INTERNATIONAL MARITIME ORGANIZATION

E

SUB-COMMITTEE ON POLLUTION PREVENTION AND RESPONSE
10th session
Agenda items 6, 7, 8, 17

PPR10/6
20 January 2023
Original: ENGLISH
Pre-session public release: ☒

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

STANDARDS FOR SHIPBOARD GASIFICATION OF WASTE SYSTEMS AND ASSOCIATED AMENDMENTS TO REGULATION 16 OF MARPOL ANNEX VI

DEVELOPMENT OF AMENDMENTS TO MARPOL ANNEX VI AND THE NO_x TECHNICAL CODE ON THE USE OF MULTIPLE OPERATIONAL PROFILES FOR A MARINE DIESEL ENGINE

ANY OTHER BUSINESS

Report of the Correspondence Group on Prevention of Air Pollution from Ships

Submitted by Denmark

SUMMARY	
Executive summary:	This document contains the report of the Correspondence Group on Prevention of Air Pollution from Ships.
Strategic direction, if applicable:	1
Output:	2.15, 2.18, 3.3
Action to be taken:	Paragraph 51
Related documents:	MEPC 73/9/8, MEPC 73/19; MEPC.342(77); MEPC.244(66); PPR 6/20/Add.1, annex 9; PPR 9/8/1, PPR 9/8/4, PPR 9/9, PPR 9/11, PPR 9/11/2, PPR 9/11/3, PPR 9/11/5, PPR 9/19/2, PPR 9/19/4, PPR 9/19/5, PPR 9/INF.10, PPR 9/INF.11, PPR 9/21, PPR 10/INF.9 and PPR 10/INF.10

BACKGROUND

1 Due to the time constraints during the COVID-19 pandemic, the topics of this Group had not been properly addressed for some time. In order to further the work and have a more structured discussion at PPR 10, PPR 9 decided to establish a correspondence group to report to PPR 10 (PPR 9/21, paragraph 19.23).

2 PPR 9 established the Correspondence Group on Prevention of Air Pollution from Ships and:

.1 tasked it to progress the work relating to the reduction of the impact on the Arctic of Black Carbon emissions from international shipping intersessionally;

.2 agreed to forward document PPR 9/9 (Panama) on Shipboard gasification of waste systems and associated amendments to MARPOL Annex VI to the Correspondence Group;

.3 agreed to forward all the documents under the agenda item on development of amendments to MARPOL Annex VI and the NO_x Technical Code on the use of multiple engine operational profiles for a marine diesel engine (MEOP) to the Correspondence Group; and

.4 agreed to forward documents PPR 9/19/2 (OCIMF), PPR 9/19/4 (Norway), PPR 9/19/5 (INTERTANKO) and PPR 9/INF.11 (OCIMF) to the Correspondence Group with a view to identifying the outline of a scope of work on the reduction on Volatile Organic Compound (VOC) emissions.

TERMS OF REFERENCE

3 The Correspondence Group on Prevention of Air Pollution from Ships was established, under the coordination of Denmark, and instructed to (PPR 9/21, paragraph 19.23):

.1 with regard to the reduction of the impact on the Arctic of Black Carbon emissions from international shipping:

.1 develop draft guidelines on recommendatory goal-based control measures to reduce the impact on the Arctic of Black Carbon emissions from international shipping, recognizing possible different approaches for new and in-service ships, using documents PPR 9/8/1 (Denmark and Finland) and PPR 9/8/4 (IMarEST) as a basis, taking into account other relevant documents and views expressed;

.2 in view of approaches considered under 1.1, review existing data on the recommended Black Carbon measurement methods (FSN, PAS, LII) to be used in conjunction with such draft recommendatory goal-based control measures with a view to:

.1 identifying the most suitable measurement method(s) to be followed, taking into account relevant documents including those submitted to MEPC 76, MEPC 77 and PPR 9;

.2 identifying the related sampling, measurement, reporting and calibration procedures;

.3 identifying how to develop and apply potential threshold (limit) value(s) for Black Carbon;

.4 gathering relevant information on the development of a standard approach to the characterization of marine fuels in terms of their aromatic and paraffinic nature; and

.3 further consider regulating or otherwise directly control Black Carbon emissions from marine diesel engines (exhaust gas) to reduce the impact on the Arctic of Black Carbon emissions from international shipping, taking into account the identified candidate control measures (PPR 6/20/Add.1, annex 9), other relevant documents and views expressed;

.2 with regard to standards for shipboard gasification of waste systems and associated amendments to regulation 16 of MARPOL Annex VI:

.1 develop draft standard specification/guidelines for thermal waste treatment devices, using the annex to document PPR 9/9 (Panama) as a basis;

.3 with regard to the development of amendments to MARPOL Annex VI and the NO_x Technical Code on the use of multiple engine operational profiles (EOPs) for a marine diesel engine:

.1 in accordance with the scope of work agreed at MEPC 73 (MEPC 73/19, paragraph 15.18), and taking into account relevant documents submitted to MEPC 71, MEPC 73, MEPC 77, PPR 7 and PPR 9:

.1 further consider how to incorporate, and prepare regulatory controls and/or draft amendments on, the use of multiple Engine Operating Profiles (EOPs) in MARPOL Annex VI and/or the NO_x Technical Code 2008 as appropriate;

.2 clarify the need for definitions of terminology and application related to EIAPP test cycles and related amendments to the NO_x Technical Code 2008; and

.3 in relation to possible outcomes from 3.1.1 and 3.1.2 above, consider whether to extend the scope of the output, and advise the Sub-Committee accordingly;

.4 with regard to the reduction of Volatile Organic Compound (VOC) emissions:

.1 identify the outline of a scope of work on the reduction of Volatile Organic Compound (VOC) emissions, taking into account documents PPR 9/19/2 (OCIMF), PPR 9/INF.11 (OCIMF), PPR 9/19/4 (Norway) and PPR 9/19/5 (INTERTANKO); and

.5 submit a written report to PPR 10.

PARTICIPANTS

4 The Correspondence Group had participants consisting of the following Member States:

AUSTRALIA
CANADA
CHINA
DENMARK
FINLAND
GERMANY
GREECE
INDIA
JAPAN
LIBERIA
MARSHALL ISLANDS
NETHERLANDS
SINGAPORE
NORWAY
PANAMA
REPUBLIC OF KOREA
RUSSIAN FEDERATION
SWEDEN
UNITED STATES

and the following non-governmental organizations in consultative status:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INUIT CIRCOMPOLAR COUNCIL (ICC)
BIMCO
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS)
OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF)
FRIENDS OF THE EARTH INTERNATIONAL (FOEI)
INTERNATIONAL MARITIME PILOTS' ASSOCIATION (IMPA)
CESA
INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS (INTERTANKO)
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)
WORLD WIDE FUN FOR NATURE (WWF)
THE EURPOEAN ASSOCIATION OF INTERNAL COMBUSTION ENGINE AND ALTERNATIVE POWERTRAIN MANUFACTURERS (EUROMOT)
THE INSTITUTE OF MARINE ENGINEERING, SCIENCE AND TECHNOLOGY (IMarEST)
INTERNATIONAL MARINE CONTRACTORS ASSICIATION (IMCA)
INTERNATIONAL BUNKER INDUSTRY ASSOCIATION (IBIA)
WORLD SHIPPING COUNCIL (WSC)
PACIFIC ENVIRONMENT
CLEAN SHIPPING COALITION (CSC)

METHOD OF WORK

5 The terms of reference (ToR) of the Group were dealt with as four independent topics: Black Carbon (BC), Gasification, Multiple Engine Operational Profiles (MEOPs or Multiple EOPs) and Volatile Organic Compound (VOC) emissions. The outcome of the discussions is summarized in this report.

6 A total of five rounds of correspondence were undertaken, each building on comments/answers from the previous round. Summaries of the comments received for each round are set out in annexes to documents PPR 10/INF.9 and PPR 10/INF.10 (Denmark), to be made available on IMODOCs by the nine-week submission deadline for PPR 10.

BLACK CARBON (BC)

7 A total of five rounds were undertaken. Each round built on the input from the previous round. The main outcomes of the rounds are summarized in table 1:

Table 1: Rounds of discussion on Black Carbon

1	Comments invited on • ToR 1: Based on document PPR 9/8/1 (Denmark and Finland) and document PPR 9/8/4 (IMarEST), a draft guideline was sent out for commenting. • ToR 2: First round of review of existing data on recommended BC measurements methods. ToR 3: Commenting on document PPR 6/20/Add.1, annex 9. Table of candidate control measures to reduce the impact on the Arctic of BC emissions from international shipping.
2	Comments invited on: • ToR 1: Second round on the draft guideline • ToR 2: - • ToR 3: Second round of comments on the control measures
3	Comments invited on: • ToR 1: third round on the draft guideline, with additional questions from Japan • ToR 2: Comments on the outstanding issues deriving from ToR 1 on measurement methods • ToR 3: Consideration of policy/regulatory options for reducing BC
4	Comments invited on: • ToR 1: Fourth round of comments on the draft guideline. Proposal by Finland based on resolution MEPC.342(77) • ToR 2: Comments from ToR 2 was used under ToR 1 • ToR 3: Further considerations of policy/regulatory options for reducing BC
5	Comments invited on the draft report to PPR 10.

8 The proposed guidelines from Finland with the comments received from round 4 are set out in annex 1. It should be noted that the Group did not have time to fully discuss the proposed guidelines; therefore further work will be needed.

9 The list of proposed policy/regulatory options with positive and negative comments from the participants of the Group is in table 2.

Table 2: Comments from the participants on proposed policy/regulatory options for Black Carbon

Proposed policy/regulatory option	**Positive**	**Negative**
1 Fuel standard (e.g. based on aromaticity)	To be looked at later	
2 Emission standard	Basic agreement to develop an emission standard for goal-based guidelines	It will need time and date to develop. It is necessary to determine fair reduction target objective

Proposed policy/regulatory option	Positive	Negative
3 ECA	ECA is a possibility – but does not regulate BC directly	ECAs need to be proposed by Contracting Parties to MARPOL Annex VI following specific procedures, so may not be suitable for the Correspondence Group to work on.
4 Engine certification/tier	The proposal has some support but should be looked at further	
7 Resolution MEPC.342(77)	Already used as starting point for a guideline	
8 Engine age, maintenance – should we include these parameters in the work of the guideline, or any other place?	This proposal does not have a lot of support to use as regulation, could be included as best practice.	
9 Install BC reduction technology, e.g. diesel particulate filters	This proposal does not have a lot of support to use as regulation, since it is not technology neutral.	Would have to looked at further

Discussions during the work of the Group on BC

On the purpose of the guideline and the inclusion of a BC threshold

10 In the responses to Japan's helpful questionnaire from round 3 of the Correspondence Group, many participants agreed that for the tasked guidelines to be "goal-based", a BC emission threshold is required and that BC measurement guidelines in the absence of this threshold, or guidance on how to reduce Black Carbon, do not satisfy the remit of this Correspondence Group and the larger tasking to the PPR Sub-Committee on the BC agenda item.

11 Some of the members suggested options for approaches to setting a BC emission threshold value (e.g. at an emission level equivalent to distillate fuel). Some participants proposed metrics based on FSN number, while others expressed the view that values should be in SI units (Standardized International units like mass per kWh).

12 Conversely, some members argued that because these are voluntary guidelines, it is not appropriate to set a BC emission threshold value. Suggestions were also put forward by some members for inclusion of approaches to reducing BC in the guideline.

