INTERNATIONAL MARITIME ORGANIZATION

E

MARINE ENVIRONMENT PROTECTION COMMITTEE
73rd session
Agenda item 5

MEPC 73/5/10
17 August 2018
Original: ENGLISH

AIR POLLUTION AND ENERGY EFFICIENCY

EEDI reduction beyond phase 2

Submitted by Liberia, ICS, BIMCO, INTERFERRY, INTERTANKO, CLIA and IPTA

SUMMARY

Executive summary:	The co-sponsors propose that the Committee agrees to early implementation of EEDI phase 3 in 2022 for specific ship types. Recognizing the challenges faced by certain ship types and/or for which there is insufficient data to facilitate an informed decision, the co-sponsors consider that the implementation date for EEDI phase 3 should remain 2025 for some ship types. This is consistent with the *Initial IMO Strategy on Reduction of GHG Emissions from Ships*, which aims to strengthen the EEDI requirements for ships with the percentage improvement for each phase to be determined for each ship type as appropriate, and to reduce CO_2 emissions per transport work as an average across international shipping by at least 40% by 2030.
Strategic direction, if applicable:	3
Output:	3.6
Action to be taken:	Paragraph 34
Related documents:	MEPC 70/5/21; MEPC 71/5/14; MEPC 71/INF.14, MEPC 71/INF.28, MEPC 71/INF.29; MEPC 71/5/13, MEPC 71/17; MEPC 72/5/4, MEPC 72/5/5; MEPC 72/INF.12; MEPC 72/WP.6; resolutions MEPC.304(72); MEPC 203(62); MEPC.245(66); MEPC.1/Circ.850/Rev.2 and MEPC.1/Circ.854

Introduction

1 At MEPC 67, the Committee established a correspondence group to review the status of technological developments relevant to implementing phase 2 of the Energy Efficiency Design Index (EEDI) as required by regulation 21.6 of MARPOL Annex VI. At MEPC 70, the Committee agreed to retain the planned reduction rates, time periods and EEDI reference line parameters in the phase 2 requirements for ship types other than ro-ro cargo and ro-ro passenger ships.

2 MEPC 71 re-established the correspondence group to review EEDI phase 3 requirements and their potential early implementation, and also the potential future EEDI phase 4. The review is to be finalized in time for EEDI phase 3 to be implemented in 2022 if agreed by the Committee.

3 At MEPC 72, the Committee adopted the *Initial IMO Strategy on Reduction of GHG Emissions from Ships* (resolution MEPC.304(72)) (the initial strategy). This includes commitments to review and strengthen the EEDI, with the percentage improvements for each phase to be determined for each ship type, as appropriate (paragraph 3.1.1 of the initial strategy) and to reduce CO_2 emissions per transport work by at least 40% by 2030 compared to 2008 as an average across international shipping (paragraph 3.1.2 of the initial strategy). The initial strategy therefore, recognizes that different ship types can be expected to achieve a different rate of EEDI reduction and that CO_2 emissions will be reduced as an average across the fleet.

4 The co-sponsors support strengthening the EEDI requirements and improving the energy efficiency of ships and effective implementation of the initial strategy.

5 When reviewing the status of technology and readiness of ships to achieve EEDI phase 3, it is necessary to consider each of the ship types with an assigned EEDI, and to further consider ships of different sizes within each ship type. Decision making should be evidence based.

6 Whilst being fully committed to delivering the objectives of the initial strategy, the co-sponsors are also committed to preserving the safety of seafarers and ships. Reducing emissions of GHGs must not be at the expense of safety.

7 After reviewing data in the IMO EEDI database (MEPC 71/INF.14) and the comments submitted to the Correspondence Group on EEDI review beyond phase 2 (MEPC 71/INF.12), the co-sponsors consider that the available data supports early implementation of EEDI phase 3 in 2022 for container ships and general cargo ships. The implementation date for other ship types should remain 2025 unless the Organization receives sufficient additional data in time to facilitate informed decisions in support of potential early implementation for any of these other ship types. Further attention should be given to the EEDI reduction rates for bulk carriers and tankers, and outstanding concerns over minimum power and safe manoeuvrability must be resolved before implementing EEDI phase 3.

