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Submission by the International Maritime Organization to the thirty-second session of UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA 32)

Agenda item 7(a)
Emissions from fuel used by international aviation and maritime transport

Outcome of the sixtieth session of IMO's Marine Environment Protection Committee Further progress made on technical, operational and market-based measures

SUMMARY

IMO's Marine Environment Protection Committee met for its sixtieth session (MEPC 60) in March 2010 with control of greenhouse gas emissions from ships as the paramount issue on its agenda. More than 800 delegates from 94 Member States, five United Nations bodies, six intergovernmental organizations and 43 non-governmental organizations with consultative status with IMO participated at the session.

The Committee held extensive discussions on making mandatory, the technical and operational measures that were agreed as voluntary at its last session, and established the basic concepts and developed draft regulatory text as possible amendments to MARPOL Annex VI. The Committee concluded that more work was needed, in particular on ship size, target dates and reduction rates in relation to the Energy Efficiency Design Index for new ships, and agreed to establish an intersessional meeting of its Working Group on Energy Efficiency Measures for Ships, which will report back to the Committee's next session (MEPC 61) in September/October 2010.

With regard to market-based mechanisms (MBM) for international maritime transport, the Committee had before it ten different proposals and agreed to establish an Expert Group to undertake a feasibility study and impact assessment of the different proposals in line with the work plan agreed at its last session – the Expert Group will also report to MEPC 61. The scope of the study/assessment is to identify for each proposed MBM, the reduction potential on GHG emissions from international shipping, its impact on world trade and the shipping industry, and the maritime sector in general, giving priority to the maritime sectors in developing countries.

1 IMO's Marine Environment Protection Committee met for its sixtieth session (MEPC 60) in London from 22 to 26 March 2010 where, yet again, control of greenhouse gas (GHG) emissions and improvement in energy efficiency for ships engaged in international trade was the dominant issue on its agenda.

2 In his opening speech the Secretary-General, commenting on the outcome of the United Nations Conference on Climate Change held in Copenhagen, Denmark in December 2009 (COP 15/CMP 5) stated: "like many others, I had viewed it with mixed feelings: with concern that the objective pursued, following the 2007 Bali Conference, of a legally binding instrument, had not been achieved; with measured satisfaction that, through the Accord tabled at the end of the deliberations, a step in the right direction had been taken enabling progress to be made towards a legally binding instrument; and with hope that, following new rounds of consultations to be held post-Copenhagen, the required consensus on action needed to be taken to save planet Earth would be reached at the next COP Conference." He went on to say that, the Organization and the international maritime community stood ready to build on the momentum created in the lead up to and in Copenhagen by contributing further to the attainment of the objectives set through the 2006 IMO GHG Work Plan, namely the putting in place of a comprehensive regulatory regime aimed at limiting or reducing greenhouse gas emissions from international maritime transport.

3 While the outcome of COP 15 had given the Organization more time to make real progress in its work, the Secretary-General reasoned, it had also created an increased obligation on IMO to intensify its efforts not only to do its duty *vis-à-vis* the environment but also to be able to present to COP 16, concrete results as evidence of its determination to play its part in the world efforts to stem climate change and global warming. Such action on the part of the Organization would also demonstrate its capability to satisfactorily address shipping-related environmental issues, as it had successfully done over the years through the diversity of measures it had taken to prevent and control pollution of the seas from oil and other vessel-generated sources and, most recently, decisive actions to prevent air pollution from ships.