On the selection of FSN as the preferred measurement method

13 The majority of members supported specifying FSN as the primary method of measuring BC emissions from ship engines in the guideline. However, some members argued that it was inappropriate to specify a specific measurement method in a voluntary guideline when measurement campaigns have consistently shown a good correlation between the three approved BC measurement methods.

Onboard BC measurement frequency

14 On the issue of onboard BC emission monitoring frequency, there was some divergence within the Group. The original proposal from the Coordinator was daily, revised to weekly, with some members commenting that weekly was still too frequent. Some members recommended only once a year. There was no clear technical justification for any of the proposals.

Issues where the Group reached general agreement

15 During the four rounds of comments, the Group reached general agreement on the following:

.1 any development of a regulation or guideline should be goal-based and technology neutral;

.2 development of a guideline based on resolution MEPC.342(77) for the collection of data;

.3 the need for development of guidelines in order to reduce the BC emissions from ships, separately for both new ships as well as existing ships;

.4 there is a need for additional time to further develop this task; and

.5 the Correspondence Group reduced the list of potential BC measures for further exploration, to the following:

.1 a switch to distillate fuels;

.2 a fuel standard based on aromatic content;

.3 a BC 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).

16 Consideration of slow steaming and port electrification was ruled out due to lack of sufficient support, while engine age/maintenance issues could be recommended as best practice but probably could not be regulated.

17 The following aspects on the candidate regulatory control options have been discussed in depth:

.1 Switch to distillate fuels: the discussion regarding a mandatory switch to distillates as an easy to apply short term measure was discussed within the Group. Positive and negative views were expressed. In this context, the geographical scope was also discussed.

.2 Fuel standard: both positive and negative views were expressed about a fuel standard based on aromaticity. It was agreed that developing this option would take time. Notwithstanding the merits, it was generally agreed that it could not be introduced in the short term. So further discussion set aside for later.

.3 Emission standard: Seems a very suitable goal-based long-term objective but a threshold would also be needed – and achievable for existing ships, e.g. by being set initially at the BC level of distillates. Generally agreed considerable further development work would be needed so further discussion set aside for the time being.

.4 Emission Control Area (ECA): could be developed specifically to address Black Carbon or remain SO_x/NO_x. Some strong support for, but also concerns and some opposition expressed. It was recognized that a SO_x/NO_x ECA would not directly regulate Black Carbon emissions as the requirement to use distillate or similar cleaner fuels arguably would, because ULSFO, a residual fuel (with higher Black Carbon emissions), is ECA compliant. As such, the exact impact on Black Carbon would not be known. Other comments included that a Black Carbon ECA would first require a Black Carbon emission standard; that more data was needed; and that other measures (e.g. under the Polar Code or via a PSSA or a mandatory EIAPP certificate) would be a sufficient option, and that ECA proposals would need to be brought forward by States.

.5 Black Carbon engine certification for the long term: widespread support but as a long-term objective and for new engines only. Engine age issue raised.

.6 Resolution MEPC.342(77): Support for further work on the proposal was noted and text suggestions invited. Several delegations expressed strong support for making MEPC.342(77) mandatory for the existing fleet. Following Finland's proposal related to ToR1, other delegations merely expressed support for Finland – to add emissions measurement reporting to the current voluntary resolution. However, this is a separate issue to the possible implementation of resolution MEPC.342(77) as a mandatory regulation/issue.

.7 Mandatory installation of Black Carbon reduction technology: e.g. diesel particulate filters (DPFs). Some delegations opposed it as a non-technology neutral approach. Others concerned that DPF technology needed further development first, especially for large engines/ships and that their use first required a clean fuel mandate – distillate or even cleaner.

Next steps to be further discussed

18 Development of guidelines – separately for existing ships and new ships, regarding emission limits for the engine/engine after treatment systems.

19 Inclusion of the following questions raised by Japan in round 3 in the development of guidelines for existing and new ships:

.1 what specific measures, such as switch to distillate fuels, engine certification and the use of BC reduction technology, should be included into the guidelines in order to make the guidelines goal-based; and

.2 how to use regular BC emissions measurement with the measures.

20 Further work on the draft guidelines on recommendatory Black Carbon emission data collection and reporting, by Finland (annex 1).

21 The guidelines should be goal based and further discussion is needed on how to achieve this for both guidelines.

22 Additional work is required on exploring potential BC emission threshold(s), taking into account the impact of transboundary BC emission sources related to shipping at a global level, or other BC emission reduction goals for the Arctic, including the development of a methodology to establish such a goal/ threshold. Some members already provided proposals on potential approaches for developing thresholds, metrics and proposed specific options for BC threshold limit values.

23 It has been discussed if there was to be developed mandatory requirements for the BC emissions from marine diesel engines; however, this was not supported by all in the Group.

24 The Group agreed that further work should first focus on measures that can be agreed and implemented now – hence applicable to the existing ships. However, some members expressed concerns that there was not sufficient data for BC emissions, and without potential BC emission threshold(s), the necessary measures could not be determined.

25 Next steps to be further discussed include working on potential measures impacting new builds, and retrofits at a later stage, and clarifying that such measures apply to the geographic area, which has to be defined.

26 Also, there is a need to clarify related outstanding questions, including the geographic scope of any Arctic BC regulation.

27 There is still a lot of work ahead on the development of draft guidelines on recommendatory goal-based control measures to reduce the impact on the Arctic of Black Carbon emissions from international shipping, and further consideration should be given on regulating or otherwise directly controlling Black Carbon emissions from marine diesel engines (exhaust gas) to reduce the impact on the Arctic of Black Carbon emissions from international shipping. Therefore, the Group agreed to request that this work be sent to a working group at PPR 10 in order to make progress on the work.

DRAFT GUIDELINES FOR THERMAL WASTE TREATMENT DEVICES AS EQUIVALENT MEANS

28 The Group did five rounds of discussion on the guidelines set out in document PPR 9/9 by Panama. A total of five rounds were undertaken. Each round built on the input from the previous round. The focus of the discussion is summarized in table 3.

Table 3: Rounds of discussion on draft guidelines for thermal waste treatment devices as Equivalent Means

1-4	• Comments invited on the draft standard specification/guidelines for thermal waste treatment devices, using document PPR 9/9 (Panama) as a basis
5	Comments invited on the draft report to PPR 10.

29 Annex 2 to this document contains the draft guidelines, as developed during the Correspondence Group.

Issues where the Group reached general agreement

30 During the four rounds of comments, the Group reached general agreement on the draft guidelines set out in the annex 2 to this document being used as a basis for future work in order to finalize these guidelines.

Outstanding issues to be further discussed

31 Outstanding issues to be further discussed:

.1 consent and agreement need to be achieved on the proposals from Group members for modifications and/or amendments to some paragraphs of the content of the draft guideline; and

.2 there are several outstanding issues, and the guidelines in the annex is kept open in its entirety for further development.

32 The Group agreed to request that this work be sent to a working group at PPR 10 in order to make further progress on the work.

MULTIPLE ENGINE OPERATIONAL PROFILES (MEOPS OR MULTIPLE EOPS)

33 A total of five rounds were undertaken. Each round built on the input from the previous round. The items addressed in each of the five rounds are summarized in table 4:

Table 4: Rounds of discussion for MEOPs

1	Comments invited on • The need to revise MARPOL Annex VI, regulation 13 • Whether to use document PPR 9/11 as the base document. • Test cycles • General comments on documents PPR 9/11 and PPR 9/11/2
2	Comments invited on a number of "high level" questions regarding Auxiliary Control Devices (ACDs), not-to-exceed zones and multiple engine operational profiles (MEOPs or multiple EOPs), following the proposal by one member in round 1. Further, concrete proposals for the structure of a new NTC chapter 8 was invited.
3	Comments invited on: • Proposals for the definition of electronic controlled engine proposed by two members in round 2. • Whether specific elements of documents PPR 9/11 and PPR 9/11/2 could be used as starting points for the amendments to be developed, noting that concerns expressed in documents PPR 9/11/3 and PPR 9/11/5 as well as in the Correspondence Group would need to be further discussed. • Additional options for the use of multiple EOPs proposed by members in round 2. • Proposal for the structure of a new NTC chapter 8 (submitted by IMarEST in round 2).
4	Comments invited on: • Use of multiple EOPs for purpose of deep water and harbour operation. • Specific text proposals regarding ACDs. • Coordinators proposed way forward regarding definitions of terminology and application related to EIAPP test cycles. • Coordinators proposed way forward regarding additional options for the use of multiple EOPs proposed by members in round 2.
5	Comments invited on the draft report to PPR 10.

34 Annex 3 to this document contains a more detailed summary of the discussions of the Correspondence Group. Paragraphs 2 and 3 provide an overview of issues where the Group reached general agreement and issues where further consideration was needed.

Issues where the Group reached general agreement

35 During the four rounds of discussions, the Group reached general agreement on the following issues:

.1 the issue raised by Australia in paragraphs 9 and 10 of document MEPC 73/9/8, regarding deep water and harbour operation, was not an example of the engine using different engine operational profiles;

.2 support in principle for the definition of "engine operational profile" proposed in document PPR 9/11, noting that this definition was approved by MEPC 73 (as a "description");

.3 there was a need for amendments to clarify the application of auxiliary control devices. The Group developed specific text proposals to amend NTC 2008 which are presented in annex 3. The text contains different options (in square brackets) for further consideration by the Sub-Committee;

.4 amendments regarding multiple EOPs and not-to-exclude (NTE) zones should be placed in a new chapter 8 of the NO_x Technical Code 2008 (NTC); and

.5 elements proposed in documents PPR 9/11 and PPR 9/11/2 regarding NTE zones and use of multiple EOPs could be used as starting points for the amendments to be developed. However, several members stressed the need to take into account the comments in documents PPR 9/11/3 and PPR 9/11/5 as well as concerns expressed in this Correspondence Group (see also paragraph 3 on issues where the Group had diverging views).

36 It was noted that while general agreement was reached on these issues, development of specific amendments would still need to be further discussed and agreed.

37 The Group also agreed on the need for clear definitions of terminology and application related to EIAPP test cycles. Consequently, the Group supported to extend the scope of the output to cover definitions of terminology and application related to EIAPP test cycles and related amendments to the NO_x Technical Code 2008. In this regard, the Group noted that further development of the concept of not-to-exceed zones/off-cycle NO_x emission control may provide additional clarity on the application of test cycles and that this should be taken into account in the discussion of test cycles.

Outstanding issues to be further discussed

38 The Group was not able to develop draft amendments on the conditions for use of multiple EOPs as called for by its ToR. After four rounds of discussion there were still fundamentally different views in the Group on a number of key issues related to multiple engine operational profiles (EOPs) and not-to-exceed zones/off-cycle NO_x emission control. Further, a number of issues were not discussed in detail, partly due to time constraints but also due to the limitations of the format of a Correspondence Group.

39 Following round 4, the Group identified the following main outstanding issues which would require further discussion:

.1 scope and entry into force of the amendments on multiple EOPs and NTE zones;

.2 definition and application of the NTE zone, including lower boundary of the zone and possible restrictions in service;

.3 extent and procedure for the NTE assessment;

.4 NTE-zone multiplier/ off cycle NO_x emission control criteria for Tier II and Tier III

.5 extent of restrictions of changing between multiple EOPs; and

.6 possible inclusion of an option for the use of multiple EOPs for "significantly different fuels".

40 It was noted that further detailed discussions may highlight additional points or a need to revisit certain points in order to adequately cover the terms of reference.

41 In round 4, the Coordinator noted that it would be useful to have a specific text proposal for a new NTC chapter 8 covering the draft amendments regarding multiple EOPs and NTE zones as basis/base document for further discussions at PPR 10.