Discussion – bulk carriers and tankers

8 Bulk carriers and tankers, particularly large ones, face a greater challenge to achieve EEDI phase 3 than other ship types. This is despite ship designers incorporating a wide range of efficiency enhancing technologies in new designs. The co-sponsors consider that there is general agreement both in the correspondence group and in the wider maritime industry on this point, despite persistent claims of "excessive EEDI over compliance" being used to support proposals to implement of EEDI phase 3 in 2022 for all ships.

9 The formula to calculate the EEDI value of a ship can be simplified to the following:

$$\text{EEDI} = \frac{\text{Installed power} \times \text{Specific fuel consumption} \times \text{Carbon conversion factor}}{\text{Deadweight} \times \text{speed}}$$

From this simplified expression it can be seen that either reducing installed power, fuel consumption or the carbon factor of fuel, or increasing deadweight or speed will reduce the EEDI value. In practice the effects of reducing power far outweigh the negative impact on the calculation of reducing speed due to the approximate cubic correlation between speed and power (v=k*P^3).

10 The EEDI phase reductions are expressed as percentages relative to EEDI reference lines which were established following on an analysis of the existing fleet, including installed power and service speed of those ships. For most ship types the period covered for this analysis was ships delivered between 1 January 1999 and 1 January 2009. During this period, bulk carriers and tankers were already designed for moderate service speeds, were provided with relatively low installed power (relative to ship size), and had already achieved very high deadweight values for those trades able to accommodate such large ships. Therefore, there was limited potential to improve EEDI values by reducing installed power or increasing deadweight.

11 Although EEDI values of bulk carriers and tankers have shown excellent improvement, they have not matched outstanding achievements of some other ship types which reduced EEDI values more deeply and more quickly than was anticipated when the EEDI was adopted. This is because the potential to reduce speed and increase size which contributed to the stellar improvements seen in some other ship types was not viable for bulk carriers and tankers.

12 The propeller law, in which power is proportional to the cube of speed indicates the relationship between installed power and ship speed for the speed range within which most ships traditionally operated. For faster ships, even a relatively modest reduction in speed can reduce required shaft power significantly. At lower speeds the potential reduction in shaft power from reduced speed become smaller, and interaction with waves becomes more important, reaching a point where reducing speed further results in no reduction of shaft power.

13 The EEDI reference lines for different ship types are not directly comparable. For example, for container ships, a figure of 70% of deadweight is used, which adversely affects EEDI compared to if using full deadweight. However, it should be noted that the EEDI reference lines for bulk carriers and tankers reflect lower levels of installed power and a wide distribution of DWT, as bulk carriers and tankers had already moved to very large ship sizes prior to 2009. These ships had made their evolution to larger sizes before other ship types and already operated at low service speeds before the EEDI took effect. Other ship types have followed a similar evolutionary move to larger sizes and lower service speed which has been a significant factor in their excellent EEDI reductions. There have been claims that the EEDI values of large bulk carriers and tankers could be improved by measures which would in effect make ships smaller and reduce deadweight. Making these ships smaller would ease EEDI compliance, it would also make them less efficient. The EEDI lines are curves and do not represent a constant degree of efficiency. Making ships less efficient in order to ease compliance with a measure which is intended to promote more efficient ships cannot be considered sensible.

14 The Committee recognized that improving the EEDI values of new designs could result in ships being built with smaller engines to the point where ships could lack sufficient propulsion and steering abilities to maintain manoeuvrability in adverse conditions. Regulation 21.5 of MARPOL Annex VI states that:

> "For each ship to which this regulation applies, the installed propulsion power shall not be less than the propulsion power needed to maintain the manoeuvrability of the ship under adverse conditions as defined in the guidelines to be developed by the Organization."

These guidelines are provided by the *2013 Interim guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions* (2013 Interim Guidelines). The initial guidelines provided in resolution MEPC.232(65) were amended by resolutions MEPC.255(67) and then MEPC.262(68). The current requirements are provided in MEPC.1/Circ.850/Rev.2. The current guidelines require a significant increase in power, relative to ships built to comply with the earlier guidelines in the case of many bulk carriers and tankers. This increase was agreed following recognition that an adjustment was needed in order to assure the safety of these ships, however, it will make achieving EEDI phase 3 even more challenging for tankers and bulk carriers. Almost all of the bulk carriers and tankers in the IMO EEDI database were built to comply with the older guidelines.