2010 – Another crucial year in the GHG debate

4 At the start of its GHG debate, the Committee noted a range of views and contributions on how the outcome of the Copenhagen Conference should be assessed and how it might influence its work. The Committee noted that there seemed to be no disagreement among the world community that IMO is the appropriate international body to develop and enact regulations for international shipping. Although no formal decision from Copenhagen confirmed the role of IMO, the informal consultations at the Conference and most of the comments provided in a number of submissions by Members to the session pointed in the same direction - IMO is the appropriate body and should act on that understanding. The fact that Copenhagen did not deliver the full agreement the world community needs to combat climate change and ocean acidification, made the task of the Committee even more urgent and 2010 provided a good opportunity to further advance the work on a robust, comprehensive and efficient control regime for ship emissions. IMO had to do its part and should continue its work, building on the agreements reached and time lines set both within IMO and the UNFCCC. As it was expressed by one delegate; IMO and the Committee should accelerate the GHG work with caution.

5 The Committee recalled that it had made significant progress at its last session in July 2009 on all three building blocks in the Organization's GHG work; on technical and operational reduction measures, and on possible market-based mechanisms. Following thorough considerations and meticulous work, the Committee had produced a set of robust and efficient measures to improve fuel efficiency in ships and four MEPC Circulars on technical and operational measures were agreed for circulation (for more information see

paragraphs 6 – 9 and annex). Having held an in-depth debate where all aspects were carefully deliberated, a work plan for further consideration of the market-based measures, culminating in 2011, had also been agreed.

Mandatory technical and operational measures

6 MEPC 60 considered a proposal by the Governments of Japan, Norway and the United States to make mandatory the technical and operational measures that were agreed for voluntary use and trial application at its last session. The Committee agreed by majority that the measures should be mandatory and that Annex VI of IMO's MARPOL Convention (International Convention for the Prevention of Pollution from Ships) was the proper legal instrument. By applying the tacit amendment procedure enshrined in the Convention, the measures could come into force and be applied worldwide sixteen months after their adoption, while developing a new freestanding instrument would require an explicit acceptance procedure that could take years before making an impact on the emissions.

7 The most important technical measure is the Energy Efficiency Design Index for new ships (EEDI) that would require a minimum energy efficiency level per capacity mile for different ship segments (type and size), with the level being tightened incrementally every five years in pace with technological development. The EEDI is developed for the larger segments of the world merchant fleet representing about 87% of the emission potential. On the operational side, a mandatory management tool for energy efficient ship operation (SEEMP) has been developed to assist the shipping industry in achieving cost-effective efficiency improvements in their operations. More detailed information on the EEDI and the SEEMP may be found in the annex to this document.

8 The Committee established a working group on energy efficiency measures for ships and instructed it to further develop the regulatory text with the view to finalise it and agree on its circulation at the session. The group held extensive discussions and agreed on the basic concept and a draft regulatory text for mandatory application of the EEDI and the SEEMP was prepared. However, due to time constraints, the group could not completely finalize the draft text as it had still to determine the application threshold (ship size), application dates and reduction rates for the requirement of the "attained EEDI ≤ required EEDI".

9 Taking into account the need for further improvement of the draft legal text for mandatory requirements, and for development of relevant associated documents (e.g. guidelines for verification of the EEDI and development of the ship specific SEEMP), MEPC 60 agreed by majority that further work was needed and should continue expeditiously. Moreover, the Committee agreed by majority to hold an intersessional working group meeting from 28 June to 2 July on further development of the regulatory text for the mandatory energy efficiency measures for ships with a view to their approval as amendments to MARPOL Annex VI at MEPC 61 (September/October 2010) and adoption at MEPC 62 (July 2011).

10 With regard to the issue of whether amendment to MARPOL Annex VI to add provisions on energy efficiency/reduction of GHG emissions would be consistent with legal requirements, IMO's Legal Office provided the opinion that a sound substantial relationship had been established between the proposal and the current Annex VI and that there is no legal barrier to the Parties to the 1997 MARPOL Protocol (Annex VI) agreeing to expand the scope of the Annex as proposed. The Legal Office had also examined the 1969 Vienna Convention on the Law of Treaties for provisions that might be helpful in determining the issue. That Convention does not have any provision which prevents Parties from amending a treaty to expand its scope in a way that is acceptable to the Parties concerned. Such questions were therefore left for the Parties themselves to determine.