42 In this regard, the Coordinator noted that such a draft could follow the structure proposed by IMarEST in round 2 and use elements of proposals in documents PPR 9/11 and PPR 9/11/2 as starting points, taking into account the comments in documents PPR 9/11/3 and PPR 9/11/5 as well as concerns expressed in this Correspondence Group, as appropriate.

43 In round 5, the Coordinator invited members to submit proposals for a new chapter 8 to PPR 10.

44 The Group agreed to request that this work be sent to a working group at PPR 10 in order to make progress on the work.

VOLATILE ORGANIC COMPOUNDS (VOCS)

45 A total of five rounds were undertaken. Each round built on the input from the previous round. The focus of the discussion is summarized in table 4.

Table 4: Rounds of discussion for VOCs

1-4	Comments invited on the draft on the scope of work on Reduction of Volatile Organic compound (VOC) emissions
5	Comments invited on the draft report to PPR 10.

46 The draft scope of work, as developed during the Correspondence Group, is set out in annex 4 to this document.

Issues where the Group reached general agreement

47 During the four rounds of comments, the Group reached general agreement on the following issues:

.1 to base the scope of work on examination of the existing regulatory framework;

.2 action point in the report: concur with the view that the Committee should invite OCIMF to contribute to the work in reducing the emissions of VOC from tankers in their interface with terminals; and

.3 action point repeated by INTERTANKO, which gained support from other members of the Group: the scope of the work in reducing VOC emissions can only be achieved with active participation of shore terminals to receive VOCs from tankers.

Outstanding issues to be further discussed

48 Method to estimate VOC emissions (the proposal in the annex is in square brackets to be further discussed).

49 Any amendments to MARPOL.

50 Finalization of the scope of work based on annex 4 to this document.

ACTION REQUESTED OF THE SUB-COMMITTEE

51 The Sub-Committee is invited to consider this report of the Correspondence Group and, in particular:

.1 with regard to Black Carbon emissions:

.1 note the discussions of the Group (paragraphs 7 to 27);

.2 consider the points on which the Group reached general agreement and the outstanding topics described in paragraphs 15 to 17, and 18 to 27, respectively, with a view to endorsing them to facilitate further progress;

.3 consider the establishment of a working group on air pollution prevention from ships to make further progress on the output (paragraph 27 and annex 1); and

.2 with regard to thermal waste treatment:

.1 note the discussions of the Group (paragraphs 28 to 32; and annex 2);

.2 consider the points on which the Group reached general agreement and the outstanding topics described in paragraphs 30 and 31, respectively, with a view to endorsing them to facilitate further progress; and

.3 consider tasking the proposed working group on air pollution prevention from ships to make further progress on the output (paragraph 32);

.3 with regard to multiple engine operational profiles:

.1 note the discussions of the Group (paragraphs 33 to 44; and annex 3);

.2 consider the points on which the Group reached general agreement and the outstanding topics described in paragraphs 35 to 37 and paragraphs 38 to 43, respectively, with a view to endorsing them to facilitate further progress;

.3 consider tasking the proposed working group on air pollution prevention from ships to make further progress on the output (paragraph 44);

.4 with regard to VOC

.1 note the discussions of the Group (paragraphs 45 to 50; and annex 4);

.2 consider the points on which the Group reached general agreement and the outstanding topics paragraphs described in paragraph 47 and paragraphs 48 to 50, with a view to endorsing them to facilitate further progress; and

.3 take action as appropriate.

***

ANNEX 1

[DRAFT RESOLUTION MEPC.XX

(Adopted on XX YY ZZ)

PROTECTING THE ARCTIC FROM SHIPPING BLACK CARBON EMISSIONS AND COLLECTION OF BLACK CARBON EMISSION DATA

Draft guidelines on recommendatory Black Carbon emission data collection and reporting

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 MEPC 62 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 MEPC 77 approved the updated terms of reference for further work on the reduction of the impact on the Arctic of Black Carbon emissions starting with guidelines on goal-based control measures to reduce the impact on the Arctic of Black Carbon emissions from international shipping,

RECOGNIZING that Black Carbon is a potent short-lived contributor to climate warming, and as such was subject to study in the Fourth IMO GHG Study 2020,

HAVING CONSIDERED the threat to the Arctic from ships' Black Carbon emissions and understanding that the development of goal-based guidelines and any mandatory control measures will require further work and time,

RECOGNIZING that the Fourth IMO GHG Study's emission factors show that, when used in the same engine, a switch to distillate reduces Black Carbon emissions per kilogram of fuel consumption,

ENCOURAGING Member States to commence addressing the threat to the Arctic from Black Carbon emissions, and report on measures and best practices to reduce Black Carbon emissions from shipping,

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 Black Carbon emissions from ships when operating in or near the Arctic.

INVITES Administrations to provide black carbon emission data to IMO as described in the appendix of these Guidelines, and operators to also apply that appendix when undertaking related black carbon emission measurements from marine diesel engines.

INVITES Administrations to motivate the operators to voluntary apply these Guidelines when undertaking black carbon related measurements from marine diesel engines and provide black carbon emission data to IMO as described in the annex of these Guidelines.

ANNEX

DRAFT GUIDELINES ON RECOMMENDATORY BLACK CARBON EMISSION DATA COLLECTION AND REPORTING

Introduction

1 The purpose of these Black Carbon Guidelines, hereunder referred to as "the Guidelines", and Black Carbon referred to as BC, is to specify the recommendations for the testing of marine diesel engines or exhaust gas treatment systems, in combination or individually, to collect Black Carbon emission data for existing ships in order to enhance development of recommendations and regulations to reduce the impact on the Arctic of Black Carbon emissions.

Application

2 These Guidelines apply to marine diesel engines with a power output of more than [130 kW] which are installed with or without combinations of either an exhaust gas treatment system or a low-BC emission fuel, on board any ship operating in the Arctic.

3 Administrations should invite and motivate the ship owners for the collection of relevant data. To this end, ship operators and owners are invited to measure and report BC emissions.

Recommended procedure for BC measurements

4 BC measurements should be undertaken at least once for each period with a total duration of [seven] days, while operating in the Arctic, at the running load of the marine diesel engine in question and the result recorded in accordance with the annex of these Guidelines.

5 BC emissions should be sampled in accordance with ISO 8178 from a suitable connection downstream of any influencing devices or arrangements. The probe shall be installed in the exhaust gas pipe in a way that a representative sampling is possible.

1. It should be ensured that there is no open supply connection of air or other such material, which would have the effect of diluting the exhaust gas stream at the sampling point. This does not apply to any material consistently introduced into the exhaust gas stream as part of other emission control arrangements such as SCR [or EGCS]. Sampling should not be undertaken during or shortly after cleaning events, which could affect the exhaust gas stream such as turbo-charger washing or soot blowing of exhaust gas heat exchangers.

2. BC emission measurements in terms of FSN should be carried out according to ISO 10054 and ISO 8178-3. BC emissions should be measured in accordance with the device manufacturers' recommendations at a time when the engine is operating under stable conditions – that is neither torque nor speed varying by more than [5%] of the actual value over a period of not less than [10 minutes] prior to taking the reading – and above [25%] MCR. If the engine is limited due to EEXI it is with reference to the limited MCR value.

3. As an alternative to the FSN measurement method other instrumentation including LII or PAS may be used instead provided there is an established correlation between these instruments and the equivalent BC concentrations reported by FSN instruments. These alternative devices should be operated in accordance with the device manufacturers' recommendations including sample conditioning and processing.

4. The BC measurement instruments are to be maintained and calibrated/checked in accordance with manufacturer recommendations.

6 It should be ensured that there is no open supply connection of air or other such material, which would have the effect of diluting the exhaust gas stream at the sampling point. This does not apply to any material consistently introduced into the exhaust gas stream as part of other emission control arrangements such as SCR [or EGCS]. Sampling should not be undertaken during or shortly after cleaning events, which could affect the exhaust gas stream such as turbo-charger washing or soot blowing of exhaust gas heat exchangers.

7 BC emission measurements in terms of FSN should be carried out according to ISO 10054 and ISO 8178-3. BC emissions should be measured in accordance with the device manufacturers' recommendations at a time when the engine is operating under stable conditions – that is neither torque nor speed varying by more than [5%] of the actual value over a period of not less than [10 minutes] prior to taking the reading – and above [25%] MCR. If the engine is limited due to EEXI it is with reference to the limited MCR value.

8 As an alternative to the FSN measurement method other instrumentation including LII or PAS may be used instead provided there is an established correlation between these instruments and the equivalent BC concentrations reported by FSN instruments. These alternative devices should be operated in accordance with the device manufacturers' recommendations including sample conditioning and processing.

9 The BC measurement instruments are to be maintained and calibrated/checked in accordance with manufacturer recommendations.

Reporting of Black Carbon emissions

10 Reporting of Black Carbon emissions should be done by the shipowner in accordance with the measurement reporting protocol given in the appendix.

APPENDIX

**DRAFT MEASUREMENT REPORTING PROTOCOL
FOR BLACK CARBON (BC) DETERMINATION**

BC Data and information to be reported:

BC emission reduction plan including technology, fuels and/or operations to be implemented

Voluntary BC emission reduction goal: [in FSN, g/kWh, or g/kg fuel, or % reduction?]

A Ship

Name

IMO number

Flag

B Engine – for each engine over 130 kW in use in Arctic

Manufacturer

Model / type / rating designation

Serial number

Rated power (kW) & speed (rpm)

Date of installation

Details of any specially considered sampling position

Details of any documented emissions control arrangement fitted/applied

C BC data – at each measurement occasion

Date and UTC

Ship's position

FSN or BC mass concentration

Exhaust gas temperature at sample extraction point

Engine load & speed

Fuel type in use*

Emission control devices or arrangements in use at time of sampling (including devices for other than BC emission control including but not limited to SCR, EGR or EGCS)

Other relevant information]

***

* Fuel grade type and designation and BDN sulphur content.

ANNEX 2

DRAFT GUIDELINES FOR THERMAL WASTE TREATMENT DEVICES AS EQUIVALENT MEANS, UNDER REGULATION 4 OF MARPOL ANNEX VI, TO INCINERATORS AS GIVEN BY REGULATION 16 OF THAT ANNEX.

Draft 20XX Guidelines for Thermal Waste Treatment Devices

Contents:

1 Introduction

1.1 These Guidelines covers the approval, certification and in service controls applicable to thermal waste treatment devices as Equivalent Means, under regulation 4 of MARPOL Annex VI, to incinerators as covered by regulation 16 of that annex and as specifically provided for by paragraphs 1 and 5.2 of that regulation.

1.2 These Guidelines, as directed by PPR 6, are written on the basis of a technology neutral, goal based, approach that can be applied to any thermal waste treatment device using, for example, gasification, hydrothermal carbonization, pyrolysis, plasma or other thermal means for the disposal of permitted garbage and other shipboard wastes generated during a ship's normal service.

1.3 As an alternative to conventional incinerators, as a means of disposal of garbage and other shipboard wastes, these thermal waste treatment devices remain subject to the same prohibitions as to those materials which are not to be so disposed of as given by regulation 16.2 of MARPOL Annex VI.

1.3*bis* A thermal waste treatment device certified under these Guidelines should be required to duly limit dioxin formation in the exhaust gas stream and hence, in accordance with regulation 16.3, the disposal of PVC by such a device should be allowed.

