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REDUCTION OF GHG EMISSIONS FROM SHIPS

Comments on document MEPC 76/7/5

Submitted by Indonesia, Russian Federation, Saudi Arabia, United Arab Emirates, ICS, INTERTANKO, IPTA and WSC

SUMMARY

Executive summary:	This document provides additional information to that already provided to the Correspondence Group on Carbon Intensity to support excluding operations in severe adverse weather conditions from a ship's carbon intensity indicator (CII) rating calculation. The proposed exclusions would only affect how a ship's CII rating is calculated and all fuel oil used would still be reported to the IMO Data Collection System (DCS), maintaining visibility of aggregate emissions from international shipping. Failure to agree a severe adverse weather exclusion will result in efficient ships being seriously penalized because of operation in adverse environmental conditions out of their control potentially resulting in severe adverse economic consequences for those Member States served by trade routes which suffer a heightened prevalence of adverse weather. Economic consequences of unfairly penalizing ships for operating in weather conditions out of their control include distortion and damage to trade to some Member States and could result in some areas facing difficulties when sourcing shipping services.
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 28
Related documents:	MEPC 76/7/4, MEPC 76/7/5; MEPC.304(72); MEPC 75/6/3, MEPC 75/6/6, MEPC 75/18; MEPC.1/Circ.850/Rev.1; MSC 103/INF.9; MEPC 71/INF.28; ISWG-GHG 7/2/9 and MEPC 72/7/1

Introduction

1 This document comments on document MEPC 76/7/5 (China et al.).

2 MEPC 72 adopted the *Initial Strategy on reduction of GHG emissions from ships* (hereafter referred to as the Initial Strategy) (resolution MEPC.304(72)), which includes an objective "to reduce CO_2 emissions per transport work, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008".

3 MEPC 75 approved an ambitious package of short-term measures with a view to adoption at MEPC 76, including draft amendments to MARPOL Annex VI (MEPC 75/18, paragraph 7.28) as a key step to implement the Initial Strategy. The MARPOL amendments will enter into force on 1 January 2023 following adoption by MEPC 76. The package includes both goal-based technical and goal-based operational measures. The Committee established a Correspondence Group on the Development of Technical Guidelines on Carbon Intensity Reduction (hereafter referred to as the Correspondence Group) to develop the necessary supporting guidelines.

4 It is believed the Correspondence Group has made excellent progress having prepared draft guidelines for both the technical and operational parts of the package of short-term measures. Not surprisingly however, noting the very challenging timeline for the Correspondence Group's work, several significant matters remain to be resolved by the Committee before the guidelines can reasonably be finalized and considered fit for purpose.

5 The operational measure will use carbon intensity indicators (CIIs) to assign each ship an efficiency rating in one of five bands from A to E, with band A representing the most efficient ships. The Correspondence Group considered, but did not finalize, several CII rating correction factors and voyage exclusions (MEPC 76/7/5, paragraphs 8 to 12), one of which relates to adverse weather conditions and would exclude periods operating in sea states at, or more severe, than 7 Bf from CII ratings (MEPC 76/7/5, annex 1, section 4.4.1.4). The proposed exclusion would only affect the ships' CII calculation, all fuel use regardless of weather conditions would still be reported to the IMO DCS.

6 This document provides information in support of excluding periods sailing in sea states at, or more severe, than 7 Bf from CII ratings to prevent market distortion and penalization of Member States.

Adverse weather

7 Ships use weather routing and avoid the most severe conditions where practical, however avoiding such conditions is not always possible and so ships routinely and unavoidably operate in adverse weather.

8 Weather conditions at sea are assessed using the Beaufort wind force scale. The Beaufort wind force scale describes 13 sea states from 0 Bf to 12 Bf, with 0 Bf signifying calm conditions and 12 Bf signifying hurricane force conditions. Sea state 7 Bf is defined as:

.1 high wind, moderate gale, near gale;
.2 wind speed 28 to 33 knots; and
.3 wave height 4.0 to 5.5 metres.