11 Seven delegations could not agree to make the technical and operational measures mandatory under MARPOL Annex VI and argued that such measures should be voluntary for ships flying the flag of developing countries in line with the principle of common but differentiated responsibility and respective capability (CBDR) under the UNFCCC, and reserved their positions.

Need for capacity building

12 In relation to making the technical and operational measures mandatory, the Committee agreed that the possible need for capacity building for developing countries should be assessed. Its Vice-Chairman was requested, in consultation with the Chairman and assisted by the Secretariat, to undertake a preliminary assessment of capacity-building implications, and report the outcome to MEPC 61 including the possible need for additional action. The Committee further agreed that the assessment should happen in parallel with the continued development of the regulatory text and further development of the measures not to restrict progress.

Market-based mechanisms

13 Recognizing that technical and operational measures alone would not be sufficient to satisfactorily reduce the amount of GHG emissions from international shipping needed to meet the overall objectives indicated by science (IPCC FAR), and in view of projections that world trade would continue growing; market-based mechanisms (MBM) have been considered by the Committee in line with the work plan agreed at MEPC 55 (October 2006).

14 The Committee recalled that, in addition to identifying a considerable reduction potential, the Second IMO GHG Study 2009 concluded that MBMs were cost-effective policy instruments with a high environmental effectiveness. The Committee, at its last session, having considered a large number of views and contributions on the subject; agreed by overwhelming majority that a MBM was needed as part of a comprehensive package of measures for regulation of GHG emissions from international shipping. MEPC 59 conducted an in-depth discussion on MBMs and in its willingness to further consider this complex issue and fulfil the requests of the IMO Assembly in resolution A.963(23), agreed on a work plan for further consideration of such measures culminating in 2011, also building on discussions and submissions from earlier sessions.

15 Members at the last session were encouraged to submit further detailed outlines of possible MBMs for international shipping to this session. MEPC 60 noted that it had received a large number of documents from which ten distinguishable MBM proposals, or variants of some of the proposals, could be identified. The Committee also noted that the work plan assumed that the outcomes of feasibility studies and impact assessments of the MBM proposals under review would be available to MEPC 61 in the autumn of 2010, thus enabling it to make further progress.

16 In accordance with the work plan for further consideration of market-based measures, the Committee agreed that, it should focus on developing the methodology and criteria for feasibility studies and impact assessments of the proposed mechanisms, giving priority to the overall impact on the maritime sectors of developing countries, while avoiding a debate on the different proposals individually in any detail – a task that was earmarked for the next session − MEPC 61.

Feasibility study and impact assessment of proposed market-based mechanisms

17 Based on a proposal by its Chairman, the Committee agreed that an expert group should be established to undertake the feasibility study and impact assessment of the proposed mechanisms. The Committee agreed on Terms of Reference for the group including the methodology and criteria to be applied and the Secretary-General was requested to establish the group in close consultation with the Chairman. The Committee also agreed that it was imperative to adhere to the work plan and noted that it stated that, "taking into account the outcome of the feasibility studies and impact assessments, the Committee, preferably at MEPC 61 would be in a position to clearly indicate which market-based instrument it should evaluate further", and agreed to take the necessary steps to comply with that requirement.

18 The MBM proposals under review range from proposals for contribution schemes for all CO_2 emissions from international shipping (to be collected by fuel oil suppliers and transferred to a global fund), or only emissions from ships not meeting the EEDI requirement, via emission trading systems, to schemes based on the actual ship's efficiency both by design and operation. Among the measures are also proposals for rebate mechanisms and other ways to accommodate the difference in the socioeconomic capability between developing and developed states, as well as other suggestions on how the special needs and circumstances of developing countries can be accommodated. Some of the proposed schemes would reward efficient ships and ship operators by recycling parts of the financial contribution to the most efficient ones based on benchmarking. Other schemes would drive investments in more energy efficient technologies and improvements in operations by setting compulsory efficiency standards for all vessels (new and existing) and the trading of efficiency credits. Several of the proposed mechanisms, the contributions schemes (levy) inherently and the trading schemes through auctioning, would generate funds the greater part of which would be used for climate change purposes in developing countries.

