compounds in the presence of heat and sunlight forms ground-level ozone, or smog.

[6] Friends of the Earth International, "New Global and Regional Inventories of Air Pollution from International Shipping," submitted to the IMO subcommittee on Bulk Liquids and Gases, Jan. 12, 2007, BLG 11/5/5, BLG 11/INF.3.

[7] Corbett, J.J., and Koehler, H. 2003. Updated Emissions from Ocean Shipping. Journal of Geophysical Research, Vol. 108 (as cited in the United States' proposal entitled "Development of Standards for NOx, PM, and SOx" submitted to the International Maritime Organization subcommittee on Bulk Liquids and Gases, Feb. 9, 2007)("U.S. NOx, PM, and SOx Standards Proposal").

[8] 68 Fed. Reg. 9751 (February 28, 2003).

[9] *Id*.

[10] *Id.*, at 9752 (February 28, 2003).

[11] *Id*.

[12] 72 Fed. Reg. 69534-69536 (December 7, 2007).

Marine engine emissions contribute to pollution in coastal areas throughout the country, many of which are not currently in attainment with National Ambient Air Quality Standards (NAAQS).[13] Currently, more than 40 major U.S. coastal ports are located in nonattainment areas for ozone and/or $PM_{2.5}$.[14] Currently, air pollution from vessel emissions represent more than 8 percent of U.S. mobile source NOx and 15 percent of U.S. mobile source $PM_{2.5}$ emissions. These numbers are projected to rise significantly by 2030 because of increased movement of international goods. EPA estimates that by 2030 emissions from Category 3 engines will represent 34 percent of NOx, 45 percent of $PM_{2.5}$, and 94 percent of SOx mobile source emissions in the U.S.[15]

Globally, the scope of the problem from ship air pollution is staggering. In 2002, marine vessel emissions resulted in 60,000 premature deaths, primarily due to the use of high sulfur bunker fuel.[16] This peer-reviewed, published scientific study, supported in part by Clean Air Task Force, estimated that without new regulations, premature deaths from shipping-related emissions will increase by 2012, along with the projected growth in shipping traffic.

Proactive action can change this outcome, however. A new study has found that if shippers switch to marine distillate with a sulfur standard of 1,000 ppm within 200 miles of the world's coastlines, premature mortality could be cut in half, to 42,200 per year.[17]

For these reasons, we are pleased to see that S. 1499 is a top priority for federal policymakers.

THE SOLUTION

One of the primary methods of complying with S. 1499 would be switching from bunker fuel to marine distillate fuel. This is a highly cost-effective, technically feasible way of lessening health impacts without causing economic harm to the shipping sector. The benefits in switching to marine distillate, when one considers environmental and public health factors, far exceed the

[13] While marine vessel emissions have a significant effect on communities near ports, many areas of the country are affected by pollution dispersion and regional haze. Studies have shown that emissions from marine vessels can substantially contribute to pollution from 400 to 1,200 kilometers inland, and that transport of secondary products such as ozone and fine aerosol particles can travel thousands of kilometers in the atmosphere. FOEI Environmental Justice Report; 72 Fed. Reg. 69530 (December 7, 2007); *See e.g.*, Qinbin Li et al., (2002) "Transatlantic transport of pollution and its effects on surface ozone in Europe and North America," Journal of Geophysical Research Vol. 107, NO. D13, 10.1029/2001JD001422.

[14] 72 Fed. Reg. 69526 (December 7, 2007).

[15] 72 Fed. Reg. 69526 (December 7, 2007).

[16] Corbett et al., "Mortality from Ship Emissions: A Global Assessment," *Environmental Sci. Technol*, American Chemical Society, 42(24), p. 8512-8518, Dec. 15, 2007.

[17] Corbett et al., "Mitigating Health Impacts of Ship Pollution through Low Sulfur Fuel Options: Initial Comparison of Scenarios," Jan. 23, 2008, annex to Friends of the Earth International, "Avoided Global Premature Mortality Resulting from Reduction of Sulphur in Marine Fuel," submitted to the IMO's Marine Environment Protection Committee, Jan. 25, 2008. Almost 70 percent of global shipping emissions occur within 250 miles of shore, where a majority of the world's population lives. Corbett, J.J., P. Fischbeck, and S. Pandis, (1999), "Global nitrogen and sulphur inventories for oceangoing ships," Journal of Geophysical Research, Vol. 104, No. D3 (Feb. 20, 1999), at 3465, 3469.

costs. Although low sulfur fuel can cost from 50-72 percent more than bunker fuel,[18] the cleaner fuel standard of S. 1499 applies only to ocean-going vessels within a 200-mile distance from the U.S. west coast and from an as-yet undetermined distance from other U.S. coasts. Thus, vessel operators will only be required to use marine distillate for a small portion of their trip. As calculated by the South Coast Air Quality Management District (AQMD), a ship traveling from Hong Kong to Los Angeles would need to switch from bunker fuel to distillate fuel for only about 3 percent of its trip, resulting in a fuel increase of just 2.1 percent.

