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REDUCTION OF THE IMPACT ON THE ARCTIC OF EMISSIONS OF BLACK CARBON FROM INTERNATIONAL SHIPPING

Comments on document PPR 8/5/1

Submitted by IPIECA and IBIA

SUMMARY

Executive summary:	This document comments on document PPR 8/5/1 and offers some additional information that the co-sponsors believe is relevant to put the results presented in document PPR 8/5/1 in perspective
Strategic direction, if applicable:	3
Output:	3.3
Action to be taken:	Paragraph 12
Related documents:	MEPC 75/5/7; PPR 1/8/1; PPR 6/INF.15; PPR 7/8, PPR 7/22; PPR 8/5/1 and PPR 8/5/2

Introduction

1 This document is submitted in accordance with the provisions of paragraph 6.12.5 of the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.2) and provides comments on document PPR 8/5/1 submitted by Finland and Germany.

2 The co-sponsors would like to thank Finland and Germany for their assessment of the impact of aromatic content in fuels on the emissions of Black Carbon as reported in document PPR 8/5/1. The detailed analysis that has been performed adds some relevant insights.

Nature of VLSFOs on the market

3 Document PPR 8/5/1 refers to earlier work that was presented at the previous session of the Sub-Committee in document PPR 7/8 (Finland and Germany). The work presented in document PPR 7/8 caused concern as it suggested that Black Carbon emissions from international shipping may be increasing as a result of the introduction of Very Low Sulphur Fuel Oils (VLSFOs), newly formulated fuels complying with the maximum sulphur level of 0.50% m/m that became effective on 1 January 2020. However, at PPR 7

the Sub-Committee was informed, inter alia, by the International Organization for Standardization (ISO) that early analysis of fuels supplied to ships in January 2020, when compared with High Sulphur Fuel Oils (HSFOs), illustrated the more paraffinic nature of VLSFOs compared to most HSFOs. Therefore, the ignition/combustion performance of VLSFOs was expected to be improved versus the HSFO fuels used before 2020 and, as a result, Black Carbon emissions of VLSFOs could be expected to be lower (PPR 7/22, paragraph 8.5). This was further elaborated in document MEPC 75/5/7 (IPIECA and IBIA). In the meantime, the relevant ISO 8217 working group has collected further data confirming the more paraffinic nature of VLSFOs on the market during 2020.

4 The co-sponsors understand that the work presented in document PPR 8/5/1 is the final part of the Black Carbon measurement campaign presented in document PPR 7/8 and therefore refers to the same set of fuel samples. This raises the same problem as before, namely that the VLSFO samples used are not representative of VLSFOs that are actually on the market. Rather, VLSFO specimens with unusually high aromatic content (70% or more) were obtained in order to examine the link between Black Carbon emissions and aromatic content in a fuel specimen. This appears to be in contrast to the stated ambition of the measurement campaign presented in document PPR 8/5/1, which was to "analyse Black Carbon emissions of 0.50% sulphur content residual fuels from different sources and different production processes."

5 The co-sponsors are disappointed that the scope of the work has not been expanded to include more representative VLSFOs currently on the market. Moreover, no information has been provided on the origin of the fuels tested, the production processes involved and the properties of the fuels, e.g. whether they are meeting all ISO 8217 requirements. Consequently, the results presented in document PPR 8/5/1 cannot be seen as representative of Black Carbon emissions of VLSFOs and extreme care should be taken about drawing conclusions about the impact of VLSFOs in general on the basis of these results.