19 The scope of the feasibility study and the impact assessment is to identify for each proposed MBM the reduction potential on GHG emissions from international shipping, as well as its impact on world trade, on the shipping industry and on the maritime sector in general, giving priority to the maritime sectors in developing countries, recognizing the maritime sector's global efforts to reduce GHG emissions. The study/assessment will also review the practicability of implementing the various options and provide information on how the difference in capability in developing and developed states, as well as the special needs and circumstances of developing countries, can be addressed by the different proposals.

20 The Expert Group will for each of the MBM proposals under review assess the environmental effectiveness, the cost-effectiveness and their potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies. The need for technology transfer to, and capacity building within, developing countries in relation to implementation and enforcement of the MBMs, including the potential to mobilize climate change finance for mitigation and adaptation actions, are also included in the terms of reference for the Expert Group.

21 Moreover, the MBM proposal's relation with other relevant conventions and international negotiations processes such as the UNFCCC, its Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS, will also be analysed by the experts. Possible additional administrative and legal burdens for National Administrations as a consequence of implementing and enforcing the proposed MBM's, and their compatibility with the existing enforcement and control provisions under IMO's legal framework, are further aspects the experts are requested to investigate. Other matters the group will look into are the potential additional workload, economic burden and operational

impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing each of the proposed MBMs.

22 The Expert Group will submit its report to MEPC 61, which will be held in London in September/October 2010, and the Committee considered it imperative that the final report should contain clear, precise and robust conclusions and factual information. The report should be transparent and objective, and aim at assisting the MEPC to make well-informed decisions but should not make specific recommendations on policy issues, leaving them to the Committee when weighing up the outcome of the study/assessment.

23 Five delegations asserted that, in the absence of a clear outcome of the Copenhagen Conference, further work on market-based mechanisms under IMO should be postponed until after COP 16/CMP 6, to be held in Mexico towards the end of the year, and reserved their positions on the establishment of the Expert Group.

IMO's decision-making process

24 A number of delegations expressed concerns that many of the conclusions reached by the Committee were made by majority and not by consensus, in particular on mandatory energy efficiency measures and their possible inclusion in MARPOL Annex VI. Other delegations observed that the Committee should continue, as it always had, to make every effort to reach consensus whenever possible. However, when it was not possible and the matter was of utmost urgency, as in the world community's concerted effort to stem climate change, the Rules of Procedure should be respected not to restrict progress. The Committee recalled Rule 35 of its Rules of Procedures on the functions of its Chairman, whereby he shall direct the discussion and ensure observance of the Rules of Procedure, accord the right to speak, put questions to vote and announce decisions resulting from voting.

25 The Committee noted with interest an intervention by the Secretary-General where he addressed the issue of the basis on which decisions were made in the Organization as he considered it a very important matter. He reasoned that those who had been associated with the Organization for a long time would be fully familiar with the efforts it always had made to strive to achieve consensus. He went on to say:

> "Decisions made by consensus in this Organization stand good chances to be widely and effectively implemented. For the need and for the sake of succeeding in making decisions by consensus, sometimes it takes considerable time, and this has from time to time given rise to people to criticise this Organization for being slow and by implication, inefficient.
>
> In IMO, we dislike taking vote. Vote is divisive and one would ask what chances of implementation have the technical standard adopted if the decision to introduce that standard has been made on a 51 to 49 % basis. Sometimes, if consensus cannot be achieved, the decision will have to be made in accordance with the Organization's well established and well functioning Rules of Procedure, meaning that decisions are made on a majority basis, which leads to the conclusion that whatever people may think, this is a democratically-based Organization."

