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AND GASES
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REVIEW OF MARPOL ANNEX VI AND THE NO_x TECHNICAL CODE

Proposed Standards to Reduce Emissions of Nitrogen Oxides from Ships

Submitted by Friends of the Earth International (FOEI)

SUMMARY

Executive summary: This document urges adoption of stringent new international limits on emissions of nitrogen oxides from ships as amendments to regulations of MARPOL Annex VI. This document was produced by a coalition of environmental NGOs¹

Action to be taken: Paragraph 10

Related documents: BLG 11/5/5, BLG 11/5/6, BLG 11/INF.3; BLG-WGAP 1/2/11; BLG 10/14/13; MEPC 53/4/1; MEPC 53/4/8 and BLG 12/6/9

Introduction

1 The BLG Sub-Committee agreed at its eleventh session to further consider Amendments to the Regulations under MARPOL Annex VI. Limits on emissions of nitrogen oxides (NO_x) from new and existing engines were also discussed at BLG-WGAP 2 in Berlin. BLG will continue its review of potential international control of air pollution from ships at its twelfth session in February 2008.

2 This paper urges adoption of stringent new international limits on emissions of NO_x from both new and existing ships, based on use of best available technology.

Recommended International Standards for Shipping NO_x Emissions

3 Emissions of NO_x from shipping are large and growing, and produce substantial harm to human health and the environment.

- Recent studies estimate that ocean-going ships account for between 15% and 30% of global NO_x emissions.

¹ Clean Air Task Force, Friends of the Earth-US, European Federation for Transport and Environment, North Sea Foundation, Bellona and Swedish NGO Secretariat on Acid Rain.

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- Shipping emissions of NO_x are projected to grow at over 4% per year, along with increased global shipping traffic.
- In stark contrast, NO_x emissions from land-based sources are likely to decline in many areas due to more stringent emissions regulations. As a result, without additional controls, NO_x and SO_x emissions from ships are projected to exceed such emissions from land-based sources in Europe and parts of North America within a decade or so.
- Shipping emissions of NO_x and its atmospheric products, including fine particulate matter and ozone, cause serious impacts to human health and the environment, including premature death, heart and lung disease, acid precipitation, and eutrophication of coastal and terrestrial ecosystems. Ozone and nitrous oxide also contribute to climate change.

4 The above information is well known, and has been previously discussed in FOEI's and other submissions to IMO, including BLG 11/5/5, BLG 11/5/6, BLG 11/INF.3, BLG-WGAP 1/2/11, BLG 10/14/13, MEPC 53/4/1 and MEPC 53/4/8.

5 In addition, a new scientific, peer-reviewed study has for the first time estimated premature death worldwide due to particulate emissions from ocean-going shipping (including NO_x and SO_x emissions that form nitrate and sulfate particulate aerosols in the atmosphere). This study estimates that 60,000 people died prematurely in 2002 as a result of ocean-going shipping particulate emissions. A substantial portion of these deaths resulted from NO_x emissions from ships. This annual death toll is expected to increase by 40% by 2012. The study will be published in December 2007 in the journal *Environmental Science & Technology*, and is presently available on the Internet at:

<http://pubs.acs.org/cgi-bin/sample.cgi/esthag/asap/pdf/es071686z.pdf>.

Supporting information for the study may be found at:

http://pubs3.acs.org/acs/journals/supporting_information.page?in_manuscript=es071686z

This study is reported and described in further detail by FOEI in document BLG 12/6/9.

6 In view of the increasing toll of human death and disease and environmental damage caused by ship-sourced air pollution, IMO must establish emission standards for both new and existing engines at levels that reflect application of the best technology to control emissions likely to be available when such standards go into effect. The standards must anticipate tomorrow's technology, which will likely be capable of producing deeper emissions reductions than are produced by technology that is commercially available today. The innovation and creativity that has made shipping the predominant carrier of the world's goods must be harnessed to make shipping a low polluting mode of transportation as well.

7 A variety of effective NO_x reduction technologies exist today, and substantial improvements may reasonably be expected by 2015. Existing approaches include selective catalytic reduction (SCR), water technologies such as HAM and SAM, emulsified fuel, in-engine modifications, and vessel design improvements to increase overall operational efficiency. These approaches, when used in appropriate combination, can produce NO_x reductions of 85-90% or more (some, such as SCR, can do this alone in many applications).

8 It is possible that some existing ships may not be able to achieve these levels of reduction, although by 2015 many of the oldest ships will likely have been scrapped. In order to maintain a level competitive “playing field” between newer cleaner ships and older dirtier ones—that is, to avoid providing a competitive advantage to older ships that do not or cannot achieve the required reductions—port States may deny such ships entry to their ports or may charge them a fee calculated to approximate the cost of full compliance with the reduction requirements.

9 The following NOx standards are recommended for consideration by BLG 12 (and MEPC 57):

- .1 Amendments to Annex VI should require Tier 3 reductions of NOx emissions of 85% (from the existing IMO curve) for both new and existing ships as soon as possible, but no later than January 2015;
- .2 Interim NOx reductions (Tier 2) of 40% should be required by January 2011; and
- .3 Ships not meeting these standards may be denied entry by port States, or subjected to monetary fees equal to the estimated cost of compliance (plus a buffer to discourage payment of fees in lieu of achievable compliance).

Proposed amendment language is set forth in the annex to this document.

Action requested of the Sub-Committee

10 The Sub-Committee is invited to consider the above comments during the ongoing Annex VI revision process and recommend to MEPC 57 stringent limitations for NOx emissions from ships.

ANNEX

PROPOSED AMENDMENTS TO MARPOL ANNEX VI

Regulation 14
Nitrogen Oxides

Tier II

- (5) Subject to regulation 3 of this Annex, on or after 1 January 2011, the operation of a diesel engine installed on a ship is prohibited, except when the emission of nitrogen oxides (calculated as the total weighted emission of NO₂) from the engine is within the following limits, where n = rated engine speed (crankshaft revolutions per minute):
- (a) 10.20 g./kWh when n is less than 130 rpm;
 - (b) $27.00 * n^{(-0.2)}$ g/kWh when n is 130 or more but less than 2000 rpm; and
 - (c) 5.90 g/kWh when n is 2000 rpm or more.

Tier III

- (6) (a) Subject to regulation 3 of this Annex, on or after 1 January 2015, the operation of a diesel engine installed on a ship is prohibited, except when the emission of nitrogen oxides (calculated as the total weighted emission of NO₂) from the engine is within the following limits, where n = rated engine speed (crankshaft revolutions per minute):
- (i) 2.50 g./kWh when n is less than 130 rpm;
 - (ii) $7.00 * n^{(-0.2)}$ g/kWh when n is 130 or more but less than 2000 rpm; and
 - (iii) 1.50 g/kWh when n is 2000 rpm or more.
- (b) An engine to which subparagraph (a) of this paragraph applies and that was installed on a ship constructed prior to 1 January 2015 may be granted a conditional exemption by the Administration when it is demonstrated that the applicable standard cannot be met:
- .1 without compromising the safety of the ship; or
 - .2 at a cost of [XX] US\$ per ton of NO_x reduced or less.

Any ship having such an exemption shall be subject to either of the following requirements imposed by the port State:

- .1 the port State may prohibit the ship from entering its ports; or
- .2 the port State may assess and collect from the ship as a condition of port entry, a fee set at a level that will encourage compliance and discourage paying a fee in lieu of compliance.