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

The need for an urgent switch to distillates for ships operating in the Arctic

Submitted by FOEI, WWF, Pacific Environment and CSC

SUMMARY

Executive summary:	This document* discusses the implications for the Arctic of a recent study indicating that blended low sulphur residual fuels that have been developed to meet the IMO 2020 requirement will result in a significant increases in Black Carbon emissions, and calls on the IMO to mandate an urgent switch to distillates for ships operating in the Arctic to avoid a sharp rise in emissions of short-lived climate forcers in this vulnerable area
Strategic direction, if applicable:	3
Output:	3.3
Action to be taken:	Paragraph 19
Related documents:	PPR 5/24, PPR 5/INF.15; BLG 17/INF.7; PPR 6/INF.18; MEPC 74/10/8, MEPC 74/18; PPR 7/8, PPR 7/8/3, PPR 7/INF.15 and PPR 7/INF.20

Introduction

1 This document is submitted in accordance with paragraph 6.12.5 of the annex to *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.1) and provides comments on document PPR 7/8 (Finland and Germany).

2 Document PPR 7/8 (paragraph 22) reports initial study findings showing that new hybrid low sulphur fuels formulated to comply with the 2020 global 0.50% m/m sulphur limit can contain high proportions of aromatic compounds, in a range of 70% to 95%, which result

* This document is also supported by the International Cryosphere Climate Initiative (ICCI).

in increased Black Carbon (BC) emissions in a range of 10-85% when compared to conventional heavy fuel oil (HFO) and in a range of 67% to 145% (a factor of 2.45) when compared to DMA (which, along with DMZ, is the highest quality distillate fuel normally supplied for marine use).

3 More tests will presumably follow, but these initial results indicate that, as a result of the use of blended/hybrid low sulphur marine fuels, we can expect a dramatic increase in BC emissions from international shipping in 2020; a development that totally cuts across the urgent need, first recognized by IMO in 2011, to significantly cut BC emissions from shipping.

4 BC, a short-lived climate forcer, is second only to CO_2 in terms of international shipping's impact on the global climate. BC represents 7% to 21% of shipping's overall GHG equivalent impact on the climate depending on whether it is measured on a 100 or 20-year timescale (PPR 5/INF.15), with a much greater warming impact when shipping occurs near reflective snow and ice (e.g. in the Arctic). As a portion of particulate matter ($PM_{2.5}$), BC also has a negative impact on human health. The Arctic Council in 2019 called on actors to "Develop, as appropriate, and report on measures and best practices to reduce particulate matter and black carbon emissions from shipping" as a matter of urgency (Expert Group on Black Carbon and Methane, *Summary of Progress and Recommendations 2019*).

Recalling the history of work on Black Carbon at IMO

5 In 2008, over 11 years ago, MEPC 58 noted that IMO had considered documents providing summaries and analyses of various approaches to reduce emissions of climate forcing agents from international shipping, which included information on the impact of BC (MEPC 62/24, paragraph 4.14). MEPC 62 in July 2011 agreed to a work plan which, amongst other things, called on the BLG Sub-Committee to "investigate appropriate control measures to reduce the impact of BC emissions from international shipping and submit a final report to MEPC 65, where the Committee should agree on the appropriate action(s)" (MEPC 62/24, paragraph 4.20).

6 In May 2019, MEPC 74 considered the results of the previous eight year's work on BC. The Committee had before it documents from a correspondence group identifying a total of 41 possible BC control measures. However, there was no agreed prioritization nor detailed investigation of the options.

7 In view of this situation, the Clean Shipping Coalition and Pacific Environment, in document MEPC 74/10/12, urged MEPC 74 to expedite work to reduce the impact of BC emissions from international shipping on the Arctic by adopting, as an initial measure, a requirement that all ships switch to distillate fuels when operating within an appropriate and agreed geographic area. The document proposed that an initial delineation could be the accepted definition of "Arctic waters" in regulation 1.3 of SOLAS chapter XIV.

8 This call for initial action through an immediate switch to distillates was rejected on two grounds: it hadn't received sufficient support and, in any case, as a number of delegations argued, the issue was already being dealt with by PPR through work on the development of measures to reduce the risks of use and carriage of heavy fuel oils as fuel by ships in Arctic waters under agenda item 14.

9 After a discussion lasting less than one hour, MEPC 74 concluded that more work was needed and a new work programme for PPR 7 was agreed. This work plan, amongst other things, "invited concrete proposals from Member Governments and international organizations on how to control Black Carbon emissions to reduce the impact of Black Carbon emissions on the Arctic from international shipping... with a view to advising the Committee accordingly"

(MEPC 74/18, paragraph 5.67). This is remarkably similar to the task originally assigned to the BLG Sub-Committee eight years earlier, namely to "investigate appropriate control measures to reduce the impact of BC emissions from international shipping" and "submit a final report to MEPC 65, where the Committee should agree on the appropriate action(s)" (MEPC 62/24, paragraph 4.20).

10 The most detailed examination of BC abatement options together with a priority list remains the "Investigation of appropriate control measures (abatement technologies) to reduce BC emissions from international shipping" (BLG 17/INF.7), available online to delegations since December 2012. At that time, the general belief was that the sulphur cap would mean a switch to distillates; there was no discussion of low sulphur blends. In 2017, Dr. Daniel Lack updated the 2012 study and concluded "that the balance of evidence shows that a switch from HFO to distillate fuels will result, on average, in a 33% reduction in BC emissions" (PPR 5/INF.7).