The reductions in fuel sulfur content achieved by switching from bunker fuel can dramatically reduce vessel emissions. The California Air Resources Board (CARB) expects that moving from bunker fuel (approximately 25,000 ppm sulfur content) to 1,000 ppm marine gas oil will reduce PM, SOx, and NOx by 83 percent, 96 percent, and 6 percent, respectively.[19] Similarly, recent modeling of a container ship switch using 22,900 ppm bunker fuel (the average U.S. west coast sulfur content level) to 1,000 ppm marine gas oil found that PM, SOx, and NOx would decrease by 78 percent, 94 percent, and 6 percent, respectively.[20] Finally, the U.S. proposal to the IMO, which would include coastal use of 1,000 ppm distillate, is estimated to reduce PM by 65 percent and SO_2 by 78 percent by 2020.[21]

The 2005 CARB auxiliary engine rule (which requires all ships visiting ports in California to use low-sulphur distillate fuel in their auxiliary engines while at berth and within 24 nautical miles of the California coastline), provides some frame of reference for the cost-effectiveness of reduced fuel sulfur measures. CARB staff found that its auxiliary engine rule would increase fuel costs by $38 million in 2010 when the lower sulfur fuel standard of 1,000 ppm was scheduled to be implemented. Staff also estimated total capital costs of about $11 to $18 million for vessel modifications. CARB staff determined that this regulation was cost-effective and compared favorably with the cost-effectiveness of other air quality regulations adopted by the Board.[22] The attendant health benefits of using marine distillate in lieu of bunker fuel are immense. The Clean Air Task Force study indicates that societal benefits of approximately $225 billion per year will be realized from globally instituting a 1,000 ppm coastline standard, with annual mortalities reduced by approximately 40,000 [Corbett and Winebrake, 2008].[23]

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[18] Note by Secretary-General, "Report on the outcome of the Informal Cross Government/Industry Scientific Group of Experts established to evaluate the effects of the different fuel options proposed under the revision of MARPOL Annex VI," submitted to IMO subcommittee on Bulk Liquids and Gases, Dec. 20, 2007, at 15.
[19] Winebrake, J.J., and Corbett, J.J. Technical Memorandum – Total Fuel Cycle Analysis for Container Ships: A Comparison of Residual Oil, Marine Gas Oil and Marine Diesel Oil, prepared for Friends of the Earth, June 6, 2007, at 3-4.
[20] *Id.*, at 6.
[21] Note by Secretary-General, "Report on the outcome of the Informal Cross Government/Industry Scientific Group of Experts established to evaluate the effects of the different fuel options proposed under the revision of MARPOL Annex VI," submitted to IMO subcommittee on Bulk Liquids and Gases, Dec. 20, 2007, at 35.
[22] California Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking: Proposed Regulation for Auxiliary Diesel Engines and Diesel-Electric Engines Operated on Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline, at ES-15-16 ("CARB Auxiliary Rule").
[23] Friends of the Earth International, "Avoided Global Premature Mortality Resulting from Reduction of Sulphur in Marine Fuel," submitted to IMO committee on Marine Environment Protection, Jan. 25, 2008.

EUROPEAN UNION AND THE INTERNATIONAL MARITIME ORGANIZATION

Several governmental entities, including the United States, have called for the use of low sulfur distillate. Executive officials representing the U.S. at IMO negotiations, including the U.S. EPA and Coast Guard, have as a central feature of their proposal a 1,000 ppm U.S. sulfur coastal zone.[24] In addition, the European Union (E.U.) has a marine gas oil limit of 2,000 ppm for vessels in port and, by January 2010, will reduce the fuel standard to 1,000 ppm[25] for inland vessels and ocean-going vessels at berth in its ports.[26] As discussed above, CARB also has set its auxiliary engine fuel limit at 1,000 ppm by January 2010. CARB believes that "[b]y harmonizing with the 2010 EU requirements for low sulfur marine distillates, the staff's proposal promotes international consistency and increases the availability of cleaner marine distillates at ports that refuel Pacific Rim vessels."[27] These developments indicate the recognized benefits and feasibility of switching to low sulfur distillate in the near term.

Some contend that pressing for strong U.S. emission standards will interfere with IMO negotiations. However, it is important to understand, first, that the IMO has *never* adopted strong pollution controls. The IMO NOx standards currently in place simply codify emission levels that had already been achieved by industry, and its current fuel standard allows the extraordinarily high level of 45,000 ppm sulfur. Second, it is commonly understood that the IMO is currently considering adoption of new emission standards primarily due to the proliferation of legislative and regulatory actions and proposals at the national and sub-national levels. Without sufficient impetus, the international process could easily fracture and become bogged down, reverting back to a glacial pace. History suggests that U.S. action can precipitate strong international standards. For example, after Congress adopted the Oil Pollution Act of 1990 – requiring all new tankers operating in U.S. waters to be equipped with double hulls – the international community quickly adopted the same requirement.

