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CONSIDERATION OF CONCRETE PROPOSALS ON CANDIDATE SHORT-TERM MEASURES, NOTING THE DISCUSSION AT ISWG-GHG 4 ABOUT SHORT-TERM MEASURES AND THEIR CATEGORIZATION

Review of Candidate Short Term Measures

Submitted by ICS..........

SUMMARY

Executive summary:	The [co-sponsors] comment on candidate short term GHG emissions reduction measures contained within the Initial IMO strategy on reduction of GHG emissions from ships and which were proposed at ISWG-GHG4 and/or MEPC 73.
Strategic direction:	
High-level action:	
Output:	
Action to be taken:	Paragraph 15
Related documents:	MEPC.304(72), MEPC 73/WP.1, ISWG-GHG 3/2/10, ISWG-GHG 4/2/8, ISWG-GHG 4/3, ISWG-GHG 4/3/1, ISWG-GHG 4/3/4, ISWG-GHG 4/2/14, ISWG-GHG 4/2 MEPC 73/5/9, ISWG-GHG 2/2/7, MEPC.1/Circ.850/Rev.2

Introduction

1. The Committee, at MEPC 72, adopted the Initial IMO strategy on reduction of GHG emissions from ships (MEPC.304(72)) (the initial strategy). The co-sponsors supported the adoption of this initial strategy and consider it to be a major step forward for the international shipping sector, setting out a pathway for the phase-out of GHG emissions. The co-sponsors fully support rapid progress in introducing short term measures to reduce emissions of GHG gases from ships, such measures should:

- be effective, and make progress towards delivering the levels of ambition established in the initial strategy;
- promote innovation and adoption of GHG reducing technologies;
- be implementable;
- avoid penalising early movers;
- minimise negative impacts on Member States and global trade; and
- not divert time and resources from the development of longer term solutions such as zero carbon fuels.

The 2050 level of ambition of the initial strategy can only be achieved by adopting new fuels, energy carriers and technologies. Development, commercialisation and provision of the requisite infrastructure for these new fuels and technologies will require a huge effort, efforts to agree and implement short term measures must not delay or detract from development of medium and long term measures. This would be counterproductive and delay adoption of the long term measures which are needed to decarbonise the industry.

2. At ISWG-GHG 4 a draft programme of follow-up actions of the initial IMO strategy was developed which was then agreed at MEPC 73.

4. At MEPC 73 terms of reference were agreed for ISWG-GHG 5, including consideration of concrete proposals on candidate short-term measures (MEPC 73/WP.8, Annex 2).

5. This document reviews some candidate short measures within the initial strategy or which have been proposed and provides comments for the consideration of the Committee.

Speed Optimization and Speed Reduction

12. The initial strategy includes *Speed optimization and speed reduction, taking into account safety issues, distance travelled, distortion of the market or trade and that such measure does not impact on shipping's capability to serve remote geographic areas* as a candidate short term GHG reduction measure.

13. Sections 5.2.6 and 5.2.7 of the SEEMP guidelines state:

> *5. 2.6 Speed optimization can produce significant savings. However, optimum speed means the speed at which the fuel used per tonne mile is at a minimum level for that voyage. It does not mean minimum speed; in fact, sailing at less than optimum speed will consume more fuel rather than less. Reference should be made to the engine manufacturer's power/consumption curve and the ship's propeller curve. Possible adverse consequences of slow speed operation may include increased vibration and problems with soot deposits in combustion chambers and exhaust systems. These possible consequences should be taken into account.*
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> *5. 2.7 As part of the speed optimization process, due account may need to be taken of the need to coordinate arrival times with the availability of loading/discharge berths, etc. The number of ships engaged in a particular trade route may need to be taken into account when considering speed optimization.*

The co-sponsors concur with the SEEMP guidelines, which provide a concise summary of the principal arguments as to why the initial strategy should promote speed optimization, and not speed reduction.

14. Reducing the speed of a ship reduces the required power and hence fuel consumption, however it should be recognized that speed will reach a point where there is no further

reduction in fuel use because of the effect of sea margin and provision of additional ships to maintain transport supply.

15. Speed reduction could adversely affect areas which are remote from the principal shipping routes and population centres, hence the inclusion of optimization in the candidate measure (see ISWG-GHG 3/2/10 for analysis of this matter).

16. Document ISWG-GHG 4/2/8 (CSC) provided proposals for a mandatory speed reduction measure. The co-sponsors thank the submitters of the document for recognizing that any speed measures must be nuanced and cognizant of the different operational characteristics of different ship types, however they cannot recommend support for this proposal.