Reduction targets for international shipping

26 The Committee considered whether the international shipping sector should be subject to an explicit emission ceiling (cap) or a reduction target comprising the entire world fleet of merchant vessels. The paramount questions were by which international organization such a cap or reduction target should be established and how it should relate to global targets and the two degrees Celsius target in the Copenhagen Accord. Other questions related to a cap or a target line would include the methodology by which the cap/target is set and maintained as well as the possible connection with other transport modes and how they are regulated internationally.

27 Following an exchange of views, the Committee agreed that the debate on the reduction targets was a vital part of the Organization's GHG work and would need further progress at the next session so it may be closer to a conclusion with the aim to conclude on the matter simultaneously with the culmination of the work plan for further consideration of market-based measures at MEPC 62 in July 2011. Interested delegations were invited to submit further input to the next session to assist the Committee in its work on this issue.

Black carbon emissions from ships and the Arctic

28 The Committee had a brief exchange of views on whether separate actions were needed to reduce shipping impacts in the Arctic region and how this should relate to the general work on prevention of air pollution from ships under MARPOL Annex VI and the Organization's work on control of ships' GHG emissions. The Committee agreed that ship's emissions of black carbon and other particulate matter affecting the Arctic region, needed to be addressed specifically as an integral part of the Organization's work on prevention of air pollution from ships and its contribution to combat climate change and global warming. It agreed also that the matter should be revisited at the next session and invited interested delegations to submit proposals for specific pollution control measures to facilitate progress.

Closing remarks by the Secretary-General

29 In his closing remarks the Secretary-General emphasized that in his intervention on whether MARPOL Annex VI would provide the right legal vehicle for the introduction into IMO's mandatory regulatory regime, of the technical and operational measures the Committee had been elaborating on for some considerable time, he had mentioned that the political aspect of the matter should, along with the technical considerations, be taken into account in the Committee's decision-making process. He added that the Committee should, in the decision-making process, not lose sight of the wider picture, which, under the circumstances, would favour action that was more expeditious than opting for a stand-alone instrument requiring an explicit acceptance procedure.

30 Having received convincing legal advice that it would not be contrary to the legislation governing the issue to go the MARPOL Annex VI route, he appealed to those who, on legal grounds, did not feel comfortable with the proposed solution, to take back home the advice provided by the Legal Office and, in light of its clarity, to reconsider their position – and to reconsider it also, in the light of the political consideration of the matter, the need to avoid unilateral or regional measures; and above all, - "the imperative of not delaying action on which our planet cannot wait for any longer" – no matter how insignificant the contribution and responsibility of shipping in the climate change situation may be, and the impact of any remedial action it may wish to take will be.

31 On the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures, the Secretary-General stated:

> "On the matter of the Group of Experts, which your Chairman proposed should conduct a feasibility study and an impact assessment to advise the Committee on which of the various proposed MBMs to choose, you will recall that, in my opening speech, I suggested that the Group should be small in size in order to enhance its effectiveness and should comprise the right persons. Such persons, acting in their personal capacity, will be expected to rise above partisan interests. By putting those of the globe above national and other interests they may otherwise be associated with, they will be acting in the best interests the Committee aims to serve through its position that MBMs are needed to complement the technical and operational measures contemplated to provide IMO's and the industry's response to the reduction or limitation of greenhouse gas emissions from international shipping. In this respect, I appreciate your trust in me to proceed with the composition of the Experts' Group – a matter that I will pursue in consultation with your Chairman and delegates representing the full spectrum of views expressed."

32 The Committee welcomed unanimously the proposal that the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures would be chaired by its Chairman, Mr. Andreas Chrysostomou of Cyprus.

Conclusions

33 Although international maritime transport is the most energy efficient mode of mass transport and only a modest contributor to worldwide CO_2 emissions (2,7% in 2007), a global approach for further improvements in energy efficiency and emission reduction is needed as sea transport is predicted to continue growing significantly in pace with world trade.