11 Dr. Lack (Lack, D. pers. comm. 2019) now adds that "a switch to distillates itself would also produce an additional 6% to 8% reduction in BC due to fuel efficiency improvements (BLG 17/INF.7, annex, paragraph 3.6.1 and PPR 5/INF.7). So overall BC reductions of around 40% can be expected from a switch from residual to distillate fuels, with the 33% direct BC reduction figure representing the average (reduction of the switch to distillates itself) from an analysis of 57 individual measurements and can best be thought of as a 'fleet-wide' average reduction of BC".

12 Document PPR 5/INF.7 also reviewed the link between BC emissions and fuel oxygen and aromatic content and showed that oxygen rich biofuels and lower aromatic content fuels produced less BC. Only a few studies at the time had investigated BC from low sulphur/high aromatic content fuels (produced from fuel blending); those that had found that these fuels had similar or higher BC emissions compared to HFO.

13 Document PPR 5/INF.7 stated that "fuel factors such as heavy metal, oxygen, asphaltene and poly-aromatic hydrocarbon and ash content contribute to combustion characteristics" and thus BC emissions, and that "it is apparent that BC reductions are dependent on many variables and the fuel quality parameters such as heavy metal, oxygen, poly-aromatic hydrocarbon and ash content will need to be investigated to determine their impact". And further that "blending of HFO and low sulphur residual fuels to produce a 0.50% m/m sulphur compliant fuel will likely not lead to BC emissions reductions". Dr. Lack now concludes that the high aromatic content of fuels was recognized as likely having an influence on BC emissions and was one of the contributors to the variability of results.

14 The results of the study reported in document PPR 7/8 provide more information and show a clear linear correlation between lower aromatic content and lower BC emissions. Dr. Lack now concludes that "adding the results from the study reported in document PPR 7/8 produces a fleet-wide average BC reduction of 36% to 39% (73 measurements) when switching from residual (or high aromatic content fuels) to low aromatic distillates. Adding in the increased fuel efficiency of distillates (6% to 8%), these new data show - for an individual ship - that, at worst, a switch to distillates will lead to no BC reduction, and at best to a reduction of over 80%".

15 At the 6th ICCT Workshop on Marine Black Carbon Emissions (Helsinki,18-19 September 2019), participants identified six appropriate BC control policies, including an "HFO ban with a switch to distillates or other cleaner fuels" (PPR 7/INF.15). In the description of the policy (see PPR 7/INF.15, annex, table 2), participants agreed that for it to be effective as a BC control policy, it "must prohibit fuels with high aromatic/low hydrogen content, prohibit VLSFO, and prohibit desulfurized residual fuels" Participants also considered whether a fuel quality standard that "could be an aromatic content limit or a

minimum hydrogen content" would be an appropriate BC control policy, but determined that more work was needed to develop the idea. Document PPR 7/8, submitted by Finland and Germany, also provides evidence that the higher the aromatic content, the higher the BC emissions.

The need for urgent action

16 The IPCC Special Report on Global Warming of 1.5°C (SR 1.5), released in October 2018, highlighted the need for urgent action by the global community to ensure that short-lived climate forcers like BC were reduced by at least 35% from 2010 levels by 2050. The latest IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC), published in September 2019, concludes that Arctic sea ice extent and thickness has reduced, the proportion of multi-year ice of at least five years old has declined by approximately 90% and that the likelihood of an Arctic Ocean free of sea ice in September would be rare with global heating of 1.5°C, compared with up to one year in three at 2°C heating (see document PPR 7/INF.20). These reductions in sea ice cover will drastically change the Arctic marine ecosystem, as well as amplify heating impacts such as permafrost, glacier and ice sheet losses in the region.

17 Following the introduction of the IMO 2020 0.50% m/m sulphur limit, and with a ban on the use and carriage of HFO by ships operating in the Arctic under consideration, the widespread use of low sulphur fuel blends with a higher aromatic content than HFO will generate an immediate and large increase in ships' BC emissions. And document PPR 7/8 shows that the largest increases in BC emission factors occur at low engine loads. This finding is especially relevant for voyages in the Arctic given that ships will be unlikely to maintain high engine loads while operating in that environment. It is concluded therefore that IMO must take urgent action if it is to avoid a significant increase in BC emissions from international shipping having an impact on the Arctic. It is therefore of the utmost urgency that IMO should agree immediately to a mandatory switch to distillates for all ships operating in or near Arctic waters.

Conclusions

18 Given the seriousness of the findings reported in document PPR 7/8 and their implications for the Arctic and for shipping's future contribution to the climate crisis, the co-sponsors of this document believe an urgent and immediate response from IMO is necessary. More specifically, and in addition to implementing the conclusions contained in document PPR 7/8/3, the co-sponsors call on the Sub-Committee to prepare and forward to MEPC 75, as a matter of urgency and as its first concrete action on BC:

.1 a draft legal text requiring that all ships operating in or near the Arctic switch to distillates;

.2 a draft resolution, covering the period up until the above restriction comes into effect, calling on all shipowners, charterers, Member States and fuel providers to voluntarily switch to distillates when operating in or near the Arctic; and

.3 a request for MEPC to encourage coastal States and those regions in proximity to the Arctic to implement national legislation requiring the same.

Action requested of the Sub-Committee

19 The Sub-Committee is invited to review the information and proposal contained in this document and to take action as appropriate.