9 Sea state 7 Bf can reasonably be considered to represent a balanced compromise between the most severe weather sea conditions and conditions which, while still adverse, are a normal part of ship operation. Ships operating in a sea state of 7 Bf use significantly more fuel than when operating in less severe conditions. Sea state 7 Bf is aligned with the sea state used in the *Interim Guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions* (MEPC.1/Circ.850/Rev.1) (the interim minimum power Guidelines) for ships up to 200 m. These Guidelines use a sea state of 8 Bf for larger ships of 250 m and above, however the added complexity of applying two size categories to

the proposed exclusion would outweigh any benefits and risk market distortion by penalizing ships marginally above the chosen size threshold. All ships, regardless of size, suffer a significant efficiency penalty when operating in adverse weather.

10 The prevalence of adverse weather varies with location and time of year. For example, in the North Atlantic average wind speeds corresponding to 7 Bf can be expected for approximately 40% of the time during the period November to March and for 10% of the time in the period May to August. Such conditions are, however, rare in some areas, for example such conditions are unusual in the Arabian/Persian Gulf.[1] In some cases, storm seasons are not aligned with the periods of highest average wind speeds, for example the North Atlantic hurricane season is generally June to November. Some areas with generally benign weather conditions experience storm seasons. For example, although average wind speeds in the South China Sea are generally quite modest, the typhoon season (which, is most severe between July and September) sees periods of extremely severe weather. Other areas with severe storm seasons include the Caribbean Sea and Gulf of Mexico (June to November). Therefore, some trade routes are much more exposed to adverse weather than others, with this further varying according to time of year.

11 Adverse weather conditions are becoming both more frequent and more severe, for example, the 2020 Atlantic hurricane season was the most active on record.[2] For the continental United States and Atlantic Basin, some models project a 45 to 87% increase in the frequency of category 4 and 5 hurricanes.[3] A category 4 hurricane equates to 12 Bf+. This is already a matter of concern for ship construction, for example, annex 1 to document MSC 103/INF.9 (IACS) includes a common structural rules audit observation which states "Modern data show both an increase in mean significant wave height for the North Atlantic and that more extreme weather is being experienced in recent years, including the existence of rogue waves and the possible effect of climate change".

12 Improving the efficiency of ships must not compromise safety. In addition to the interim minimum power Guidelines, the Organization is considering overridable shaft power limitation concepts for both new ships (see for example document MEPC 75/6/6 (France et al.)) and for existing ships (MEPC 76/7/4, annex 3 (China et al.). The power required to operate safely in adverse weather is determined by weather conditions, CII ratings must not penalize ships simply for operating safely.

Ship operation in adverse weather

13 The power required to operate a ship at a given speed is a function of multiple factors, including, inter alia, hull form, draught and weather conditions. In calm conditions and at normal operating speeds, the propeller law assumption (i.e. power is proportional to the cube of speed/$P \alpha V^3$) is a valid approximation, however, at low speeds and in adverse conditions, wave height and wind become the dominant components of resistance and the propeller law is no longer valid. In adverse conditions, ships will operate at reduced speed for a given shaft power. In severe weather conditions, speed may reduce to a nominal advance speed despite engines operating at their maximum power output. In extremis, ships may operate at maximum shaft power merely to maintain a heading with no speed (or even negative speed) over ground. Figure 1 shows the results of an analysis of the ratio of resistance components for oil tankers in a sea state of 9 Bf carried out Herbert Engineering Corporation (HEC). For smaller ships, added resistance in waves dominates; this is reasonable given that the wave height used is independent of ship size.

1 Information based on reviewing historical records using WeatherApp.

2 https://www.noaa.gov/news/2020-atlantic-hurricane-season-takes-infamous-top-spot-for-busiest-on-record