15 Since bulk carriers and tankers are already being provided with modest levels of installed power, relative to ship size, any reductions in power are much more likely to result in these ship types approaching the point at which safety risks being compromised.

16 At MEPC 71, the Committee was updated on draft new minimum power guidelines intended to replace the interim ones currently in use, including an update on research programs which have been developing a simplified method for calculating minimum power as an alternative to minimum power lines (MEPC 71/5/13 and MEPC 71/INF.28). The Committee was advised that these revised guidelines were not mature enough to be finalized at MEPC 71.

17 At MSC 97, the Maritime Safety Committee expressed the view that amendments to the 2013 Interim Guidelines should also be considered by that Committee to ensure that all safety-related issues were adequately addressed. The co-sponsors welcome the interest shown by MSC in this matter. Improving energy efficiency and lowering emissions of greenhouse gases (GHG) are environmental matters and should be considered as such, provision of sufficient power is a question of safety and should be considered only in the context of safety. The co-sponsors would also highlight that events such as ship collisions and grounding may result in marine pollution, for example spillage of cargo or fuel. Providing ships with sufficient minimum power to manoeuvre safely in adverse weather will reduce the risk of pollution arising from allision, collision and grounding.

18 The co-sponsors consider that the levels of power required by the 2013 Interim Guidelines (MEPC.1/Circ.850/Rev.2) are sufficient to ensure that ships are provided with a safe level of installed power, however, this introduces a potential conflict between achieving the necessary EEDI, and satisfying minimum power requirements. The co-sponsors further consider that it is essential for work on draft new guidelines on minimum power to be completed, and that these guidelines must ensure that ships are provided with sufficient installed power to operate safely. Until final proposals are submitted for the consideration of the Committee, the co-sponsors cannot comment on them other than to stress the critical nature of minimum power requirements for some ship types in the context of the EEDI regulations. Looking beyond EEDI phase 3 at the future EEDI phase 4 the issue may become pertinent to more ship types.

19 Defining minimum power is not in itself sufficient, the capability of power systems to respond to load changes and maintain control of the ship in conditions where shaft torque and not power is the limiting factor is also important. A ship may be provided with sufficient power to meet minimum powering requirements, but this power may not be usable in some conditions. This is because of changes in power system design such as the use of very long stroke engines optimised for good fuel efficiency and emissions performance and very large slow revving propellers which have altered the load and torque characteristics of propulsion systems.

20 Recognizing the issues faced by bulk carriers and tankers, at MEPC 72, China proposed amending their EEDI reference lines (MEPC 72/5/8). This proposal was not supported for EEDI phase 2, but the document was referred to the Correspondence Group on EEDI review beyond phase 2 for further consideration with respect to EEDI phase 3. An alternative to amending the reference lines would be to amend the required reduction rates.

21 The potentially conflicting demands of the EEDI regulation and providing sufficient power could be reconciled by providing ships with a reserve of power. Ships would be certificated with an installed power for normal service which would be used to establish their EEDI value and a reserve of available power which would allow the ship to comply with the Organization's guidelines for minimum power in order to maintain safety of the ship. Any use of this additional power would be recorded. Records of when this available power was used would be subject to inspection by relevant authorities to confirm that it was not used improperly. This would be equivalent to switching an engine between NO_X Tier II and Tier III modes of operation upon entering or exiting an ECA-NO_X. Guidance for switching between Tier II and Tier III operation is provided in MEPC.1/Circ.854. This additional reserve of power could be provided using power take in (PTI) arrangements or other means.

22 The EEDI value of a ship can be reduced by using a lower carbon fuel, benefiting from the carbon factor in the EEDI calculation. Lower carbon fuels include liquefied natural gas (LNG) and methanol. Looking further forward, carbon neutral alternative fuels such as hydrogen and ammonia may be adopted by shipping, along with alternative modes of energy conversion such as batteries.