While some may seek to defer and wait for an international consensus to develop around an uncertain level of pollution protection, we believe that the most effective way of resolving the health harms associated with dirty bunker fuels is for Congress to act now and demonstrate leadership by enacting stringent standards that the International community can follow.

TECHNICAL FEASIBILITY

Previously, some in the shipping industry have raised concerns about the technical feasibility of switching from bunker fuel to marine distillate. Those concerns have been allayed. At least one major shipping company, Maersk, has demonstrated the feasibility of this switch. It voluntarily switched from bunker fuel to distillate fuel (2,000 ppm) for ships operating within 24 nautical miles of certain California ports.[28] In addition, since the early-1990s, USS-POSCO has been

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[24] PM and SOx standards in coastal zones would also be achievable through the use of seawater SOx scrubbers. U.S. NOx, PM, and SOx Standards Proposal.

[25] Several U.S. and foreign fuel producers have already begun production on grades of marine distillate with this level of sulfur. *See e.g., Polish player already offering 0.1% sulphur fuel*, SUSTAINABLESHIPPING.COM, Jan. 7, 2008, available at http://www.sustainableshipping.com/news/2008/01/70274.

[26] Directive 2005/33/EC of the European Parliament and of the Council, July 6, 2005.

[27] CARB Auxiliary Rule, VI-10.

[28] 72 Fed. Reg. 69525 (December 7, 2007).

making fuel switches from heavy fuel oil to ultra-low (less than 500 ppm) sulfur distillate prior to entering the Bay Area AQMD boundary on the regular routes between South Korea and Pittsburg, California. Ultra-low sulfur distillate was used to facilitate the use of on-board selective catalytic reduction (SCR) systems to further minimize air pollution.[29] Furthermore, cruise ships within 24 nautical miles of the California coastline have had to use distillate fuel since January 1, 2007.[30] No significant incidents have been reported.

U.S. EPA asserts that "properly designed ships would be able to operate on distillate fuel either under a fuel-switching strategy or for extended use." CARB has also addressed several technical issues relating to the use of low sulfur distillate. For example, in response to concerns from industry that low sulfur fuels with lower lubricity could cause damage to fuel pumps, CARB stated that those concerns were associated with landside diesel fuels having very low sulfur levels, lower than the proposed 1,000 ppm standard.[31] In addition, CARB summarized that concerns related to the low viscosity of distillate affecting pump leakage and engine performance could be resolved by minimum viscosity requirements or modifications such as the use of a fuel cooler, thereby lowering fuel temperature and increasing viscosity.[32] In sum, actual experience and agency opinion demonstrate that marine distillate switching, when performed by competent professionals according to recommended procedures,[33] is feasible.

THE PUBLIC SUPPORTS A MOVE TO CLEANER FUELS

Broad public support exists for a switch from bunker fuel to marine distillate fuel. This past November, the Cosco Busan ran into the Bay Bridge and spilled of 58,000 gallons of toxic bunker fuel into San Francisco Bay, demonstrating the risk that bunker fuel poses to marine life. In response to this accident, Friends of the Earth circulated a petition calling on Congress to require a complete phase-out of bunker fuel use. Over 7,400 individuals from across the country signed on to this petition to ban bunker fuel, a copy of which is attached to this testimony.

CONCLUSION

The Marine Vessel Emissions Reduction Act is urgently needed. A recent study indicates that by 2012 nearly 84,000 people could die prematurely from global vessel emissions. Other health and quality of life impacts on communities in the U.S., especially port communities, are acute. Congress is the appropriate body to deal with this issue; the U.S. EPA still has not agreed to regulate foreign-flagged vessels – a fatal flaw in any regulation of ocean-going ships, since foreign-flagged ships are responsible for about 90 percent of vessel emissions in US waters.[34] In addition, EPA has not assured implementation of emission controls or fuel standards by a certain date or level of stringency. Congress should act now to ensure that significant emission reductions are achieved thereby improving health and facilitating efforts to attain federal air quality standards for impaired areas. S. 1499 will also send a firm and timely message to the

[29] CARB Auxiliary rule, VI-12.
[30] CARB Auxiliary Rule, ES-4.
[31] CARB auxiliary rule, VI-16.
[32] *Id*.
[33] Engine manufacturers and marine equipment suppliers publish guidance for vessel operators that set forth recommended procedures. CARB Auxiliary Rule, VI-13.
[34] 72 Fed. Reg. 69536 (December 7, 2007).

IMO that the U.S. Congress is serious about dealing with air emissions from vessels in the furthest reach of its waters, and will likely finally spur the international body into action.