3 See for example https://www.gfdl.noaa.gov/global-warming-and-hurricanes/.

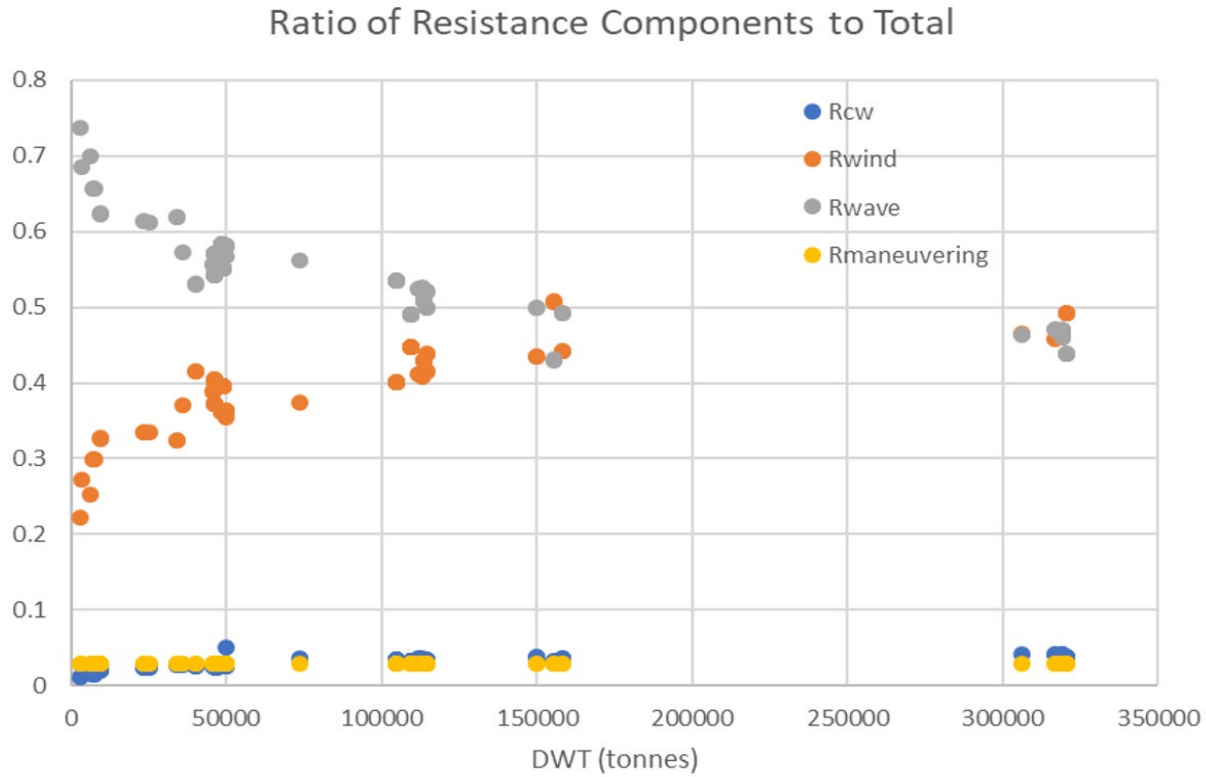

Figure 1 – Relative contributions of resistance components for tankers

14 To date, most analysis of the impacts of adverse weather on shaft power has focused on bulk carriers and tankers because of concerns about minimum power and safe operation in adverse weather. Document MEPC 75/6/3 (ICS and RINA) analysed minimum power requirements in adverse weather for a large number of bulk carrier and tanker designs using the minimum power line method of the interim minimum power guidelines and the simplified assessment method developed by the SHOPERA study (MEPC 71/INF.28 (Denmark et al.)). The analysis was undertaken at a number of weather conditions and advance speeds of 4.0 to 9.0 knots for minimum power line method and 2.0 knots for the SHOPERA method. Additional calculations were undertaken to investigate the effect of a 4.0 knot advance speed if using the SHOPERA method. This analysis demonstrated that the level of minimum power required to assure safe operation using both methods is very sensitive to weather conditions for all ships, but that smaller ships are especially sensitive to weather conditions.

15 Figure 9 of document MEPC 75/6/3 illustrates the shaft power required to maintain an advance speed of 2.0 knots as sea state deteriorates from 7 Bf to 12 Bf for a range of bulk carrier designs using the SHOPERA simplified assessment method, demonstrating the scale of increasing power required just to maintain manoeuvrability as conditions deteriorate.

16 In document MEPC 72/7/1, INTERTANKO summarized the conclusions of a study carried out by UCL which analysed the operational efficiency for a group of 11 identical ships operated under the same management which found a high level of variability in indicated operational efficiency. The document concluded that in the case of the energy efficient operating index (EEOI) "approximately 60% of the variability in EEOI is attributable to parameters that are predominantly beyond the ship operator's control and are more commonly determined by the environmental conditions as well as commercial conditions" (MEPC 72/7/1, paragraph 21). It could be expected that environmental conditions will be even more important in influencing annual efficiency ratio (AER) values since the AER is based on DWT, and therefore utilization/cargo carried, which was the other main causal factor for high EEOI variability between similar ships, does not apply.