1.4 A thermal waste treatment device certified in accordance with these Guidelines should meet Performance Level 1 in terms of emissions to air which is comparable to the emission limit requirements given in the *2014 Standard specification for shipboard incinerators* (resolution MEPC.244(66)) – this Performance Level should be demonstrated by in-service emission measurements. Where there is a related water discharge to sea that also should be controlled as given by these Guidelines.

1.5 Additionally, an applicant may request certification to Performance Level 2. In that case not only should the Performance Level 1 requirements be met but there are detailed additional testing requirements which should be met prior to approval as an Equivalent Means together with tighter in-service emission limits.

2 General - Basis of these Guidelines

2.1 In order to be 'technology neutral' these Guidelines follow a goal-based approach, the basis of which is:

.1 the in-service monitoring and recording of specified emissions;

.2 the identification of relevant Functional Objectives; and

.3 the applicant-proposed/demonstrated resolution of each Functional Objective by means of an applicant-compiled Thermal Waste Treatment Device (TWTD) Technical Report. The aspects which should be covered as part of that TWTD Technical Report may include, but are not limited to, the items listed in table 1 as given by these Guidelines.

[2.2 The TWTD Technical Report should be assessed for completeness in respect of the Functional Objectives by the reviewing Administration and further developed by the applicant as considered necessary by the Administration together with such physical surveys as required of the device in production and, as a unit, as installed and in operation. This TWTD Technical Report should thereafter form the basis of the overall approval package of that thermal waste treatment device as an Equivalent Means to incineration for permitted onboard garbage and waste disposal. Thereafter individual unit certification should be in accordance with the procedures as agreed in respect of the related Functional Objective – Unit certification resulting in the issue to each unit of a TWTD Certificate, the form of which is given in annex 1, and the approval of that unit's TWTD File.]

[2.2 The TWTD Technical Report should be approved by the Administration. The approved TWTD Technical Report is the overall approval package used in the approval of a single TWTD of the same type as specified in the report. After satisfactory testing according to the TWTD Technical Report, the TWTD is issued a certificate as per the annex of these Guidelines and is thus regarded an equivalent means to incineration for permitted onboard garbage and waste disposal under regulation 4 of MARPOL Annex VI.

[2.2 The TWTD Technical Report should be approved by the Administration, or any organization recognized by it, for each TWTD model/type. The installation and testing requirements in the approved TWTD Technical Report is ~~the overall approval package~~ used in the ~~approval~~ certification of a single TWTD unit of the same model/type as specified in the report. After satisfied testing upon installation according to the TWTD Technical Report, the TWTD unit is issued a Certificate as per the annex of these Guidelines and is thus regarded an equivalent means to incineration for permitted onboard garbage and waste disposal under regulation 4 of MARPOL Annex VI]

2.3 These Guidelines cover only the MARPOL Annex VI, prevention of air pollution, aspects related to the use of thermal waste treatment devices. The manufacturer, installer, shipowner and others, as applicable, are responsible for ensuring that all other relevant statutory requirements, together with relevant classification requirements, are complied with as and where appropriate.

Safety Note

These Guidelines may involve hazardous materials, operations and equipment. These Guidelines do not purport to address the safety aspects associated with the use of thermal waste treatment devices. It is the responsibility of the user of these Guidelines to establish appropriate safety and health practices and determine the applicability of regulatory and classification limitations prior to use, including possible port State limitations.

3 Definitions:

TABLE X OF DEFINITIONS

Applicant	This may be the device manufacturer or another party – in all cases the applicant is responsible for providing the required information, performance testing (where required) and subsequent required ongoing support of the certification
Carbon monoxide (CO)	Controlled as an indicator of incomplete oxidation of waste material – otherwise as per NO_x Technical Code 2008
Event Record Points	Events to be recorded for the purpose of reflecting compliant operation for the device type installed
Functional Objectives	These are the objectives which should be met in order that the thermal waste treatment device is designed, manufactured, installed, operated, maintained and serviced such that the required emission performance is achieved and that as an Equivalent Means other uncontrolled pollution streams are not generated
PAH	Polycyclic Aromatic Hydrocarbons – expressed in terms of phenanthrene equivalent as defined in the *2021 Guidelines for Exhaust Gas Cleaning System*
Performance Level 1	See section XX for the requirements for Performance Level 1. This performance level, where limited, is comparable to the existing requirements for incinerators (resolution MEPC.244(66)) but as appropriate to in-service monitoring applied on a continuous basis to a thermal waste treatment device
Performance Level 2	Requirements set out in section Y. This level has tighter emission to air limits than Performance Level 1. The report from that testing should be included in the TWTD Technical Report
Sewage sludge	Material from the ship's sewage system which would include, but not limited to, de-watered sewage prior to treatment or the residues from a sewage treatment plant
	Material submitted to the approving Administration covering detailed aspects of the TWTD Technical Report should not be circulated outside the approving Administration
Supporting information annex	Commercially sensitive material submitted to the approving Administration covering detailed aspects of the TWTD Technical Report.
Thermal waste treatment device (TWTD)	A device for disposing, by thermal action, of onboard generated garbage other than by use of an incinerator as defined by paragraph 2.2 of the *2014 Standard specification for shipboard incinerators*, (resolution MEPC.244(66)), as may be amended. The thermal waste treatment device includes the waste reduction unit itself together with all other necessary support systems and equipment.

TWTD File	The document prepared by the applicant for each certified thermal waste treatment device and approved by the Administration. The TWTD File should be retained on board with the device during its service life. The TWTD File details the device and how it is to be surveyed or inspected.
TWTD Operating Manual	The document supplied with the thermal waste treatment device describing to the user how the device is to be installed, operated, maintained and serviced
TWTD Technical Report	The document prepared by the applicant detailing how the Functional Objectives are met. The TWTD Technical Report would form part of the information supplied to the Organization by the Administration of a Party approving a thermal waste treatment device as an Equivalent Means in accordance with the requirements of regulation 4 of MARPOL Annex VI.
UTC	Universal Time Coordinated

4 [Emission limits]/[Requirements]

[Paragraph 4.1 regarding discharges to air does not apply to non-incineration processes, such as hydrothermal carbonization.]

[Paragraph 4.1, regarding discharges to air, does not apply to systems which do not generate any emissions to air, such as hydrothermal carbonization.]

4.1 Discharges to air

4.1.1 Performance Level 1

4.1.1.1 A thermal waste treatment device certified under these Guidelines should not exceed the following in-service maximum emission limits:

CO 185 ppm (dry basis) at 11.00% O_2 – averaged over each UTC three-hour period

Soot number maximum average: Bacharach 3 or Ringelman 1 (20% opacity) (A higher soot number is acceptable only during very short periods such as starting up)

Opacity 20% (corresponding to Ringelmann 1) (A higher [soot number] [opacity] is acceptable only during very short periods such as starting up)

4.1.1.2 CO should be measured in accordance with chapter 6.4 of NO_x Technical Code 2008 (direct measurement and monitoring) and should be monitored at a frequency of not less than 0.05 Hz.

4.1.1.3 Oxygen content, temperature and pressure profiles, as applicable, through the thermal waste treatment device should be monitored and controlled in accordance with the relevant Functional Objective.

[4.1.1.4 (We need some text about the opacity as this is now introduced instead of Ringelmann. We do not have a good proposal and are not experts into ISO standards, but maybe we can start with something like this) Measurements for opacity should be conducted with a device that fulfils ISO 11614 Reciprocating internal combustion compression-ignition engines – Apparatus for measurement of the opacity and for determination of the light absorption coefficient of exhaust gas and following the principle of the testbed setup herein as appropriate.]

[4.1.1.5 Each model shall be subject to a specified type approval test operation at the factory or an approved test facility, and under the responsibility of the Administration, using the following standard fuel/waste specification for the type approval test for determining whether the incinerator operates within the limits specified in paragraph 2 of this appendix, the results should be included in the TWTD Technical Report.]

4.1.2 Performance Level 2

4.1.2.1 Where requested by the applicant, the thermal waste treatment device may additionally be certified as meeting Performance Level 2. This involves a detailed pre-certification test together with in-service emission limits which are tighter than those of Performance Level 1.

4.1.2.2 Pre-approval Test

As part of the initial approval process for Performance Level 2 as an Equivalent Means, the thermal waste treatment device model should be subject to a Pre-approval Test.

4.1.2.2.1 The Pre-approval Test should be of 6-8 hours duration with the thermal waste treatment device in its operating condition.

4.1.2.2.2 Pre-approval Test emission limit values are given on a dry basis, other than for HC which is measured on a wet basis, at 11.00 % O_2 concentration and at 273 K, 101.3 kPa:

Pre-approval Test

Species	Limit	Test Method
CO	50 ppm	NTC **
NO_x	100 ppm – as NO_2	NTC **
HC	15 ppmC_1	NTC **
Particulate matter	10 mg/m^3	US EPA Method 5
Hydrogen Chloride (HCl)	10 mg/m^3	US EPA Method 26/26A
Dioxins and Furans*	0.1 ng/m^3	US EPA Method 1613B

In addition oxygen, temperature and pressure profiles, as applicable, through the device should be monitored over the duration of the test period and given in the test report.***

* as listed and with equivalency calculated in accordance with EU Directive 2010/75/EU Annex-VI Part 2

** in accordance with NO_x Technical Code 2008 chapter 5

*** oxygen content, temperature and pressure, as applicable, should be measured in accordance with NO_x Technical Code 2008 chapter 5

4.1.2.2.3 Pre-approval Test procedures:

.1 testing should be undertaken while operating with a) sludge oil (if applicable to the TWTD system) and b) solid waste compositions both as given in paragraph 1 of appendix IV to MARPOL Annex VI;

.2 sampling position should be after any exhaust gas treatment components, such as water washing, but prior to any dilution of that exhaust gas;

.3 CO, NO_x and HC should be monitored at a frequency of not less than 0.05 Hz over the duration of each test and those readings averaged to give the result to be compared to the respective limit value;

.4 CO and NO_x limits are given on a dry basis. Consequently, if these are measured on a wet basis, those findings should be converted to dry basis reading using a concurrently measured water vapour content in order to determine the relevant dry/wet correction factor (concentration, dry = concentration, wet/exhaust gas water fraction);

.5 correction to reference 11.00% O_2 should be on the basis of:

$C_{reference} = C_{measured}$ x (20.95 - O_2 measured) / (20.95 – 11.00);

.6 oxygen content, temperature and pressure, as applicable, profiles through the TWTD should be monitored over the duration of each test for conformity with the required values as given by the relevant Functional Objective;

.7 not less than three separate HCl and particulate matter readings should be taken over the duration of each test period at approximately equally spaced intervals and those results averaged to give the result to be compared to the limit value. For thermal waste treatment devices with intermittent loading those test procedures should commence no later than 10 minutes after a loading; and

.8 alternative emission species test methods which provide equivalent results to those given above may be used with the agreement of the Administration.

4.1.2.2.4 A test report detailing the thermal waste treatment device tested, the test sequence followed, the measurement devices/procedures used, the traces of the CO, NO_x, HC, O_2, temperature and pressure profile readings and the test results of the other emissions measured together with details of the actual sludge oil (if applicable), and solid waste compositions and waste loading quantities and times should be recorded in a test report which should form part of the TWTD Technical Report. If the TWTD is not built for handling sludge oil and testing is therefore not undertaken with sludge oil, this should be specified in the test report.

4.1.2.3 In service, the emissions from thermal waste treatment devices certified to Performance Level 2 should not exceed the following in-service maximum emission limits:

CO 50 ppm (dry basis) at 11.00% O_2 – averaged over each UTC three-hour period
Opacity 10%

4.1.2.3.1 CO should be measured in accordance with 6.4 of the NO_x Technical Code 2008 (direct measurement and monitoring) and should be monitored at a frequency of not less than 0.05 Hz.

