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POLLUTION PREVENTION AND RESPONSE

Reducing Black Carbon emissions in the Arctic

Submitted by FOEI, WWF, Pacific Environment and CSC

SUMMARY

Executive summary:	This document responds to MEPC 80/9, the outcome of PPR 10, and the invitation for interested Member States and international organizations to work intersessionally on further developing proposals on potential Black Carbon (BC) control measures and to submit those to PPR 11. It provides additional information to support the further consideration and development of potential BC control measure proposals.
Strategic direction, if applicable:	3
Output:	3.3
Action to be taken:	Paragraph 17
Related documents:	MEPC 62/24; MEPC 68/21; MEPC 74/INF.5; MEPC 78/11; MEPC 79/5/5; MEPC 80/9, MEPC 80/16/2; MEPC.342(77); PPR 10/6, PPR 10/INF.10 and PPR 10/6/3

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.4) and comments on paragraph 2.16 of document MEPC 80/9 (Secretariat) and the invitation to interested Member States and international organizations to work intersessionally on further developing proposals on potential Black Carbon (BC) control measures and to submit those to the next session of the PPR Sub-Committee (MEPC 80/9, PPR 10/WP.1/Rev.1, paragraph 6.33.2).

2 In 2011, MEPC agreed to a work plan for the consideration of the impact on the Arctic of emissions of Black Carbon from international shipping (MEPC 62/24, paragraph 4.20), which included investigation of appropriate control measures to reduce the impact of BC emissions from international shipping (MEPC 62/24, paragraph 4.20.3) and reporting to MEPC 65 where appropriate actions would be agreed (MEPC 62/24, paragraph 4.20.4).

3 Twelve years on, the investigation has concluded with the identification of six measures, including: (1) a switch to distillate fuels; (2) a fuel standard based on aromatic content; (3) a BC emission control area (ECA); (4) engine certification (long term); (5) further work on resolution MEPC.342(77); and (6) the mandatory installation of BC reduction technology, e.g. diesel particulate filters (DPFs) (see document PPR 10/6, paragraph 15). Following further consideration of the six control measures by PPR 10, the onus is now on Member States and international organizations to work intersessionally to develop the most appropriate and effective BC control measures and to submit a proposal to PPR 11.

4 This document summarizes some of the considerations around the six potential control measures, some of which could be complementary, and sets out some thinking that the co-sponsors believe will be helpful in the further consideration and development of potential BC control measures. It is worth noting too that to reach these six potential control measures it has been agreed that further work should focus first on measures that can be agreed to and implemented immediately and be applicable to existing ships.

5 In document PPR 10/6/3 (FOEI et al.), the co-sponsors set out a pathway for the future control and regulation of BC impacting the Arctic. It is comprised of near-term regulatory measures, including a switch to distillate fuels or other cleaner non-fossil fuels via an amendment to MARPOL Annex VI (based on resolution MEPC.342(77)), and Arctic emission control areas (ECAs) addressing sulphur oxides and particulate matter. In the mid- to long-term, potential regulatory measures focused on the development of an aromatic fuel standard, engine certification and the mandatory installation of BC reduction technology are proposed.

Six BC control measures

Switch to distillate fuel

6 With respect to a switch to distillate fuels, resolution MEPC.342(77) was adopted two years ago in 2021 and urges Member States and ship operators to voluntarily use distillate or other cleaner alternative fuels or methods of propulsion that are safe for ships and could contribute to the reduction of BC emissions from ships operating in or near the Arctic. Based on recent analysis by the International Council on Clean Transportation (ICCT), the volume of distillate fuel required for an Arctic-wide switch to distillate is less than 25% of the volume of compliant fuel calculated as required to comply with the recently adopted Mediterranean Sea SO_x ECA.[1]

7 Turning a voluntary resolution into a mandatory control measure could be undertaken relatively easily with an amendment of MARPOL Annex VI (see document MEPC 79/5/5 (FOEI et al.)) and would simply require that ships use marine distillate fuel or other cleaner, alternative fuels or methods of propulsion that are safe for ships while operating in or near the Arctic. A new regulation in MARPOL Annex VI Chapter 3 (Requirements for Control of Emissions from Ships) addressing Special Requirements for Ships Operating in the Arctic could be introduced, including definitions of Arctic, BC and marine distillate fuel. BC has already been defined by this Committee (document MEPC 68/21, paragraph 3.26) and marine distillate fuel is described in ISO 8217:2017.

Fuel standard based on aromatic content

8 With respect to a fuel standard based on aromatic content, there is clear scientific evidence that BC emissions from transport fuels vary according to the aromatic content of the fuel (and with factors such as engine age, load and condition) and that the hydrogen/carbon

[1] https://cleanarctic.org/wp-content/uploads/2023/04/BC_in_Arctic_prePPR10.pdf, and annex to document MEPC 78/11.

(H/C) ratio of fossil fuels is a good indicator of the aromatic content. Recent studies on aviation kerosene set out a clear pathway to reduce naphthalene, the principal aromatic in kerosene, through additional refinery hydrotreatment.[2] It is notable that during the additional hydrotreatment process of kerosene, the sulphur is eliminated first at effectively no cost because the cleaner fuel is more energy intensive, and overall aromatics in kerosene can be significantly reduced for a minimal fuel cost premium – less than 5%. The challenge for marine fuels is to examine what reductions in both aromatics and sulphur could be achieved by similar additional hydrotreatment and at what cost both for refineries and the end user. Marine fuels can be further hydrotreated to meet significantly lower sulphur content standards for marine engines of limited capacity or when used in inland shipping.

