ANNEX 2

RESOLUTION MEPC.393(82)
(adopted on 4 October 2024)

GUIDANCE ON BEST PRACTICE ON RECOMMENDATORY GOAL-BASED CONTROL MEASURES TO REDUCE THE IMPACT ON THE ARCTIC OF BLACK CARBON EMISSIONS FROM INTERNATIONAL SHIPPING

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that, at its sixty-second session, it agreed to a work plan including an investigation of appropriate control measures to reduce the impact on the Arctic of Black Carbon emissions from international shipping,

RECALLING FURTHER that, at its seventy-seventh session, it approved updated terms of reference for further work on the reduction of the impact on the Arctic of Black Carbon emissions, starting with the development of guidelines on recommendatory goal-based control measures to reduce the impact on the Arctic of Black Carbon emissions from international shipping,

RECALLING that, at its seventy-seventh session, it also adopted resolution MEPC.342(77) on *Protecting the Arctic from shipping Black Carbon emissions* urging 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 Black Carbon emissions from ships when operating in or near the Arctic,

ENCOURAGING Member States to continue addressing the threat to the Arctic from Black Carbon emissions, to engage with Arctic Indigenous Peoples with a view to including Indigenous knowledge in research and determining mitigation measures, and to report on measures and best practices to reduce Black Carbon emissions from shipping activities,

NOTING that, at its eighty-second session, it adopted, by resolution MEPC.394(82), *Guidelines on recommendatory Black Carbon emission measurement, monitoring and reporting*,

HAVING CONSIDERED, at its eighty-second session, draft guidance on best practice on recommendatory goal-based control measures to reduce the impact on the Arctic of Black Carbon emissions from international shipping, developed by the Sub-Committee on Pollution Prevention and Response,

1 ADOPTS the *Guidance on best practice on recommendatory goal-based control measures to reduce the impact on the Arctic of Black Carbon emissions from international shipping*, as set out in the annex to the present resolution;

2 INVITES Member States to take urgent action in applying this Guidance, including the dissemination thereof to the shipping industry and other interested parties and reporting to the Committee on any experience gained in their implementation;

3 AGREES to keep this Guidance under review in light of the experience gained.

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GUIDANCE ON BEST PRACTICE ON RECOMMENDATORY GOAL-BASED CONTROL MEASURES TO REDUCE THE IMPACT ON THE ARCTIC OF BLACK CARBON EMISSIONS FROM INTERNATIONAL SHIPPING

1 Purpose

1.1 This Guidance is intended to assist ship operators/companies in their efforts to reduce Black Carbon (BC) emissions from their ships operating in or near the Arctic in measurable and concrete ways.

1.2 This Guidance is recommended for all ships and should be taken into account in pursuing reductions of their Black Carbon emissions in or near the Arctic.

2 Scope

2.1 This Guidance reflects a number of ways by which measurable and consistent reductions from ships of their BC emissions when operating in or near the Arctic can be achieved, as follows:

.1 supporting informed decision-making by ship operators/companies;

.2 supporting/guiding ship operators/companies in their consideration of how best to achieve reductions in BC emissions;

.3 supporting/guiding ship operators/companies in their consideration of how best to document reductions in BC emissions; and

.4 supporting/guiding ship operators/companies in their consideration of how to develop a holistic approach to BC emissions reduction without increasing the negative impact on the environment and which may achieve environmental co-benefits.

2.2 This Guidance further details how the ship operator/company can develop a BC Management Plan, setting up reduction targets of their choosing per device, ship, fleet and/or other entity, how to validate if targets are met, and how to maintain the plan.

2.3 Ship operators/companies are encouraged to share their annual reports on the BC Management Plan with their Administration with a view to gathering expertise within IMO.

3 Guidance on best practices/control measures for ships

3.1 As an initial step, the ship operator/company should conduct an initial inventory of those BC sources and undertake BC emission measurements from those sources (marine diesel engines). The ship operator/company should use the *Guidelines on recommendatory Black Carbon emission measurement, monitoring and reporting* (resolution MEPC.394(82)).

3.2 The ship operator/company may consider setting a voluntary BC emission reduction target threshold. In setting a reduction target threshold, the ship operator/company may consider using distillate or other cleaner alternative fuels or methods of propulsion that are safe for ships and could contribute to BC reduction as called for in resolution MEPC.342(77) and what BC emission reduction target threshold might be achieved, if applied.

3.3 After setting such target threshold, the ship operator/company should identify and consider what practices and/or control measures are available to the ship which could be implemented to achieve the set reduction target threshold for BC emissions. This may take into account the information on technology options, measures, applicability and other considerations for BC emissions reduction for existing ships as set out in the appendix.

3.4 The ship operator/company should consider developing a BC Management Plan taking into account the above and include periodic monitoring for managing and ensuring success in reduction efforts.

4 Framework and structure of the BC Management Plan

4.1 The BC Management Plan should be structured as follows:

Planning to determine the current status of the ship's BC emissions and the expected BC emissions reductions.

Establishing an implementation system to identify those measures to be implemented, developing the procedures for management, defining tasks associated with those procedures, and assigning those tasks to responsible personnel.

Monitoring – BC emissions reduction of a ship should be monitored quantitatively on a regular basis (e.g. weekly, monthly), taking into account the *Guidelines on recommendatory Black Carbon emission measurement, monitoring and reporting* (resolution MEPC.394(82)).

Self-evaluation and improvement – The purpose of self-evaluation is to, among other benefits, evaluate the effectiveness of the planned measures and their implementation and allow for improvements.