Impact

17 The Correspondence Group has recommended the AER as the CII for most ship types, with a variation using GT in place of DWT for some ship types (cgDIST). The AER is calculated as follows:

$$AER = \frac{Emissions}{DWTxDistance}$$

18 Paragraphs 7 to 12 of this document demonstrate that it is not possible to always avoid adverse weather, and paragraphs 13 to 16 demonstrate that ships use significantly more fuel in adverse weather (increasing the AER value) and that environmental conditions are a principal causal factor in CII variability.

19 Ships operating in adverse weather will have a higher (i.e. worse) AER value than an equivalent ship under the same management operating in areas of benign weather, regardless of any efficiency improving technologies which are used on board and of how the ship is operated. This negative impact will not be normalized by applying a multi-year approach to calculate CII ratings as has been suggested by some.

20 The CII rating system is designed to incentivize efficient operation. Ships with a higher (A, B) rating will be more attractive to charterers and shippers than lower rated (D, E) ships and so attract a premium in the market. Trade routes which suffer a higher prevalence of adverse weather will degrade CII ratings, making such trades less attractive to shipowners. This could result in market distortion. Shipping costs for routes favouring good CII ratings will reduce while shipping costs will increase for routes which increase AER values because of how the value of ships will be affected by their CII rating.

21 In addition to the possible consequences identified in paragraph 20, should hard CII enforcement of CIIs objectives be introduced as proposed (but not supported by the Committee) in document ISWG-GHG 7/2/9 (Denmark et al.) which included a "goodbye clause" then some trade routes may become non-viable. If serving a trade degrades a ship's CII rating and risks withdrawal of statutory certificates, then ships will not serve such trades. This could result in some regions finding it very difficult to secure shipping services since a ship without statutory certification cannot be operated.

22 The entities which will be the most affected by a failure to make a sensible provision for operation in adverse weather will not be shipowners, which will adapt their operations to where they can reasonably take place. Those most affected will be Member States with ports and regions exposed to a heightened prevalence of adverse weather or reliant on trade routes passing through regions exposed to adverse weather. The disproportionate influence of weather on smaller ships (paragraphs 13 to 14) means that SIDS would be even more exposed to such consequences since in many cases they rely on services operated by smaller ships.

23 Excluding periods operating in sea states of 7 Bf or worse would mitigate these effects and reduce the potential for CIIs to cause serious market distortion and penalize Member States. Unless the Organization determines that achieving CII objectives is more important than avoiding market distortion and penalizing Member States on account of their location, then an adverse weather exclusion is the only possible way forward at this time.

24 Effective verification requirements would be necessary to ensure that the proposed exclusion is used appropriately, to ensure that the CII rating system operates effectively and to maintain a level playing field. The draft guidelines should therefore include audit and verification requirements. These might include, inter alia, requirements to maintain weather records, distance travelled in adverse weather, use of reserve power, speed and shaft power to facilitate diligence checks during audits.

25 The proposed exclusion would only affect CII ratings. All fuel used would still be reported to the IMO DCS, maintaining visibility of aggregate emissions and facilitating evidence-based decision-making. Ultimately it is aggregate emissions which are of crucial importance, the CII rating system being simply a tool to help lower aggregate emissions.

26 The CII rating system is intended to promote improved operational efficiency of ships, not to penalize Member States because of their geographical location. The proposed exclusion will only exclude conditions where the principal determinants of efficiency are completely outside the control of shipowners and crews, it will not affect imperative to optimize efficiency in all other conditions. Therefore, the proposed exclusion will not affect the trajectory towards decarbonization since ships will still be rated for most of their time in operation.

Proposal

27 The co-sponsors propose that:

.1 periods in conditions at, or more severe than, sea state 7 Bf be excluded from CII ratings, however this will not affect reporting of aggregate emissions;

.2 the draft guidelines on operational carbon intensity indicators and the calculation methods (CII guidelines, G1) include the proposed exclusion along with requirements for verification, including defining the information and records to be maintained and made available during CII audits; and

.3 at the 2026 review point, the Committee should review the impacts of the proposal to evaluate whether CIIs can be normalized for periods of adverse weather, or whether to retain voyage exclusions as an ongoing provision.

Action requested of the Committee

28 The Committee is invited to consider the proposals presented in paragraph 27 and take action, as appropriate.