17. The CSC proposal would establish speed baselines for ship types, further sub-divided by size, and then defining limits for average speed over the course of a year. The baseline speeds would be established based on historic data and then verified using data submitted to the IMO Data Collection System (DCS). It is stated that use of an average speed limit value would enable ships to operate at higher speeds at certain times of the year when required to carry perishable cargo, and compensate by operating at lower speeds at other times of the year. This, it is claimed, would avoid market distortion. An initial reduction of 10% below the baselines is indicated, with further reductions to help IMO meet its 2030 GHG emissions reduction target.

18. Establishing baselines from historic speed data will not account for regional conditions and the demands of different trades and cargo. The proposal assumes that ships will only carry perishable cargo at certain times of year, allowing them to offset seasonal high speed operation by slowing down out of season. A reefer ship or reefer container ship can expected to carry time sensitive cargo at all times of the year. Further, the nature of liner ship operations requires regular fixed schedules of operation in order to maximise efficiency of the logistic chain.

19. At MEPC 73 many delegates recognised the importance of port optimisation in reducing GHG emissions from ships. Improving port efficiency will play an essential role in achieving the objectives of the initial strategy (paragraphs 7.19 – 7.21, MEPC 73/WP.1). For port optimisation measures to work ships must have flexibility to adjust voyage speeds in order to ensure on time arrival.

20. Efficiency measures must not risk the safety of seafarers and ships. Ships routinely use weather routing to avoid adverse weather, this may necessitate increasing speed to compensate for the longer routing. An annualised average speed limit could result in unintended consequences in the later part of the reporting period, if ships are unable to operate at a higher speed to offset the lost time involved in avoiding adverse weather conditions.

21. Ships must be provided with sufficient power to operate safely when adverse conditions cannot be avoided or when operating in areas with strong currents or exposed to high windage. Low load engine operation reduces efficiency both in terms of engine specific fuel consumption (g/KWhr) and also in terms of overall power system efficiency as energy recovery systems cannot operate as efficiently. Most ships have already reduced speed to a point which provides a good balance between lower fuel use and minimising problems associated with low load operation.

22. Despite tools such as AIS tracking, monitoring and enforcement of speed limits would not be a simple task. For example, it would need to consider circumstances where ships need to increase speed to avoid hazards to safety. This could create an unreasonable administrative burden for both shipowners and Administrations.

23. Port congestion is already a major challenge for the industry, slowing the global fleet down without expanding port capacity would only make this worse as more vessels will be required in order to move the same annual amount of cargo and would in fact be counterproductive.

24. The propeller law (i.e. $P \alpha V^3$) is a simplification and breaks down at low speeds as interaction with waves becomes more important. Ships reach a point where reducing speed will not result in further reduction of power (and hence fuel consumption) since the power required is a function of interaction with waves. Also, as speed reduces so does the proportionate reduction in power.

25. Speed reductions could lead to modal shift and higher aggregate GHG emissions in the case of time sensitive cargo, particularly in the short sea segment. Some cargo may even shift to air freight, resulting in higher GHG emissions.

26. Mandatory speed reduction measures could inhibit technological innovation. There has been some comment on the possibility of a rebound effect (see for example document ISWG-GHG 4/3). If a ship can emit less GHG emissions and also operate at a higher service speed then this should not be prevented, to do so would effectively remove a major incentive for shipowners to invest in new and innovative technologies.

27. Low load engine operation increases emissions of NOx, PM and Black Carbon, the co-sponsors would urge the Committee not to introduce measures which could worsen emissions of local pollutants.

28. The existing SEEMP guidelines which already address speed optimization. Strengthening the SEEMP would avoid the time necessary to agree separate speed measures, reduce administrative burden and avoid the negative consequences of mandatory speed restrictions.

29. The co-sponsors recommend that the Committee should support speed optimization, not mandatory speed reduction, this could be achieved by strengthening the SEEMP.

Operational Efficiency Indicators

30. Operational efficiency indicators have been advocated, for example, documents ISWG-GHG 4/3/1 and ISWG-GHG 4/2/14. The co-sponsors agree that an appropriate operational energy efficiency indicator or key performance indicator (KPI) may provide a useful tool for a ship to demonstrate its energy efficiency performance. However, inappropriate metrics would be counterproductive.

31. The Operational energy efficiency indicators which have been submitted for the consideration of the Committee measure the efficiency of trade, not the operational energy efficiency of ships and rely on assumptions. They do not account for asymmetric trading patterns or influence of sea conditions, weather and current, as such they would not provide meaningful, comparable values. If published they would almost certainly be used unfairly to promote some ships as being better than others, leading to erroneous conclusions and distortion of trade.