4.1.2.3.2 Oxygen content, temperature and pressure profiles, as applicable, through the thermal waste treatment device should be monitored and controlled in accordance with the relevant Functional Objective.

4.2 Discharge Water to Sea

4.2.1 This section applies if there is:

.1 a direct water discharge as a by-product of the thermal waste treatment process used; and/or

.2 water used to wash the exhaust gas from the thermal waste treatment device before discharge to atmosphere.

and where that water is then subsequently discharged to sea.
Alternatively, these discharge water streams may be collected in a holding tank for discharge ashore.

4.2.2 If discharged to sea, the discharge water should not be diluted or mixed with water from other sources before monitoring for the turbidity and PAH limit parameters. After monitoring for PAH and turbidity the discharge water may be diluted as required or chemically treated prior to pH monitoring.

4.2.3 The discharge water to sea should not exceed the following limits at any time when the thermal waste treatment device is in operation:

.1 pH minimum 6.5 or a maximum difference of 2 pH units between the inlet water and the discharged water after dilution values – if chemically treated the requirements of 10.1.6.1 of the 2021 Exhaust Gas Cleaning Systems Guidelines should also be applied;

.2 Turbidity maximum continuous turbidity in the discharge water should not be greater than 25 FNU (formazine nephelometric units) or 25 NTU (nephelometric turbidity units) or equivalent units, above the inlet water turbidity assessed on the basis of 15-minute average values; and

.3 PAH phenanthrene equivalent concentration should not exceed that equivalent to [2.2] g/h per nameplate capacity in MW at the discharge water flow rate(s) above the inlet water PAH concentration.

4.2.4 The monitoring methods used for pH, turbidity and PAH should be in accordance with the 2021 Exhaust Gas Cleaning Systems Guidelines and should be monitored at a frequency of not less than 0.05 Hz.

4.2.5 Performance, calibration and permissible deviations of the discharge water monitoring devices should be in accordance with the relevant sections of the 2021 Exhaust Gas Cleaning Systems Guidelines.

4.3 Residues from thermal waste treatment devices

4.3.1 Any solid residues or other materials, including any washings or other material collected as part of maintenance or servicing activities, should be discharged ashore to appropriate reception facilities [or re-use institutions in the case where the TWTD generates a useful material such as biochar].

4.3.2 Any residues from TWTD discharge water treatment system, either in-service or as collected during maintenance or servicing activities, should be discharged ashore to appropriate reception facilities.

5 Functional Objectives and TWTD Technical Report

[5.1 These are the Functional Objectives which should be met in order to achieve the in-service Performance Level 1 emission limit requirements and, if applicable, those of Performance Level 2. The following listing of core functional objectives represents a technology neutral approach to the review of the design, manufacture, installation, use and ongoing management of a thermal waste treatment device. The applicant is therefore additionally responsible for identifying any other Functional Objectives which may potentially affect the device's performance in terms of emissions to air and, if applicable, water and to duly address those as part of the TWTD Technical Report such that the requirements of regulation 4.4 of MARPOL Annex VI are met. Consequently, the TWTD Technical Report is to cover, but is not limited to, an assessment of the following functional requirements and is to be compiled against the Functional Objective references as listed in table 1. In the case of operational/servicing/maintenance requirements, the TWTD Technical Report may cite the relevant section of the TWTD Operating Manual which is to be supplied with the device rather than reproducing in full the applicable text. Where a particular Functional Objective is not applicable due to the operating principle applied, the wastes streams to be processed or other factors then that would be given as 'not applicable', together with supporting justification, in the TWTD Technical Report.

5.2 It is recognized that the applicant may need to provide commercially sensitive information to the Administration in order to demonstrate that a particular Functional Objective has been met by the design of the thermal waste treatment device and/or would be met in service. In view of this, such information may instead be included in a supporting information annex to the TWTD Technical Report which would not be circulated outside the approving Administration. Where information is provided in that category, it may be cited rather than being given in full in the TWTD Technical Report itself.]

[5.1 The Functional Objectives are those which should be met in order to achieve in-service the Minimum Performance Level emission requirements as per sections 4.1.1 and 4.2.3. If the device in question is a Better Performance Achiever, the Functional Objectives ensure that the performance as per the appendix of the Certificate is achieved. The following listing of core functional objectives represents [the minimum set of objectives][or alt.: examples of objectives]. Hence the applicant is responsible for identifying any additional Functional Objectives which may potentially affect the device's performance and address those as part of the TWTD Technical Report. Consequently, the TWTD Technical Report is to cover, but is not limited to, an assessment of the [following] [or alt.: identified] functional requirements and is to be compiled against the Functional Objective references [as listed in table 1] [or alt.: identified and compiled using table 1 as a basis]. In the case of operational/servicing/maintenance requirements, the TWTD Technical Report may cite the relevant section of the TWTD Operating Manual which is to be supplied with the device rather than reproducing in full the applicable text.

5.2. It is recognized that the applicant may need to provide commercially sensitive information to the Administration in order to demonstrate that a particular Functional Objective had been met by the design of the thermal waste treatment device and/or would be met in service. In view of this, such information may instead be included in a supporting information annex to the TWTD Technical Report which would not be circulated outside the approving Administration. Where information is provided in that category, it may be cited rather than being given in full in the TWTD Technical Report itself.]

[5.2 Commercially sensitive material, for example as-build drawings, detailed process description including process and instrumentation diagrams and electrical diagrams, needed to prove the functioning and performance of the device, may be exempted for inclusion in the TWTD Technical Report if low-level principal drawings and in-service operational parameters are made available in the TWTD Technical Report. Nevertheless, commercially sensitive material should be submitted to the Administration for approval in the cases where it proves the functioning and performance of the device.]

Table 1 – Thermal Waste Treatment Device – Functional Objectives

[Note: the following points in table 1 should not apply to processes with no emissions to air, such as hydrothermal carbonization: 1.1, 1.8 (no intake air in HTC), 1.11, 1.12, 1.13, 1.14, 1.18, 1.19, 1.21, 1.22, 2.2, 2.5, 3.10 - 3.17, 4.2, 4.3 (with regard to oxygen content), 4.7, 5.3 and 7.1.]

[5.3 These Guidelines have been developed on a technology neutral basis. Therefore, particular Functional Objectives as listed below may not be applicable to certain types of TWTD since the point being covered does not exist. The applicant should indicate in the TWTD Technical Report submitted why certain Functional Objectives are not applicable to the TWTD under consideration and provide justification for that assertion.]

	Functional Objective	**Content of TWTD Technical Report**
1. Device design and manufacture		
1.1	The device should be designed to meet the Performance Level 1 criteria under all operating conditions with the waste materials it is designed to process To include those in-service controls and measurements used to regulate the device	Description and basis of how the device has been designed and tested to demonstrate the required performance
1.2	Device capacity should be defined	How capacity (i.e. MW) is assessed and defined for the device
1.3	The device should be so designed that when installed it will operate as required when the ship is upright and when inclined at any angle of list up to and including 15° either way under static conditions and 22.5° under dynamic conditions (rolling) either way and simultaneously inclined dynamically (pitching) 7.5° by bow or stern	Description of how the device has been designed and tested to ensure that it will operate as required under those conditions
1.4	The device should be designed so that there will not be leakage out of the device to the surrounding environment	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service

	Functional Objective	**Content of TWTD Technical Report**
1.5	The device should be designed to handle the various temperatures to which it will be exposed	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.6	The device should be designed to resist corrosion and erosion that may be result from the process method applied, the waste materials to be handled or the resulting products	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.7	The device should be designed to minimize the amount of by-product, unburnt and partially combusted material in the exhaust gas stream	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.8	The device should be designed to control intake air flow such that the required oxygen content and operating conditions are achieved through the device for it to function as intended	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service together with the required oxygen content profile across the device in operation
1.8.*bis*	The device should be designed for safe operation during its intended service	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.10	The device should be designed to maintain the required pressure levels through the device for it to function as intended	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service together with the required pressure profile across the device in operation
1.11	The device should be designed so to minimize visible smoke and particulate emissions	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.12	The device should be designed to minimize the formation of dioxins in the exhaust gas stream when disposing of garbage containing PVC	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.13	The device should be designed so that if there is an emergency shut down, either triggered by the device itself or the user, there will not be abnormal levels of emissions	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.14	The device should be designed so that on restart following an emergency shutdown the emission limits will normally not be exceeded	Description and basis of how the device has been so designed and how is that demonstrated and maintained in service
1.15	Unless discharged ashore the discharge water arrangements of the device should be designed to meet the discharge limits under all operating conditions with the waste materials it is designed to process	Description and basis of how the discharge water arrangements of the device have been designed and tested to demonstrate in service that the required performance will be

	Functional Objective	**Content of TWTD Technical Report**
	To include those in-service controls and measurements used to regulate the device together with emergency shut-down and re-starting procedures	achieved under all operating conditions
1.16	Where the nature of the device operating principles results in a discharge water stream with pollution aspects additional to those controlled in section 4 of these Guidelines then those should be duly controlled	Identification of additional discharge water criteria applicable to the operating principle applied and how those are controlled in order to meet the requirements of regulation 4.4 of MARPOL Annex VI
1.17	The capacity of the device (minimum and maximum) should be stated and should be such that when operating at any point in that range the emission limits would not be exceeded	How that capacity range has been established and demonstrated
1.18	All different capacity options/models of the device should meet the emission limits	How those capacity ranges have been established and demonstrated
1.19	The design of the device should be defined and there should be an agreed conformity of production arrangement to ensure each unit as delivered will not exceed the emission limits in service Each unit should be identified in a manner which provides for its inclusion under the approval given together with its waste handling capacity (MW)	Device definition and proposed conformity of production arrangement and how that is to be audited/inspected to ensure ongoing consistency with that definition
1.20	There should be a means of unit certification [Each model should undergo a type approval process, and then each unit installed on board should undergo commissioning testing to check it has been installed correctly.]	Proposed means by which each unit will be certified and how is that to function between the applicant and the Administration leading to the issue of individual TWT Device Certificates
1.21	Where there are design/manufacturing changes after approval as an Equivalent Means that affect the emissions performance of the device, those changes should be approved before being applied to devices to be considered for certification under that approval	Proposed change management process and how will that function to ensure that changes are not introduced to certified devices prior to their acceptance by the Administration
1.22	Additional device design and/or manufacture related Function Objectives as applicable to this type of device which are relevant in terms of meeting the emission limits and the objectives of regulation 4.4 of MARPOL Annex VI should be identified	Resolution of those additional Functional Objectives

	Functional Objective	Content of TWTD Technical Report
2. Installation on board		
2.1	The installation on board should be such that the device performance is as required	The onboard installation requirements, including if applicable discharge water arrangements, to ensure that the performance of the device is not adversely affected by, but not limited to, heat, vibration, ship movement or the functioning of other equipment. How is it demonstrated, by post installation tests or other means, that these requirements have been met
2.2	The exhaust duct arrangements and fittings should be such that the device performance is as required	The design, arrangement and installation requirements of the exhaust duct design from the device to atmosphere to ensure that the performance of the device is not adversely affected. All necessary connections for operating features, monitoring devices and control arrangements to be positioned as necessary The means by which it is demonstrated these have been met
2.3	The necessary supply services (fuel, air, compressed air, electrical, etc.) for the device to operate as required should be provided	Listing of all the requirements in respect of those support services necessary for the correct operation and performance of the device including any associated discharge water arrangements The means by which is it demonstrated that these have been met
2.4	Installation test demonstrating that the device performance is as required including that of any discharge water arrangements	Installation test procedures which are to be applied and associated acceptance criteria
2.5	Additional device installation related Function Objectives as applicable to this type of device which are relevant in terms of meeting the emission limits and the objectives of regulation 4.4 of MARPOL Annex VI should be identified	Resolution of those additional Functional Objectives