9 While engine load and condition also affect BC emissions, burning "cleaner" fuel is a more significant contributor to emissions reductions. Development of a BC emission threshold, based initially at emission levels resulting from the use of distillate MGO fuels, has been suggested (PPR 10/6, paragraph 10). Doing so would be a first step towards setting a fuel standard based on aromatic content. Further research on marine fuel properties, aromatic content and H/C ratio, along with additional information on refinery processes could then inform a discussion as to the further tightening of such a fuel standard.

BC Emission Control Area

10 Traditional SO_x/PM and NO_x emission control areas (ECAs) as provided for in MARPOL Annex VI may not directly regulate BC emissions as effectively as a mandatory switch to distillates, as ultra-low sulphur fuel oil (ULSFO) is ECA compliant as is the use of exhaust gas cleaning systems to remove sulphur in the exhaust of ships continuing to use heavy fuel oils. The development of a BC ECA specifically to be applicable in the Arctic could directly address BC emissions but would require a fuel standard or specification that leads to BC emissions reductions. Such a fuel standard or specification could initially be set at the level of BC emissions reductions achieved by burning only distillate fuels.

11 Alternatively, an Arctic BC ECA could specify only the use of compliant fuels which reduce ships BC emissions. As with SO_x ECAs, it would require all ships to switch to compliant fuels when entering the BC ECA. Because scrubbers do not always reduce BC emissions and may in fact increase them, alternate compliance mechanisms would not be permitted. Establishing an Arctic BC ECA could be achieved through a new regulation in MARPOL Annex VI, Chapter 3 (Requirements for Control of Emissions from Ships) addressing Special Requirements for Ships Operating in the Arctic. Both a newly established definition of "Arctic" and the IMO definition of "Black Carbon" would need to be included in any Arctic ECA regulation.

12 The co-sponsors welcome document MEPC 80/16/2 (Canada) in which Canada informs MEPC of the intention to propose a Canadian Arctic ECA and the work described in document MEPC 80/INF.35 (Austria et al.) to develop a proposal for an Atlantic ECA. It is anticipated that these designations will contribute to efforts to reduce emissions of Black Carbon impacting the Arctic, particularly when the compliant fuel is distillate as it is assumed it will be in the development of a proposal to designate a Canadian Arctic ECA (MEPC 80/16/2). Indeed, document MEPC 74/INF.5 (France), which provided supporting information for the Mediterranean SECA proposal in document MEPC 78/11 (Albania et al.), forecasts ship emission reductions upon implementation of 95% for SO_x, 80% for PM and 51% for BC.

[2] See Mathpro, Techno-economic Assessment of Process Routes for naphthalene control in Petroleum Jet Fuel, February 2023 https://theicct.org/publication/naphthalene-control-jet-fuel-mar23/ and CE Delft December 2022 Social Costs and Benefits of advanced aviation Fuels https://cedelft.eu/publications/social-costs-and-benefits-of-advanced-aviation-fuels/

Engine certification

13 A mandatory engine certification system has been recognized as a long-term measure, given the considerable engine testing regime and development that would be required. If it was to only be applicable for new engines then such a standard could not be considered as an effective measure for achieving immediate reductions in BC emissions in the timescales required to meet UN objectives for reducing emissions of short-lived climate forcers and contributing to a 50% reduction in shipping's climate impact by 2030.

Further work on resolution MEPC.342(77)

14 Document PPR 10/6 (Denmark) (paragraph 17.6) notes that several delegations expressed strong support for making resolution MEPC.342(77) mandatory for the existing fleet. Given that this effectively amounts to a mandatory switch to distillates, it will not be addressed further in this submission. It should also be noted that adding emissions measurement reporting to the current voluntary resolution is a separate issue and not relevant when discussing the possible implementation of resolution MEPC.342(77) as a mandatory regulation.

Mandatory installation of BC reduction technology

15 The mandatory installation of BC reduction technology such as diesel particulate filters (DPFs) of which there are several types, for ships operating in or near to the Arctic, is the sixth potential BC control measure identified for further exploration (PPR 10/6, paragraph 17.7). BC reduction technology is acknowledged as needing further development and DPF technology is not a stand-alone measure, as its use would be contingent on ships using cleaner fuels. It would however be wrong to ignore a technological solution that, in conjunction with a clean fuel mandate, could potentially lead to a >90% reduction in BC emissions, particularly when the ultimate long-term BC emission standard needs to be set at zero if global climate objectives are to be met. DPFs have been widely used in other transport sectors for over a decade due to health and air pollution concerns, and the co-sponsors suggest that existing experience on installation of DPFs in the shipping sector be submitted for consideration.

Polar fuel standard

16 While not identified specifically as a control measure in document PPR 10/6, the concept of a polar fuel standard was discussed during PPR 10 (PPR 10/WP1/Rev.1, paragraph 10.18), particularly in considering the introduction of a pour point descriptor in the definition of heavy fuel oil in MARPOL Annex I, regulation 43A, which addresses the risk of heavy fuel oil spills in Arctic waters. While regulation 43A of MARPOL Annex I does not address the impact of BC emissions on the Arctic, the concept of a polar fuel standard could be valuable to efforts aimed at reducing BC emissions impacting the Arctic. However, it is likely that the time required to develop and mandate a polar fuel standard means it would be unlikely to achieve the urgently needed short-term reductions in Arctic BC emissions.

Action required of the Committee

17 The Committee is invited to note the information contained in paragraphs 6 to 16, and urge interested Member States and international organizations to develop concrete proposals for Black Carbon control measures and submit them to PPR 11.