32. Research undertaken on behalf of Intertanko (document MEPC.72/Inf.5) demonstrated that the results of applying efficiency indicators to identical sister ships operated by the same company varied greatly. This supported the conclusions of document ISWG-GHG 2/2/7 (Argentina, China, India and the Philippines).

33. No single operational energy efficiency indicator is suitable for all ships. Ships have to obey charterers' instructions regarding service speed, itinerary and amount of cargo to be

shipped when under time charter. Even liner ships are routinely redeployed between different routes with very different operating conditions, meaning that historic data for operational performance cannot be assumed to be meaningful in terms of assessing future (or current) performance.

34. The co-sponsors supportive the use of appropriate operational efficiency indicators or KPIs selected by the shipowner as part of the SEEMP self-evaluation and improvement process. Such indicators or KPIs must be appropriate for the ship type.

Mandatory technology retrofit

35. Document ISWG-GHG 4/2/14 (Belgium et al) included mandatory technology retro-fitting as a possible short term GHG reduction measure.

36. The co-sponsors fully support improving the efficiency of existing ships, however mandatory technology retrofitting would be very problematic. In ISWG-GHG 4/2/14 it is stated that "many efficiency improving technologies that have been shown to be cost-effective are not applied to ships", how is cost effective defined? How would the economic viability of a measure be assessed? The costs of retrofitting any technology will be ship specific and vary hugely, based on (but not limited to) factors such as:

- The extent of work needed to access the installation area, followed by re-instating any access openings;
- Scale of modifications required to existing system;
- Modifications to existing systems and equipment, which may not necessarily form part of the retrofit but which require extensive adjustment to create space;
- Structural modifications to the fabric of the ship to carry additional weight and consequential modifications to maintain stability and fire/flood sub-division;
- The location chosen for the work and availability of resource; and
- Time off hire for completion of works.

These are all in addition to the cost of purchasing the equipment and associated class costs. Whether or not a retrofit is sensible will also be influenced by the age of the ship. The cost of a retrofit cannot be estimated, but only worked out on a ship specific basis requiring significant time and effort. Generic high level estimates proposed by consultants and others should not be seen as credible cost estimates. Shipowners do not generally need to be coerced into installing genuinely cost-effective technologies.

37. There is a lack of independent and impartial information to assess the performance of new technologies and it is unclear how much, if any environmental benefit, some technologies deliver. Documents MEPC 73/5/9 and ISWG-GHG 4/3/4 (RINA) highlighted uncertainties and inaccuracies associated with claims which have been made for percentage savings for energy saving techniques and how this makes it difficult to compare the effectiveness of such techniques. RINA also observed that the effectiveness of some techniques may have been overestimated and called for a robust framework which could be used to verify claims made for energy saving techniques. The co-sponsors concur with the arguments presented by RINA, which are consistent with the operational experiences of shipowners.

38. Mandatory retrofitting of technology is not within scope of existing IMO instruments and would be within Group B of the programme of follow-up actions of the initial IMO strategy, a candidate measure which is not work in progress and is subject to data analysis.

39. The co-sponsors consider that strengthening the SEEMP would promote improvement of existing ships with a lower administrative burden and would avoid the problems associated

with mandatory retrofit proposals which have been identified in paragraphs 36 & 37 of this document, without requiring data assessment.

EEDI for existing ships built before EEDI Phase 0

40. Document ISWG-GHG 4/2 (Norway) proposed developing an EEDI for existing ships built before phase 0. The co-sponsors fully support strengthening the existing IMO energy efficiency framework, including the EEDI, however we have serious reservations with respect to extending the EEDI to existing ships built before EEDI phase 0.

41. The EEDI is a design measure, which assigns a value to a ship when tested under controlled conditions according to a defined method of calculation, it is important not to conflate operational efficiency measures with the EEDI. Improving a ships EEDI can only be done by applying technical and design measures, it cannot be improved by operational measures. Changing the EEDI of an existing ship would require either technology retrofit, re-profiling of the hull, engine de-rating (this is not the same as slow steaming) or similar measures. The co-sponsors would reiterate that where retrofitting technology or re-profiling hull contours is advantageous and cost effective it is already done.