4.2 The Black Carbon Management Plan should include the following information:

.1 which period the ship will seek to control BC emissions;

.2 in which areas, while operating there, the ship will control BC emissions;

.3 list of chosen sources being controlled for BC emissions;

.4 list of the set BC reduction target per chosen source or for the ship in general;

.5 description of how BC emissions are controlled per chosen source or for the ship in general;

.6 description of how to monitor reductions of BC emissions, including frequency and method(s) used;

.7 description of how an assessment will be conducted to identify whether the set reduction target(s) has been met;

.8 description of which corrective actions will be exercised if the set reduction target(s) is not met, if any;

.9 identify what should be contained in the ship's BC records; and

.10 in case the ship wants to report back to its Administration on a yearly basis, identify the date on which a report will be made available.

APPENDIX

TECHNOLOGY OPTIONS, MEASURES, APPLICABILITY AND OTHER CONSIDERATIONS FOR BLACK CARBON EMISSION REDUCTION FOR EXISTING SHIPS[1]

Possibility to apply:

✓ possible
(✓) possible with constraints and associated with high costs/efforts
X virtually impossible, would require efforts like conversion to new

Effectiveness related to its BC reduction potential:

+++ to +: very high to good 0: neutral n/a: not applicable

Detailed technology	**Estimated BC reduction potential in relation to HFO**	**Possibility to apply the technology to ships**		**Effectiveness of the detailed technology** ATTENTION: Effectiveness related to its BC reduction potential		**Comments/constraints**
		Re-fit	*Existing*	*Re-fit*	*Existing*	*"Re-fit" means that a measure can be applied to an "existing" ship after modifications; "existing" means a ship as it is, with no (technical) changes.*
***Technology:* Exhaust after-treatment**						
DPF *(Diesel Particulate Filter)*	80-99%	(✓)	X	+++	n/a	Only in combination with appropriately controlled sulphur / ash content fuels.
ESP *(ElectroStatic Precipitator)*	70%	(✓)	X	+	n/a	Safety aspects yet unsolved, may hinder the application of ESP on board ships.
Wet EGCS *(Exhaust Gas Cleaning System, "scrubber")*	0-25%	(✓)	X	0	n/a	There may be local restrictions on the discharge of discharge water from EGCS.
SCR *(Selective Catalytic Reduction)*	0-35%	(✓)	X	+	n/a	SCR is a technology to reduce NO_x. In combination with fuel injection timing, the engine can be tuned to reduce PM and BC emissions by increasing NO_x emissions abated by the SCR.
DOC *(Diesel oxidation catalyst)*	0	(✓)	X	0	n/a	DOC is a technology to reduce CO and HC but has no effect on BC.[2]

[1] Annotation: BC reduction potential depends on engine load, type and working principle (2- or 4-stroke, mean engine speed) and deviations of fuel properties.

[2] DOC was often mentioned and listed as a technology to reduce exhaust emissions in the BC discussion.

Detailed technology	**Estimated BC reduction potential in relation to HFO**	**Possibility to apply the technology to ships**		**Effectiveness of the detailed technology** ATTENTION: Effectiveness related to its BC reduction potential		**Comments/constraints**
		Re-fit	*Existing*	*Re-fit*	*Existing*	*"Re-fit" means that a measure can be applied to an "existing" ship after modifications; "existing" means a ship as it is, with no (technical) changes.*
Technology: Cleaner fuels						
Distillates	30-45%	✓	✓	+	+	30% with a low aromatic content (high H/C ratio). A lower H/C ratio means an increase in unsaturated hydrocarbons which indicates an increase in aromatic content which results in higher BC emissions.
LNG *(Liquified Natural Gas)*	>85%	(✓)	X	++	n/a	
LPG *(Liquified Petroleum Gas)*	>85%	(✓)	X	++	n/a	
Methanol	>85%	(✓)	X	++	n/a	
OME *(Oxymethylene ethers)*	>85%	(✓)	(✓) *(up to 15% mixing ratio)*	+++	+	OMEs contain oxygen and their combustion is similar to LNG. However, not commercially available, yet. Can be used as drop-in fuel. BC reduction potential relates to mixing ratio.
Biofuels						BC emission reduction. potential largely varies and depends on the fuel production pathway, its property and quality.
Sustainable synthetic fuels, PtX *(Power to Gas or Liquid)*	20-80%	✓	✓	++	++	Since these are sulphur and ash free fuels, they would provide the necessary basis for allowing possible DPF application.
Fuels with high H/C ratio	10-60%	✓	✓	+	+	The H/C ratio provides information on the aromaticity of a fuel, decreased ratio means higher aromatic content and higher BC emissions (H/C ratio is not provided in ISO 8217).

Detailed technology	**Estimated BC reduction potential in relation to HFO**	**Possibility to apply the technology to ships**		**Effectiveness of the detailed technology** ATTENTION: Effectiveness related to its BC reduction potential		**Comments/constraints**
		Re-fit	*Existing*	*Re-fit*	*Existing*	*"Re-fit" means that a measure can be applied to an "existing" ship after modifications; "existing" means a ship as it is, with no (technical) changes.*
Others						
Fuel cells / batteries	100%	(✓)	X	+++	n/a	Effective only if energy or hydrogen is generated by renewable energy. In case of a hybrid solution (ICE engine and battery), the BC reduction is limited and dependent on the load capping, shaping and shifting strategy. However, might be highly effective during transients. Not applicable for long distances and presumably not applicable in polar waters (energy demand and reserve not predictable).
Check/ control of engine and after-treatment devices on maintenance intervals and TBO[3]	10-60%	✓	✓	+	+	Engine and after-treatment device maintenance is the basis to ensure consistent emission performance.

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[3] Time Between Overhaul.