

MARINE ENVIRONMENT PROTECTION  
COMMITTEE  
70th session  
Agenda item 7

MEPC 70/7/2  
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## REDUCTION OF GHG EMISSIONS FROM SHIPS

### Issues relating to the use of fuel oils from non-petroleum sources

Submitted by IMarEST

#### SUMMARY

*Executive summary:* It would be seen that the general use of non-petroleum sourced fuel oils could be the long-term goal of IMO in order that shipping may play its part in reducing the flow of fossil carbon into the atmosphere. However, it would be identified that there are a number of issues regarding the applicability of regulation 18.3.2 of MARPOL Annex VI which deals with non-petroleum fuel oils and in particular how the requirements of sub-clause .2 of that regulation could realistically be met. It is therefore suggested that consideration should be given to making regulation 18.3.1 applicable to all fuel oils, recognizing that if Member States saw this as the appropriate means to resolve the identified issues it would, in accordance with the Committee's procedures, need to be taken forward by them as a new work item.

*Strategic direction:* 7.3

*High-level action:* 7.3.1

*Output:* 7.3.1.1

*Action to be taken:* Paragraph 12

*Related document:* MEPC 69/21

#### Introduction

1 This document seeks to highlight a perceived regulatory barrier to the use of non-petroleum fuel oils related to the general application of regulation 18.3.2 of MARPOL Annex VI, which deals with non-petroleum fuel oils, and in particular how the requirements of sub-clause .2 of that regulation could in practice actually be met.

## Discussion

2 MEPC 69 discussed in some detail various aspects relating to the way forward for international shipping and IMO's role following the Paris Agreement under the UNFCCC. While energy efficiency will provide some amelioration in terms of the GHG emissions resulting from the activities of international shipping, it would be seen that the long-term objective should be to move generally to the use of fuel oils derived other than from fossil fuel sources such as petroleum. The carbon content of those future fuel oils would be derived from that already in the terrestrial/tropospheric cycle, rather than that currently sequestered underground in those fossil source materials.

3 Therefore it is proposed that, as one element in promoting this change of source material, IMO should retain under review its own requirements in order to ensure that these do not represent unwarranted impediments to the use of non-petroleum sourced fuel oils.

4 In this regard, the IMarEST brings to the Committee's attention issues relative to the requirements of regulation 18.3.2 of MARPOL Annex VI. Whereas regulation 18.3.1 applies to fuel oils derived from petroleum refining, regulation 18.3.2 applies to fuel oils derived other than from petroleum refining. Hence while regulation 18.3.2 clearly applies to fuel oils solely derived from non-petroleum sources, there is a lack of clarity as to the status of petroleum/non-petroleum blends or how non-petroleum sourced fuel oils would be documented at the time of supply.

5 The first point is that the provisions of these regulations do not give guidance as to the status of fuel oils which are blends of both petroleum and non-petroleum derived fuels. This point is particularly pertinent to biodiesels which are typically blends of petroleum derived distillates and fatty-acid-methyl (or ethyl)-esters (FAME) derived from a variety of organic source materials. These biofuel blends typically contain 2 - 20% FAME, although operation on any proportion up to 100% could be possible provided the engines and associated systems are duly designed and prepared.

6 The second point is there are certain fuel oils, most notably methanol ( $\text{CH}_3\text{OH}$ ), which technically can be derived from either petroleum or non-petroleum sources. As highlighted in the IMO published booklet "Methanol as a Marine Fuel", due to cost considerations most methanol is currently produced from natural gas, however it can also be produced from a range of feedstocks such as municipal or industrial wastes, renewable organic material or even from atmospheric  $\text{CO}_2$ . However, at present there is no requirement within the MARPOL Annex VI documentary requirements to indicate the source stock from which such fuel oils have been derived. Potentially, the blend status point made above in paragraph 5 could equally apply here, although due to the differing production costs of methanol from petroleum/non-petroleum sources it is unlikely that the latter "premium" product would normally be supplied mixed with the former.