42. EEDI phase 0 entered into force on 1 January 2013. An EEDI for existing ships built before the EEDI took affect would require significant work to develop and agree, in particular development of survey and certification requirements which would have to be cognisant of the differences between new and existing ships. Given the procedures for amending the MARPOL Convention and the time which would be necessary to apply such a measure to the existing fleet (clearly calculating EEDI values and carry out the necessary surveys and certification of the existing fleet would require a reasonable interval following entry into force) it is unlikely that an EEDI for existing ships built prior to phase 0 could enter into force before 2025. A significant period of time would then be necessary for the existing fleet to be certificated. Considering the available resource of recognised organisations and the time which would be required to survey and certificate each ship, the co-sponsors estimate that such ships could expect to receive their EEDI values in the period 2025 – 2030. By this point they would be 10 – 15 years old. This would merely measure and certificate a ships EEDI value, it would not result in any reduction of GHG emissions.

43. If the intention is to require existing ships built before EEDI phase 0 to reduce their initial EEDI value then clearly this would require further time. Paragraphs 36 – 37 have already evaluated the challenges facing technology retrofitting, we estimate that ships making such improvements would be at least 15 – 20 years old.

44. The age profile of three key ship types which form the bulk of the world fleet is shown in table 1, using data from Equasis:

Ship type	0 - 4 yrs	5 – 14 yrs	15 – 24 yrs	25+ yrs
Small bulk carrier	11	11	80	207
Medium bulk carrier	736	1793	610	653
Large bulk carrier	1804	3042	874	110
Very large bulk carrier	442	1051	170	20
Small container ship	1	16		1
Medium container ship	230	1039	815	169
Large container ship	202	961	299	45
Very large container ship	429	733	167	
Small oil & chemical tanker	156	244	428	1074
Medium oil & chemical tanker	752	2851	1265	2044

Large oil & chemical tanker	504	1655	416	54
Very large oil & chemical tanker	417	1056	300	6
Total (all)	5684 (19%)	14452 (48.25%)	5424 (18.1%)	4383 (14.65%)
Total (large & very large)	3798 (25.74%)	8498 (57.58%)	2226 (15%)	235 (1.59%)

Table 1 – Age distribution of bulk carrier, container ship and oil & chemical tanker fleet, 2016[1]

There is general agreement that the majority of CO2 emissions originate from large ships, the data in table 1 demonstrates that for the categories of large and very large ships, over 83% are 0 – 14 years old and just over 16% older than 15 years, with those older than 25 years at less than 2%. Even if including small (with small being <500GT) and medium sized ships, then it is clear that the majority of ships are in the range 0 – 14 years and with a small minority at 25 years or older.

45. Paragraphs 41 - 44 demonstrate that

- The EEDI is a design measures and can only be improved by technical and design measures, not by operational efficiency measures;
- Should an EEDI for ships built before phase 0 be developed then ships would be at least 10 – 15 years old when certificated with a new EEDI;
- Certificating an existing ship with an attained EEDI does not alter that ships efficiency;
- If such ships are required to then reduce their EEDI then they will probably be 15 – 20 years old by the time such modifications are made; and
- Most larger ships, which are responsible for most GHG emissions from shipping, are less than 15 years old.

From this it can be derived that introducing an EEDI for ships built before phase 0 would entail significant effort to develop, followed by imposing a significant cost on industry to survey and certificate existing ships and that there would be very limited benefit from such a measure. The expected benefits cannot be considered as being in any way commensurate with the costs and administrative burden of such a measure.

46. Applying operational efficiency measures will be more appropriate for older ships than attempting to develop a new EEDI for them, promoting improved operational efficiency could be achieved by strengthening the SEEMP.

Strengthening EEDI requirements for existing ships which already have an attained EEDI value

47. Document ISWG-GHG 4/2 (Norway) also proposes strengthening the EEDI for existing ships which already have an attained EEDI value. The co-sponsors would re-iterate that the EEDI is a design measure therefore improving the EEDI value of an existing ship would necessitate technical measures such as technology retrofitting, re-profiling the hull, de-rating the engine or similar.

48. Paragraphs 35 – 39 highlight the challenges associated with technology retrofitting. Robust guidelines to evaluate the effectiveness of such technologies are a pre-requisite for any consideration of proposals to mandate technology retrofitting.

[1] Source - http://www.equasis.org, small <500GT, medium 500 – 25000GT, large 25000 – 60000GT, very large >60000GT

49. The age of EEDI phase 0 and phase 1 ships is less than that of those built prior to phase 0, some of them would nevertheless still be reaching an advanced stage of their service lives by the time any proposals to strengthen their existing EEDI took effect and still older by the time any improvements were applied to lower their attained EEDI values.

50. The co-sponsors reiterate that where refitting technology is attractive it is already done for commercial reasons, shipowners want more efficient ships. Fuel is one of the most significant costs for any shipowner and all try to minimise fuel use so far as is practicable. This applies regardless of the oft quoted split incentive between owners and charterers since it also affects the charter rate for a ship.