	Functional Objective	Content of TWTD Technical Report
3. In-service operation		
3.1	When in an idle condition there should not be any significant emissions from the device (these systems can be difficult to quickly shut completely on and off and thus may require an idle status when they don't receive any feedstock)	Means by which this requirement is achieved or basis on which this is not applicable
3.2	The warm-up phase should ensure that on completion the device will operate as required	Means by which this requirement is achieved
3.3	The preparation of solid waste (sorting, size screening etc.) should be such that the device will operate as required	Operating procedures in respect of the preparation of solid waste
3.4	The preparation of liquid wastes/sludge oil should be such that the device will operate as required	Operating procedures in respect of the preparation of liquid wastes
3.5	The preparation of sewage sludge should be such that the device will operate as required	Operating procedures in respect of the preparation of sewage waste
3.6	The procedure for loading solid waste should be such that the device performs as required	Operating procedures in respect of the loading of solid waste into the device
3.7	The procedure for loading liquid waste should be such that the device performs as required	Operating procedures in respect of the loading of liquid waste into the device
3.8	The procedure for loading sewage sludge should be such that the device performs as required	Operating procedures in respect of the loading of sewage waste into the device
3.9	If applicable – the procedure for concurrently loading solid waste, liquid waste or sewage sludge should be such that the device performs as required	Operating procedures in respect of the concurrent loading of solid waste, liquid waste or sewage waste into the device
3.10	When processing solid waste, the emission to air should be controlled to not exceed the emission limits	Operating procedures for the disposal of solid waste
3.11	When processing liquid waste, the emission to air is to be controlled to not exceed the emission limits	Operating procedures for the disposal of liquid waste
3.12	When processing sewage sludge, the emission to air should be controlled to not exceed the emission limits	Operating procedures for the disposal of sewage sludge
3.13	If applicable - when concurrently disposing of solid waste, liquid waste or sewage sludge the emission to air should be controlled to not exceed the emission limits	Operating procedures when operating concurrently on solid waste, liquid waste or sewage sludge
3.14	The loading of further waste material should not result in one or more of the emission limits being exceeded	Operating procedures in respect of loading additional solid waste, liquid waste or sewage sludge while the device is in operation

	Functional Objective	Content of TWTD Technical Report
3.15	The device should demonstrate ongoing compliance with the emission limits to air at all times when in operation, including warm-up and shutdown phases	Means by which ongoing compliance with the emission limits is to be demonstrated
3.16	The means by which ongoing compliance with the emissions to air are monitored should produce reliable measurement data	Means by which monitoring equipment, and any associated equipment, are operated, zero and span checked, maintained and serviced to achieve the required measurement performance
3.17	The device should be shut down in a manner which ensures that all thermal processes are terminated and that the device and associated exhaust system to atmosphere is purged of all residual gases	Operating procedures and procedures relating to the shutdown of the device
3.18	The means and procedures for the removal of solid residues from the device should ensure that these are fully and securely contained for landing ashore	Operating means and procedures in respect of the removal of solid residue material from the device and subsequent onboard storage prior to discharge ashore
3.19	The discharge water arrangements should be prepared, operated and shutdown such that the emission to sea limits are met under all operating conditions including during the device warm-up and shutdown phases	Operating procedures of the discharge water arrangements, including control and monitoring functions, relating to the preparation for use, in-service application and shutdown
3.20	Discharge water PAH limit should be expressed as a concentration (µg/litre) as appropriate to the device across its operating range	PAH limit(s) should be given against discharge water flow rate(s)
3.21	The means by which ongoing compliance with the discharges to sea is monitored should produce reliable measurement data	Means by which monitoring equipment, and any associated equipment, are operated, zero and span checked maintained and serviced to achieve the required measurement performance
3.22	Additional Functional Objectives related to device operations, as applicable to this type of device and relevant in terms of meeting the emission limits and the objectives of regulation 4.4 of MARPOL Annex VI, should be identified	Resolution of those additional Functional Objectives
4. Record-keeping		
4.1	There should be an Events Record for each TWTD device installed. That Events Record is to cover all phases of operation of the device when in service	What the Events Record is to include and the manner of its recording
4.2	There should be retained records in respect of emissions to air	Form of records which are required to be kept demonstrating the performance and self-checking functions against respective limits

	Functional Objective	Content of TWTD Technical Report
		showing that the device performed as required set against the recorded Event Record points
4.3	There should be records of the oxygen content, temperature and pressure values, as applicable to the principle of operation, through the device showing that it operated within the required profiles	Form and extent of records which should be kept demonstrating that the required oxygen content, temperature and pressure values were achieved set against the recorded Event Record points
4.4	There should be records in respect of emissions to sea	Form of records which are required to be kept demonstrating the performance and self-checking functions against respective limits showing that the device performed as required set against the recorded Event Record points
4.5	There should be records of solid, and any other, residue materials or related liquids discharged ashore	Related record-keeping requirements
4.6	Records should be against date and UTC. These records should be retained on board at least 18 months from date of recording. If the recording device is changed over that period, it should be ensured that the required data is retained on board and available as required. The recording device should be capable of producing reports as required demonstrating past performance	Means by which the required records are to be recorded and retained on board in a tamper-proof manner. The extent and form of the reports that the recording device is capable of producing.
4.7	Additional Function Objectives related to device record-keeping, as applicable to this type of device and relevant in terms of meeting the emission limits and the objectives of regulation 4.4 of MARPOL Annex VI, should be identified	Resolution of those additional Functional Objectives
5. Maintenance and servicing		
5.1	The extent, frequency and details of device maintenance necessary by user is to be specified – including like for like replacements – should be specified	Basis and details of the required onboard maintenance in terms of activities and timings in order to maintain the effectiveness of the device
5.2	Extent, frequency and details of TWT device servicing requirements should be specified	Basis and details of the required servicing in terms of activities and timings in order to maintain the effectiveness of the device to operate with the emission limits
5.3	Extent, frequency and details of maintenance and servicing requirements of emission monitoring devices should be specified	Basis and details of the required maintenance and servicing in terms of activities and timings in order to maintain the effectiveness of the devices to operate as required

	Functional Objective	Content of TWTD Technical Report
5.4	Maintenance and servicing records should be retained on board for a duration at least 18 months from the date of performance	Means by which the recordkeeping requirements related to maintenance and servicing are recorded and retained on board in a tamper-proof manner and will be available as required
5.5	Additional Function Objectives related to device maintenance and servicing related as applicable to this type of device and relevant in terms of meeting the emission limits and the objectives of regulation 4.4 of MARPOL Annex VI, should be identified	Resolution of those additional Functional Objectives
6. Instructions and training		
6.1	A TWTD Operating Manual should be supplied with the device covering as necessary those Functional Objective sections 2 to 5	The TWTD Operating Manual, which may be divided into a number of separate documents as appropriate, should provide all necessary direction and guidance for the installation, in-service operation and onboard maintenance of the device together with appropriate fault finding and resolution guidance. Also included should be the servicing extent and timing requirements
6.2	A person who is to operate or maintain the device is to be trained to implement the guidance provided by the TWTD Operating Manual - training records are to be retained on board at least 18 months from date of training or while that person is performing those tasks – whichever is the longer	Description and content of the provided training programme, which may include test material, to be provided which would allow the user to train persons to apply the guidance as given in the TWTD Operating Manual and means to record, in a tamper-proof manner, which persons had been successfully trained as appropriate to their assigned tasks
7. TWTD File		
7.1	To enable the device to be surveyed, or inspected, a TWTD File should be provided The TWTD File should include, but is not limited to, the following: 1. Identification of the device to which the File refers, including model, rating and serial number 2. Description of the device and its manner of operation – including any exhaust gas treatment arrangements 3. The means by which the device should be surveyed both initially and in-service to verify that it is conforms to its as certified	An example of a TWTD File covering the required topics should be included

	Functional Objective	Content of TWTD Technical Report
	condition and is operating and performing as required 4. The means by which it would be verified that the guidance given in the TWTD Operating Manual has been applied as required 5. Means of verification that the required maintenance and servicing has been performed as required 6. Description of the emission monitoring arrangements and components and necessary ancillary equipment or requirements. Including details of the respective sampling points relative to the layout of the device including, if fitted, the discharge water handling arrangements 7. Details of monitoring device zero and span check, calibration, maintenance and servicing requirements and timings and the means of verification that those actions have been undertaken as required Emission limit values 8. Description of the monitoring and record keeping arrangements and the capability of the recording device to produce operating/emission reports for selected parameters as required 9. The means by which recorded emissions values, set against the Events Record, compared to the respective limit values would be reviewed In addition, the TWTD File should include other checkpoints, as appropriate to the particular type of thermal waste treatment device and its manner of operation, that would confirm its correct operation and performance	
7.2	The TWTD File for each TWTD model should be approved by the Administration	Means by which TWTD File for each device will be submitted for approval
7.3	Amendments to the TWTD File which reflect changes that affect aspects covered by these Functional Objectives and the associated TWTD Technical Report or emissions performance, should be approved by the Administration. Where these are to be applied to previously certified devices and reflect necessary changes to the TWTD File as approved, those changes should not be applied prior to their approval by the Administration. Where additions, deletions or amendments to the TWTD File are	Means by which amendments to previously approved TWTD File will be submitted for approval prior to application to in-service devices

	Functional Objective	Content of TWTD Technical Report
	separate to the TWTD File as initially approved, they should be retained with the TWTD File and should be considered as part of it	
8. Performance Level 2		
8.1	Where a device is to be approved and individual units certified to Performance Level 2, and as a result the device requires additional or alternative fittings, settings, operating procedures, documentation or other aspects in order to achieve that performance level, then that should be reflected as relevant in each of the respective Functional Objectives as listed above	Information, procedures, records, restrictions or other as appropriate to achieving and maintaining Performance Level 2

6 Certification process

6.1 The certification process divides into two parts. The first is the approval of the proposed thermal waste treatment device model as an Equivalent Means under regulation 4 of MARPOL Annex VI. The second part is the approval of individual units of that thermal waste treatment device operating on the basis of the Equivalent Means as approved.

6.2 The approval by the Administration of the thermal waste treatment device model as an Equivalent Means should be on the basis of the applicant-submitted TWTD Technical Report together with, if appropriate, any additional information in the supporting information annex. The TWTD Technical Report should specify whether the units are to be certified to Performance Level 1 or Performance Level 2 and, in the latter case, contain the necessary supporting data including the Pre-approval Test report.

6.3 Any subsequent amendments to the information as given in the TWTD Technical Report or which affect emissions performance as controlled by these Guidelines should be approved by the Administration before being applied to individual thermal waste treatment devices in service.

6.4 Following approval of the thermal waste treatment device unit as an Equivalent Means then individual units should be certified by the Administration in accordance with the agreed procedures as set out in the TWTD Technical Report as approved.

6.5 An approved thermal waste treatment device should be issued with a TWTD Certificate, as set out in the annex, by the Administration and have TWTD File as approved by that Administration.

6.6 Following satisfactory completion of installation test procedure as given in the TWTD File, then section 2.6 the Supplement to the International Air Pollution Prevention Certificate should be duly updated.