23 The co-sponsors consider that bulk carriers and tankers, particularly larger ones, will have applied all available energy efficiency enhancing measures during EEDI phase 2 and will only be able to go beyond EEDI phase 3 by switching to alternative fuels. Provision of a fuel supply infrastructure for these alternative fuels is critical to any discussions of further EEDI reductions. The supply infrastructure for LNG is very limited and is restricted to a handful of ports where LNG is particularly attractive to certain ship types, such as those which operate entirely within an ECA. These are not generally the ports used by bulk carriers and tankers, and there is little progress in developing an LNG supply chain in those ports (or even regions) which serve the bulk tramp trades, the supply infrastructure is even less developed for other alternative fuels.

Discussion – ro-ro passenger and ro-ro cargo ships

24 At MEPC 70, the Committee considered document MEPC 70/5/21 which demonstrated that the EEDI reference lines for ro-ro passenger and ro-ro cargo ships did not adequately represent their physical properties as applied in the EEDI calculation. At MEPC 71, the Committee agreed to amend the reference lines for these ships types based on proposals provided in document MEPC 71/5/14 (MEPC 71/17, paragraph 5.59). At MEPC 72, the Committee adopted amendments to the EEDI reference lines for ro-ro passenger ships and ro-ro cargo ships (MEPC 72/17, annex 6). The amendments will enter into force on 1 September 2019, however the resolution encourages flag Administrations to implement the revised reference lines as soon as possible and prior to entry into force.

25 The co-sponsors consider that it would be sensible to gain experience and confirm the efficacy of the amended reference lines before implementing EEDI phase 3. To do otherwise risks introducing an impractical requirement which is not achievable given that there is still little available data for this ship-category to support informed decision making.

26 Early implementation would lead to a confused and potentially disruptive situation as a result of both possible and implemented amendments and corrections, decided and to be decided at MEPC 71, MEPC 72 and MEPC 73. Should EEDI phase 3 be implemented it would create a confusing situation with four different requirement levels in force during a period of 25 calendar months (December 2019 to January 2022) from non-corrected phase 1 to possible early implementation of corrected phase 1, through corrected phase 1, phase 2 and then an earlier date for phase 3.

27 The co-sponsors therefore consider that the implementation date of EEDI phase 3 should remain 2025 for these ship types.

Discussion – gas carriers, LNG carriers, ro-ro vehicle carriers, refrigerated cargo carriers and cruise passenger ships having non-conventional propulsion

28 The co-sponsors consider that there is insufficient data available to support early implementation of EEDI phase 3 for these ship types. However, should data be made available then this could be considered later.

Proposals

29 The co-sponsors propose that EEDI phase 3 should be implemented ahead of schedule in 2022 for container ships and general cargo ships and that it should be implemented in 2025 as originally scheduled for all other ship types. The co-sponsors further propose that new guidelines for minimum power are established before EEDI phase 3 is implemented for bulk carriers and tankers, and that these guidelines are agreed by MSC as well as by MEPC.

30 Recognizing that challenges and technical difficulties in trying to reconcile achieving EEDI phase 3 whilst retaining a safe level of installed power, the co-sponsors recommend that the EEDI reduction rates for bulk carriers and tankers are amended, detailed proposals should be developed by the correspondence group which is reviewing EEDI requirements.

31 The availability of the necessary supply infrastructure for alternative fuels should be considered by the Correspondence Group on EEDI review beyond phase 2 before making any proposals on reduction rates and implementation dates for EEDI phase 4.

32 The co-sponsors consider that these measures are both justified and necessary, and would:

.1 facilitate earlier implementation of EEDI phase 3 for some ship types;

.2 avoid introducing impracticable requirements for other ship types; and

.3 allow the correspondence group to consider future EEDI phase 4 without these discussions stalling as a result of the same concerns which have caused so much difficulty with respect to EEDI phase 3.

33 In response to concerns that these proposals would be a relaxation of efforts to improve the efficiency of international shipping the co-sponsors would emphasise that the *Initial Strategy on Reduction of GHG Emissions from Ships* commits the industry to at least a 40% reduction in carbon intensity per transport work as an <u>average</u> across international shipping by <u>2030</u> and to determine further EEDI reductions for each ship type. The proposals in paragraphs 30 to 34 are consistent with the approach defined in the initial IMO GHG strategy.

Action requested of the Committee

34 The Committee is invited to consider the comments and proposals contained in this document and to take action as appropriate.