51. For ships certificated to EEDI phase 1 phase 2 there will be less scope to apply energy improving technologies since many of these technologies will have already been applied. De-rating the engine will be less feasible since such ships will in most cases already have down sized engines in order to optimise their attained EEDI value and will have much less scope to reduce engine power whilst maintaining compliance with the *2013 Interim Guidelines for Determining Minimum Propulsion Power to Maintain the Manoeuvrability of Ships in Adverse Conditions* (MEPC.1/Circ.850/Rev.2).

52. Improving the operational efficiency of ships is more appropriate for older tonnage, which could be achieved by strengthening the SEEMP. Proposals to require existing ships built following the introduction of EEDI phase 0 to reduce their attained EEDI values should not be supported.

Require ships to measure speed-fuel curves in a standardized way

53. Document ISWG-GHG 4/2/14 (Belgium et al) proposes requiring that ships measure speed-fuel curves in a standardized way. The co-sponsors support this proposal, however we would offer some observations.

54. Belgium et al suggest that information about the ship's energy efficiency is often only available in a simple form, such as a maximum consumption per day, rather than consumption as a function of speed and loading condition. This may be true in some cases, however many ships already have speed – fuel curves for their ships when at different draughts.

55. Belgium et al also reference the relationship between shipowners and charterers. This is an important relationship since it is the charterer, not the shipowners that takes the key operational decisions which determine ship deployment and efficiency. However,paragraph 14 of ISWG-GHG 4/2/14, "*One of the well-evidenced market failures is the split incentive between the shipowner and the charterer. In several segments of the shipping market, charter rates do not reflect a ship's efficiency, therefore the shipowner has little incentive to invest in the energy efficiency of the ship*" is not supported. A ships fuel consumption is a key metric for securing charters and the charter rate which a ship can command, therefore it is not correct to state that a shipowner has little incentive to invest in the efficiency of a ship.

56. Notwithstanding the value of speed – fuel curves it is important to recognise that the relationship between speed and fuel use varies over time as a result of hull fouling, engine condition, propeller condition, operational parameters such as hull trim and environmental conditions such as current and wind. Therefore, even with a standardised methodology to establish speed – fuel curves a degree of variability will remain.

57. The co-sponsors do, however, support a common methodology for measuring speed-fuel curves for new ships which could then form part of the ships SEEMP.

Proposals

58. The co-sponsors in paragraph 1 supported short term GHG reduction measures which are:

- are effective, and make progress towards delivering the levels of ambition established in the initial strategy;
- promote innovation and adoption of GHG reducing technologies;
- are implementable;
- avoid penalising early movers;
- minimise negative impacts on Member States and global trade; and
- do not divert time and resources from the development of longer term solutions.

59. Short term measures will only be of value if they can be agreed and implemented quickly, provide actual reductions in GHG emissions from international shipping and do not delay development of longer term measures.

60. This document has considered some short term measures which have been proposed:

- Speed Optimization and Speed Reduction
- Operational Efficiency Indicators
- Mandatory technology retrofit
- EEDI for existing ships built before EEDI Phase 0
- Strengthening EEDI requirements for existing ships which already have an attained EEDI value
- Require ships to measure speed-fuel curves in a standardized way.

The co-sponsors support speed optimization and improving the operational efficiency of existing ships. Both of these objectives could be achieved by strengthening the SEEMP. Mandatory speed reduction measures and mandating retro-active design measures and technology fitment would be time consuming to develop, incur a significant administrative burden and cost, distort markets and be of limited value. The co-sponsors have similar concerns regarding the use of of operational efficiency indicators, although it is considered that these, or any suitable KPI, could be a valuable internal tool when demonstrating effectiveness of the SEEMP. Requiring an EEDI for existing ships would not affect operational efficiency since the EEDI is a design measure, and such a measure would be expensive and burdensome to implement and slow to take effect. Given the age profile of the world fleet, especially the larger ships which emit, this cannot be seen as an effective way forward. The co-sponsors can support requiring that new ships measure speed-fuel curves in a standardized way, however it is also considered that this information is already available for most existing ships, albeit not is a standardised form.

61. The co-sponsors consider that the efficiency of the existing fleet should be improved using operational measures, and that the most effective, least burdensome and quickest way to achieve this would be to strengthen the SEEMP. The co-sponsors support strengthening the EEDI for new ships but consider that any attempt to apply EEDI requirements retrospectively (including requiring EEDI reductions for ships which have an attained EEDI value) would be time consuming to agree and implement and that the cost of such a measure would be disproportionate with the expected benefits.

Action requested by the Committee.

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