6.7 Individual thermal waste treatment devices should thereafter be subject to the survey procedures as given in the approved TWTD File at those times the ship on which the device is installed is surveyed in accordance with the applicable MARPOL Annex VI survey regime.

6.8 Amendments to the thermal waste treatment device as installed, operated or monitored should be duly covered by amendments to the TWTD File as approved by the Administration before they are applied in service.

[6.1 The certification process divides into two parts. The first is the type approval of the proposed thermal waste treatment model according to the Functional Objectives provided in the TWTD Technical Report. The second part is the certification of individual units of that thermal waste treatment device as an Equivalent Means to incineration for permitted onboard garbage and waste disposal under regulation 4 of MARPOL Annex VI.

6.2 The approval by the Administration of the thermal waste treatment device as an Equivalent Means should be on the basis of the applicant-submitted TWTD Technical Report together with, if appropriate, commercially sensitive material. [As part of that TWTD Technical Report would be whether the units are intended to be certified to a Better Performance Achiever.]

6.3 DELETED

6.4 Following type approval of the thermal waste treatment device model individual units should be certified by the Administration in accordance with specification in the approved TWTD Technical Report and be issued with a TWTD Certificate as set out in the annex of these Guidelines.

6.5 DELETED

6.6 Following satisfactory completion of installation test procedure as given in the TWTD Technical report, then section 2.6 the Supplement to the International Air Pollution Prevention Certificate should be duly updated.

6.7 Individual thermal waste treatment devices should thereafter be subject to the survey procedures as given in the approved TWTD Technical report at those times the ship on which the device is installed is surveyed in accordance with the applicable MARPOL Annex VI survey and port State control regime.

6.8 Amendments to the thermal waste treatment device as installed, operated or monitored should be duly covered by the TWTD Technical Report and amendments to reflect such should be approved by the Administration before they are applied in service.]

ANNEX

Form of TWTD Certificate

Name of Administration

Thermal Waste Treatment Device Approval Certificate

Issued under the provisions of the Protocol of 1997, as amended, to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 related thereto under the authority of the Government of:

……
(*full designation of the country*)

by ……..
(*full designation of the competent person or organization authorized under the provisions of the Convention*)

This is to certify that the Thermal Waste Treatment Device, as an Equivalent Means under regulation 4 to incineration under regulation 16, as detailed below has been surveyed and related documentation approved in accordance the 20XX Guidelines for Thermal Waste Treatment Devices adopted by resolution MEPC…(..).

Manufacturer	Model/ Type	Serial Number	Maximum capacity (MW)	Equivalent Means – approval reference

This Thermal Waste Treatment Device is certified to:
Performance Level 1 ...……... ☐
Performance Level 2 ...……..... ☐

The Thermal Waste Treatment Device is based on a non-incineration process, such as Hydrothermal Carbonization, and does not generate harmful emissions into the air .....….....…… ☐

Title	Approval reference
TWTD File	

A copy of this Certificate together with the approved TWTD File should be carried on board the ship fitted with this Thermal Waste Treatment Device at all times and should be available as required.

This Certificate is valid for the life of the Thermal Waste Treatment Device, subject to surveys in accordance with regulation 5 of MARPOL Annex VI, installed in ships under the authority of this Government.

Issued at ……..
(*place of issue of Certificate*)

Date (dd/mm/yyyy) …….. ……
(*date of issue*) (*signature of duly authorized official issuing the Certificate*)

(*seal or stamp of the authority, as appropriate*)

***

ANNEX 3

SUMMARY OF CORRESPONDENCE GROUP DISCUSSIONS - MEOP AND RELATED ISSUES

AUXILIARY CONTROL DEVICES

1 The Group considered the proposal in document PPR 9/11/3 to extend the definition of Auxiliary Control Devices (ACDs) to in MARPOL Annex VI to include the following elements, in addition to the starting of the engine and general operating conditions: "engine stopping, low load and reversing operation". However, most members preferred to keep the existing definition.

2 There was general agreement in the Group that amendments to the NO_x Technical Code regarding auxiliary control devices are appropriate. The Group considered specific text proposals provided in documents PPR 9/11 and PPR 9/11/5:

3 Regarding amendments to the NO_x Technical Code (NTC), in particular amendment of NTC 2.4.1 on information to be included in the Technical File for engines fitted with ACDs, the Group considered two alternative proposals:

.1 amending 2.4.1.1 to end '…. including any NOx reducing device and or system fitted and / or any ACD fitted.' or

.2 by adding a new 2.4.1.9 reading: "Outline of auxiliary control device functionality."

4 There was not a clear majority for either of the two options.

5 The Group agreed in general on the proposed new NTC 2.4.6 proposed in document PPR 9/11/3. In round 4, some members supported the proposal by one member for an alternative text in 2.4.6.1. In round 4, one member proposed a compromise text for NTC 2.4.6. All three options are included in square brackets in the draft amendments presented below:

"2.4.6 Auxiliary Control Devices

Where an Auxiliary Control Device (ACD) is included in the Technical File it shall be required that:

.1 the action of an ACD on NO_x emission control [shall be minimized][has been demonstrated to be necessary][shall be no more than the minimum required to ensure safe engine operation];

.2 the fitting and extent of operation of an ACD shall be justified to, and subject to the approval of, the Administration; and

.3 the action, duration or other factors of an ACD, which temporarily restrict or bypass the control of NO_x emissions, shall be included within the identifications required by paragraphs 2.4.1.1 and 2.4.1.2 and their operation are to be covered under paragraph 2.4.1.4."

STRUCTURE OF AMENDMENTS REGARDING MULTIPLE EOPS AND NTE ZONES

6 There was general agreement in the Group that amendments to regulation 13 of MAPOL Annex VI regarding multiple EOPs are not necessary. While some members supported use of document PPR 9/11 as a base document, there was general agreement that amendments related to multiple EOPs and NTE zones could be placed in a separate chapter 8 to the NTC. There was some support for the structure proposed by IMarEST in round 2. However, some members noted that the structure should not preempt decisions on some of the key elements where the Group has diverging views.

SCOPE OF AMENDMENTS REGARDING MULTIPLE EOPS AND NTE ZONES

7 The Group had diverging views regarding the scope of the amendments related to multiple EOPs and NTE zones.

8 Some members were of the view that the amendments should apply only to electronically controlled engines, while others preferred the amendments to apply to new engines in a technology neutral way. Several members noted that the majority of modern engines have some electronic control and that requirements regarding multiple EOPs and NTE zones would mainly be relevant for electronically controlled engines due to the greater operational flexibility.

9 Some members of the Group supported to define "electronic controlled engine". The Group considered two possible definitions of electronically controlled engine as proposed by members, but there was not clear consensus on one definition.

10 Finally, some members pointed to the definition of "engine operational profile" proposed in document PPR 9/11 and noted that this definition was approved by MEPC 73 (as a "description").

ENTRY INTO FORCE OF AMENDMENTS REGARDING MULTIPLE EOPS AND NTE ZONES

11 In document PPR 9/11, it is proposed that draft amendments on the use of multiple engine operational profiles and off-cycle NO_x emission control assessment apply to new engine families and engine groups certified after [date of adoption plus 16 months].

12 One member proposed to change "certified" to "where the EIAPP certificate is first issued". Another member noted that it was premature to consider entry into force of amendments.

NOT-TO-EXCEED ZONES (OFF CYCLE NOX EMISSION CONTROL)

Definition and application of the NTE zone/Off cycle NO_x emission control zone

13 There was general agreement in the Group to use the concept proposed in annex 3 to document PPR 9/11 (proposed new NTC 3.2.10) as a starting point for amendments regarding the definition of the NTE zone. This included support in principle for the concept of the applicant defining the zone (subject to approval by the Administration).

14 However, the Group did not reach agreement on the following issues and noted that these issues would need to be further discussed:

Lower boundary of the NTE/off-cycle NO_x control zone

15 Some members were of the view that the NTE zone should apply within the range of the relevant test cycles over which the engine is certified (ref. paragraph 11 of document PPR 9/11/3 and paragraph 12 of document PPR 9/11/5).

16 Other members supported the proposal in annex 3 to PPR 9/11 (proposed new NTC 3.2.10). Those members noted, inter alia:

.1 the proposal is adapted from the NTE zone in US-EPA 40CFR1042; and

.2 due to the absence of a mode cap in Tier II, there is a risk that extending the off-cycle NO_x emission control zone further could de-facto increase the stringency of Tier II. It is important to note that this issue is closely interlinked with the definition of screening criteria for Tier II.

Possible restrictions in service

17 Some members were of the view that the definition of the NTE zone must limit the torque/speed range available in service as proposed in paragraph 11 of document PPR 9/11/3 and paragraph 12 of document PPR 9/11/5.

18 Other members supported the proposal in annex 3 to PPR 9/11 (proposed new NTC 3.2.10), which does not introduce monitoring or restrictions in service. Those supporting this view noted, inter alia, that:

19 The NTE zone should basically represent the area of engine operation in which the applicant expects the engine to be operated later, and that this corresponds to the current requirement that the applicant must specify the test cycle for the respective engine based on the expected operational profile of the engine.

20 The control area is defined to support the evaluation of the expected torque/speed range during the certification process (and accepted by the Administration), but not being an item for on-board surveys.

21 The zone should represent the typical operation rather than the allowed operation, to avoid introducing a huge effort in regimes where the engine when installed will almost never be operated.

22 The manufacturer/applicant-defined area could be accompanied by documentation from the applicant, to be approved by the administration. In that sense, the administration would ensure that the area is not freely selected by the applicant but suited for the application(s) and that the area is representing the majority of the later operation in application.

Extent of testing required/Off cycle NO_x emission control assessment

23 There was general agreement in the Group to use the concept proposed in annex 1 to document PPR 9/11 (proposed new 3.4) as a starting point for amendments regarding the extend of the NTE assessment/mapping. This would imply that the NTE assessment would consist of a combination of mapping/examination of existing applicable design analysis, simulation or test, or a combination thereof and witnessed emission tests (during testing of parent engine).

24 However, there were diverging views in the Group regarding the extent and procedure of the "mapping" and the number of physical emission tests:

.1 Some members were of the view that the number of physical test points proposed in the proposed new NTC 3.4.4 are not sufficient and that the procedure for "mapping" would need to be further developed. Those supporting this view noted, inter alia:

.1 the regulation must not restrict the Administration from exercising sufficient oversight to ensure that the NTE-zone requirements are met;

.2 there needs to be a balance developed covering the interest of both parties, applicant and Administration; and

.3 the applicant should map the engine over the engine torque and speed range where the engine is expected/intended to operate, with increments of no less than [5%][10%] intervals of rated speed and torque. In addition, a minimum of three test points during the Parent Engine test is proposed.

.2 Some members supported the concept proposed in annex 1 to document PPR 9/11 (proposed new 3.4) and noted, inter alia:

.1 the regulation should avoid introducing undue burdens on the applicant/ manufacturer, especially for larger engines in small series;

.2 there is a link between the "off-cycle group" concept (proposed new NTC 3.4.3.2 in annex 3 to document PPR 9/11) and the number of tests; and

.3 open to consider that the definition of the area should be accompanied by documentation from the applicant, to be approved by the administration. In that sense, the administration would ensure that the area is not freely selected by the applicant but suited for the application(s) and that the area is representing the majority of the later operation in application.