7 The significance of the points made in paragraphs 5 and 6 and in the general application of regulation 18.3.2 above lies in the specific requirement of regulation 18.3.2.2. In essence most of the requirements of regulation 18.3.2 correspond to requirements in regulation 18.3.1 – the sulphur content clause 18.3.2.1 is effectively redundant given the framing of regulation 14 and the wide application of the term "fuel oil" as defined in regulation 2. Regulation 18.3.2.2 requires that these non-petroleum derived fuel oils shall not "*cause an engine to exceed the applicable  $\text{NO}_x$  emission limit set forth in .... Regulation 13*". Which then raises the questions of: who so demonstrates that is the case; and how that would be so demonstrated?

8 As to who so demonstrates, while this requirement is given by regulation 18, "Fuel availability and quality", and many of its provisions are directed to the fuel oil suppliers, it may not be seen as possible for the fuel oil supplier to give such an assurance since they have no knowledge of what marine diesel engines may be installed on a ship to be supplied with a fuel oil to which regulation 18.3.2.2 applies. In the case of the engine builders, other than the ongoing supply of replacement spare parts under the applicable conformity of production requirements, their role in the certification process is completed on issue of each engine's EIAPP Certificate. As such, the engine builder will have demonstrated the NO<sub>x</sub> emission performance of a liquid fuel oil engine, in accordance with 5.3.2 of the NO<sub>x</sub> Technical Code 2008, in the general absence of marine grade reference fuels, on a petroleum derived distillate. Only where a fuel oil, such as methanol, is to be used in a dual fuel engine operating on the Otto, as opposed to Diesel cycle, for Tier III compliance will that performance have been demonstrated at the Parent Engine test stage. Consequently, that then leaves the shipowner as the demonstrating party for any liquid fuelled engine, but as detailed in the following paragraph that is effectively an impossible task.

9 The demonstration that the non-petroleum fuel did not cause the engine to exceed the relevant limit value would require the NO<sub>x</sub> emission performance to be established on a case-by-case basis while actually using, in the case of the biodiesels, the particular blends – not just the maximum – to be supplied taking also into account the actual FAME source material. That can only be undertaken in accordance with the requirements of chapter 5 of the NO<sub>x</sub> Technical Code 2008 which, as highlighted by the justification for the need for the Guidelines for Selective Catalytic Reduction (SCR) units – MEPC.198(62), as amended by MEPC.260(68) – can only be undertaken under test bed conditions and not on an installed engine due a number of factors, not least the requirement that testing adheres to the prescribed test cycle. Additionally, while some engines as certified may have a margin between that test value and the limit value, in other engines that will not be the case, therefore no general rule could ever be established. Furthermore, the certified NO<sub>x</sub> emission value is the highest value of the various engine models/sub-types that are covered by an Engine Family/Engine Group, hence there could be engines within an Engine Family/Engine Group with a particular NO<sub>x</sub> emission value below that of the Parent Engine, so further complicating as to which engines could so use, and at what ratios, the non-petroleum fuel oil.

10 In view of the above, it is questioned whether it is viable to retain regulation 18.3.2.2 and, if so, how in practice compliance is actually expected to be demonstrated. One option to resolve this issue, together with the points raised in paragraphs 5 and 6, would be for the scope of regulation 18.3.1 to be extended to instead cover all fuel oils, irrespective of source material, and hence regulation 18.3.2 should be deleted. However, it is fully recognized that, as this is an amendment to MARPOL Annex VI, such a proposal would need to be taken forward by Member States as a new work item.

11 If the suggestion in paragraph 10 was to be followed, it would need to be accepted that from the research literature available, which however is mainly in respect of automotive as opposed to marine engines, there is some, but not universal, tendency to some increased NO<sub>x</sub> emissions when using biodiesels (increases potentially up to 10% at 100% FAME – but that differs between different FAME sources, some resulting in much lower increases and appears least for FAME from animal fats). However, that could be set alongside the existing NO<sub>x</sub> Technical Code approach to the use of residual fuel oils, where the fuel bound nitrogen content can typically be around 0.5 – 0.8% (and higher) and which, due to the high efficiency by which the combustion process transforms that to NO<sub>x</sub>, could account for an increase of around 4 g/kWh. Nevertheless, that is not taken into account in the establishment of the NO<sub>x</sub> emission value under the reference conditions and requirements of the Code.

**Action requested of the Committee:**

12 The Committee is invited to note the information provided above and the comment in paragraph 10 and to take action as may be deemed appropriate.

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