Black Carbon emission levels

6 It is worth noting that all Black Carbon levels reported in document PPR 8/5/1 are low compared to the Black Carbon emission factors that have customarily been used in earlier studies. This is illustrated by table 1 below:

Table 1: Comparison of Black Carbon emission factors depending on the type of fuel

Engine type, fuel and load	Black Carbon (mg/kWh)	Black Carbon g/kg fuel	Reference
4-stroke, HFO and LSHFO, E2 cycle	87.4	0.44	Calculated, based on Emission Factors from the *Fourth IMO GHG Study 2020*
4-stroke, HFO, E2 cycle	15.1	0.08	PPR 8/5/1
4-stroke, VLSFO 70% arom., E2 cycle	20.9	0.10	PPR 8/5/1
4-stroke, VLSFO 80% arom., E2 cycle	21.5	0.11	PPR 8/5/1
4-stroke, VLSFO 95% arom., E2 cycle	28.2	0.14	PPR 8/5/1
2015 ICCT inventory	50	0.25	PPR 6/INF.15
Modern diesel engines	10 – 20	0.05 – 0.10	PPR 6/INF.15

7 Measured Black Carbon emissions based on the E2 cycle as reported in document PPR 8/5/1 for VLSFOs with 70-80% aromatics indicate that these emissions are about 75% lower than would be estimated using the emissions factors reported in the *Fourth IMO GHG Study 2020*. With actual VLSFOs on average being more paraffinic than the HFOs used prior to 2020, it can be expected that average Black Carbon emissions from using VLSFOs in modern engines will be of the order of 80% lower than what would be expected on the basis of the emission factors from the *Fourth IMO GHG Study 2020*. These observations are consistent with results reported by the Swedish Research Institute VTT in 2018 (PPR 6/INF.15), also shown in table 1.

8 The Black Carbon emissions reported in document PPR 8/5/1 have been obtained with a medium speed small bore research engine. Earlier work by the International Council on Clean Transportation (ICCT) and others has clearly established that Black Carbon emissions from 2-stroke large bore engines are significantly lower than those from medium- and high-speed engines. This means that the results presented in document PPR 8/5/1 may not be representative for a large part of the merchant fleet.

9 In addition to the observations above, the co-sponsors would like to recall document PPR 1/8/1 (Liberia et al.), which established, based on scientific reports, that international shipping only made 2% contribution to the deposition of Black Carbon in the Arctic. Obviously, the impact of increasing maritime traffic and the local impact close to shipping lanes should be considered. However, it would seem appropriate to take account of this data when evaluating cost and benefits of any Black Carbon related measures considered, including overall well-to-wake emissions associated with different types of fuels that can be used in the Arctic.

Fuel aromatics level

10 Notwithstanding the observations in paragraphs 4 to 9, the co-sponsors support ISO's ongoing work to evaluate the potential inclusion in the next revision of ISO 8217 of an indicator as to whether a fuel tends to have a paraffinic or aromatic character. However, ISO is not the right body to propose a regulatory limit from an environmental perspective, as the ISO 8217 standard addresses the suitability of fuels (prior to conventional onboard treatment) for combustion purposes in marine diesel engines. The co-sponsors would like to urge any consideration of a regulatory limit on aromatics or a proxy for aromatics to properly consider any trade-offs that need to be made in order to meet a specified limit, e.g. with respect to stability of the fuels concerned.

Measures to reduce Black Carbon emissions in the Arctic

11 The co-sponsors fully support the development of proportional measures to reduce Black Carbon emissions in the Arctic. The co-sponsors note that the introduction of a ban to use and carry HFO, agreed at MEPC 75, will effectively eliminate the vast majority of VLSFOs from being used in the region as they typically exceed the density limit used in the definition of HFO. To reduce Black Carbon emissions in the short term, a number of measures could be promoted on a voluntary basis. These are listed below, with the measures with highest potential impact shown on top:

.1 avoid the use in the Arctic of ships equipped with older mechanical injection engines (reference: PPR 6/INF.15);

.2 use of LNG-fuelled ships where possible (reference: PPR 6/INF.15); and

.3 voluntary switch to distillate fuels, in particular on ships using medium or high speed 4-stroke engines (reference: PPR 6/INF.15).

Action requested of the Sub-Committee

12 The Sub-Committee is invited to consider the information contained in this document and to take action, as appropriate.