Criteria for compliance with NTE zones/off-cycle NO_x emission control screening criteria

25 There was general agreement in the Group to use the concept proposed in annex 3 to document PPR 9/11 (proposed new 3.4) and document PPR 9/11/2 as a starting point for demonstration of compliance with the NTE requirements/off-cycle NO_x emission control screening criteria. Most members supported in principle the proposal in PPR 9/11 for a multiplier of 1.5 for Tier III and the proposal in document PPR 9/11/2 for a concept for Tier II based on interpolation between mode points. However, there were diverging views in the Group regarding the multiplier/acceptance criteria for Tier II.

26 Some members supported the concept in PPR 9/11/2, including the proposed multiplier of 1.5. Those supporting this view noted, inter alia:

.1 the purpose of the proposal is to provide transparency while maintaining the stringency of current regulation; and

.2 Due to the limitations of technology employed in Tier II and the absence of a mode cap of that Tier, imposing too strict limitations on off-cycle emissions could de-facto lead to increased stringency of the existing regulation. However, those members are open to consider how to ensure that Fα = 1.5 provides sufficient control for different engine sizes, types and applications.

27 Some members agreed to the concept in document PPR 9/11/2 in principle, but had concerns regarding the multiplier/acceptance criteria, inter alia, given the high level of NO_x emissions from Tier II engines, the emission multiplier in the NTE zone should be set at 1.25 times the interpolated emission value for a given speed/torque point.

28 Two members supporting the latter view expressed concerns regarding the approach laid out in document PPR 9/11/2. These concerns were as follows:

.1 First, the NTE margin is to be applied to all points other than the certification mode points. The NTE zone should cover the mode points as well. The zone also includes reduced stringency in some places, including along the inter-mode point where the emission profile or trend is not continued from the mode point. It is not clear why this was done other than to reduce the stringency of the NTE zone emission limit and is not acceptable.

.2 In document PPR 9/11/2 the approach appears to be to apply the intended NTEZ margin to all points other than the specific test cycle mode points. This results in a concern that this would allowing "post-holing" at those points, with relaxed settings elsewhere including along the inter-mode point line which instead would be seen that it should follow the trend expected from the mode points. Furthermore that 'inter-mode' performance should not then represent a sharp edged trench within the overall NTE zone – rather that should be a "vee" with the arms ending at the NTE zone boundaries and the base on the "inter-mode" line.

MULTIPLE ENGINE OPERATIONAL PROFILES (EOPS)

Definition

29 The Group agreed in general to use the definition of engine operational profile as proposed in document PPR 9/11, noting that there may be a need to revisit the definition when agreement is reached on the scope of the amendments. Further, the Group noted that the proposed definition of EOPs had been approved by MEPC 73 as a "description".

Conditions for use of multiple EOPs

30 The Group agreed in principle with the conditions for the use of multiple EOPs described in paragraphs 9 to 19 of document PPR 9/11. Further, there was general agreement that available EOPs as well as any conditions for their use should be identified in the Technical File.

31 However, some members had concerns on specific elements of the amendments proposed in annex 1 of document PPR 9/11. One member noted that there are some aspects they do not agree with and specifically stated that the comments in paragraph 8 of document PPR 9/11/3 should be taken into account.

Envelope concept

32 The Group agreed in general that when multiple EOPs are applied using the "envelope approach", the emission value as entered onto the EIAPP should be constructed from a "composite" as illustrated in paragraph 14 of document PPR 9/11/5.

33 Some members were of the view that in case the "envelope" concept is applied, switching between EOPS should be permitted without any conditions. Those supporting this view noted, inter alia:

.1 When the "envelope concept" is applied (as described in PPR 9/11, proposed new MARPOL Annex VI reg. 13.10.2 and proposed new NTC 3.3.4), the application of multiple engine operational profiles does not result in NO_x emissions exceeding the applicable limits.

.2 By applying the envelope method, it could be assured that compliance to the NO_x emission limits under regulation 13 will be maintained even if it will be permitted to switch the operational profiles of an engine without restrictions during operation.

34 The members supporting this option were of the view that in case the envelope concept is applied, there is no need for recording of the EOP in use.

35 On the other hand, some members were of the view that conditions for switching between EOPs should also be restricted in case the "envelope concept" is applied. Those supporting this view referred to the comments in paragraph 4 of PPR 9/11/3:

.1 "a ship should nonetheless be required to select an EOP at the beginning of a voyage for use during the entire trip for a given emission Tier and duty cycle. The operator should not be allowed to switch EOPs several times throughout the voyage in an attempt to maximize energy efficiency at the expense of NO_x emissions."

36 The members supporting this option were of the view that the EOP in use should be recorded to provide a means of verification during a survey to ensure that the EOPs have been used as allowed.

Other options for use of MEOP

37 Most members agreed in principle on the conditions for the two other options for use of multiple EOPs proposed in annex 1 of PPR 9/11:

.1 Certification of an engine switchable between Tier II and Tier III.

.2 Certification of an engine used to satisfy more than one test cycle application, selectable based on the duty the engine is performing.

38 However, one member noted that the concerns raised in paragraph 8 of document PPR 9/11/3 should be taken into account.

39 Further, the Group considered three possible new options proposed by members in round 2:

.1 Expansion of Envelope Concept to engines designed to operate at different rated power and/or speed under different EOPs. The new 13.10.2 proposed in document PPR 9/11 might leave a loophole.

.2 Each EOP complies with the NO_x emission limits under regulation 13, change between different EOPs can be permitted only once at the start of each voyage for use during the entire trip.

.3 For engines with significantly different fuels, envelope concept could be an unnecessary complication.

40 There was general agreement in the Group not to consider option 1 and 2 further in the Correspondence Group. In this regard, some members noted that the envelope concept, as proposed by EUROMOT, does not leave a loophole.

41 Regarding option 3, there was some support for further consideration of an additional option for significantly different fuels, provided a specific proposal is provided. However, some members were of the view that option 3 is not needed as significantly different fuels can be handled by the envelope. One member noted that the conditions for change between EOPs should not be linked to fuel but to change in operating conditions, for example "low speed laden 8-12 knots" and "high speed laden > 12 knots".

***

ANNEX 4

SCOPE OF WORK ON REDUCTION OF VOLATILE ORGANIC COMPOUND (VOC) EMISSIONS

With the aim of investigating how the reduction of VOC emissions could contribute to the implementation of the *Initial IMO Strategy on reduction of GHG emissions from ships,* a need has been identified to examine the potential of the existing regulatory framework (MARPOL Annex VI, regulation 15) and consider if there are ways to improve it, taking into account the cost-effectiveness of control measures.

The scope of work should include:

1 [Definition of ships]

.1 [the source of majority of VOC emissions which are generated during loading;

.2 Mandating terminals to receive the VOCs developed during transit and retain on board;]

.3 review of relevant regulation, taking into account ship design safety and effectiveness, as well as safety of ship operations;

.4 operational requirements to be considered:

.1 whether all tankers shall have a required P/V valve opening pressure of minimum 0.20 bar, a closing pressure as high as possible and no excess pressure above the opening pressure up to the maximum design capacity (paragraph 16);

.2 a requirement for tankers carrying crude oil to be provided with a pressure control system in way of the mast riser for the purpose of automatic maintenance of tank pressure on voyage and during loading with settings that will ensure a safe reduction of VOC emissions and a closing pressure as high as possible;]

.3 the requirement to keep on board and implement a VOC management plan should be made applicable to tankers carrying oil products and noxious liquid substances.

.4 how a simplified method for measuring and recording VOC emissions from tankers could be developed and implemented.

2 [One simplified method to estimate VOC emissions that will not involve sophisticated equipment could be the following:

Equipment

.1 Install a flow meter on the inert vent line. This must be ultrasonic type. These flow meters are almost maintenance free. What is needed, is a spool piece for the sensors on a straight section of the vent line. In addition, one pressure and one temperature sensor are needed.

.2 Information is needed from the loading paper about cargo volume.

.3 A hydrocarbon measurement on the spool piece should also be taken in the beginning of the loading and at completion of loading before using handheld HC measurement devices.

Logging

.1 Log volume measured out of riser during loading in Sm^3 : V_{inert}.

.2 Log volume measured out of riser during transit in Sm^3: $V_{transit}$.

.3 Log total cargo loaded: V_{cargo}.

.4 Log HC Alfa value start loading HC_{start} and end loading HC_{end} (ensure that these is flow through the sample point when performing the measurements). Alternatively, measure HC in cargo tanks prior to start loading and after loading has been completed.

Calculation procedure

.1 VOC emissions in kg due to hydrocarbons due to displacement: VOC_{disp} (kg) = HC_{start} x V_{cargo} (Sm^3) x 2.1

.2 VOC emissions in kg due to VOC generated during loading: VOC_{gen} (kg) = V_{inert} (Sm^3) x ((HC_{start} + HC_{end})/2) x 2.1

.3 VOC emissions in kg during transit: $VOC_{transit}$ = $V_{transit}$ (Sm^3) x HC_{end} x 2.1

Emission factor (EF)

.1 EF_{gen} (kg/Sm^3) = VOC_{gen} (kg) / V_{cargo} (Sm^3)

.2 $EF_{Transit}$ (kg/Sm^3) = $VOC_{transit}$ (kg) / V_{cargo} (Sm^3)

Accuracy between 5 and 10%

Factor 2.1 is an experience factor that transform the volume to mass. Hundreds of more accurate measurements have shown that this is a reasonable assumption. Assume spool piece, ultrasonic flow meter, transmitters and cabling can be installed for a cost between $30 and $60,000 depending on size of the inert line. Must be further evaluated.

If this or any other method is accepted, we should consider how regular measurements and monitoring of VOC emissions could be implemented.]

3 Include the terminals in the work to get their view/perspective, in order to find ways to avoid release of VOC during loading and avoid the inappropriate depressurizing of tanks prior to arrival at terminals.

4 How to prevent any leakages and reduced opening and closing pressure of P/V valves [how to minimize any leakages of P/V valves].

5 Including maintenance in the management plan. (MSC/Circ.677 and ISO 15364 needs to be addressed as part of the scope.)

6 [The acceptability of using a ventilation procedure under MARPOL Annex II to remove cargo residues from a tank containing volatile noxious liquid substances.]

7 [Consider any amendments to the VOC management plan in accordance with the outcome on the work of the operational requirements (MEPC.185(59)) 'Guidelines for the development of a VOC management plan' taking into account document ISWG-GHG 9/3) and associated circulars] [Alternative text: Consider any amendments to the 'Guidelines for the development of a VOC management plan' (MEPC.185(59)) and associated circulars based on the outcome of the work on the technical and operational requirements.]

8 [Further consider any amendments to the existing regulation (MARPOL Annex VI, regulation 15), taking into account the work on the technical and operational requirements.] [Alternative text: Further consider any amendments to the existing regulation (MARPOL Annex VI, regulation 15), taking into account the work on the operational requirements with the aim to investigate how the reduction of VOC emissions could contribute to the implementation of the Initial IMO Strategy on reduction of GHG emissions from ship.]

9 Forward to relevant Sub-Committees for comments the placeholder for matters related to P/V valves, mast riser etc. would probably be SOLAS chapter II-2/4.5.3. The Sub-Committee which is responsible for this part of SOLAS, so either SDC or SSE, should therefore be involved.

10 The applicable Sub-Committee could be invited to consider the relevant proposals listed below:

.1 a requirement for a set pressure of P/V valves of 0.2 bar;

.2 controllable pressure release through the mast riser;

.3 periodical pressure and vacuum testing, and verification of the set-pressure of P/V valves; and

.4 leakage rate of P/V valves.

11 [The PPR Sub-Committee and the ESPH Technical Group could consider the acceptability of using a ventilation procedure under MARPOL Annex II to remove cargo residues.]