34 IMO has developed a set of robust and efficient technical and operational measures that will serve as performance standards for increased energy efficiency in international shipping and a comprehensive regulatory framework based on the Organization's extensive experience and well established policies and practices is nearing completion. The framework builds on IMO's reputable and well tested enforcement and control provisions (Flag and Port State Controls) and includes also aspects such as monitoring, verification and reporting as well as modalities for effective implementation. The Organization's work on these matters represent a practical approach that may very well serve as an example of how to establish global performance standards on energy efficiency taking into account the current negotiations on issues such as establishment of baselines and the need to make the emission limits tighter over time.

35 With regard to the market-based measures, where IMO is currently working in accordance with a work plan culminating in 2011, IMO and its Member Governments, recognising that the technical and operational measures alone would not be sufficient to satisfactorily reduce the amount of GHG emissions from international shipping in view of projections for world trade and the overall reductions needed to meet the two degrees target, are determined to develop a mechanism that will enable the shipping industry to achieve the eventually agreed reduction target.

36 IMO will continue its endeavours to reduce any environmental impacts from international shipping, a transport industry that is vital to world trade and sustainable development, and keep relevant bodies of the UNFCCC informed of its achievements.

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ANNEX

DESCRIPTION OF THE PACKAGE OF TECHNICAL AND OPERATIONAL REDUCTION MEASURES FOR SHIPS AGREED BY MEPC 59

1 The following circulars were issued (17 August 2009) following MEPC 59 and may be found on the IMO website: www.imo.org:

.1 the EEDI formula was circulated as MEPC.1/Circ.681, Interim Guidelines on the method of calculation of the Energy Efficiency Design Index for new ships (annex 17 to MEPC 59/24);

.2 the EEDI verification procedure was circulated as MEPC.1/Circ.682, Interim guidelines for voluntary verification of the EEDI (annex 18 to MEPC 59/24);

.3 the SEEMP was circulated as MEPC.1/Circ.683, Guidance for the development of a SEEMP (annex 19 to MEPC 59/24); and

.4 the EEOI was circulated as MEPC.1/Circ.684, Guidelines for voluntary use of the ship EEOI (annex 20 to MEPC 59/24).

IMO's Energy Efficiency Design Index (EEDI)

2 MEPC.1/Circ.681, Interim Guidelines on the method of calculation of the EEDI for new ships was circulated on 17 August 2009.

Background

2.1 The maritime industries have continuously endeavoured to optimize ships' fuel consumption, e.g., through the development of more efficient engines and propulsion systems, optimized hull designs and larger ships, and thereby achieved a noteworthy reduction in fuel consumption and resulting CO_2 emissions on a capacity basis (tonne-mile). Although ships are the most fuel efficient mode of mass transport, the Second IMO GHG Study 2009 identified a significant potential for further improvements in energy efficiency mainly by the use of already existing technologies. Additional improvements in hull, engine and propeller designs, together with reduction in operational speed, may lead to considerable reductions as illustrated in the figure below.

Potential reductions of CO_2 emissions by using existing technology and practices

DESIGN (New ships)	Saving of CO_2/tonne-mile	Combined	Combined
Concept, speed and capability	2% to 50%[+]	10% to 50%[+]	25% to 75%[+]
Hull and superstructure	2% to 20%		
Power and propulsion systems	5% to 15%		
Low-carbon fuels	5% to 15%[*]		
Renewable energy	1% to 10%		
Exhaust gas CO_2 reduction	0%		
OPERATION (All ships)			
Fleet management, logistics and incentives	5% to 50%[+]	10% to 50%[+]	
Voyage optimization	1% to 10%		
Energy management	1% to 10%		

[+] Reductions at this level would require reductions of operational speed.
[*] CO_2 equivalent, based on the use of LNG.

Source: Second IMO GHG Study 2009

Purpose of the EEDI

2.2 IMO's Marine Environment Protection Committee (MEPC) has developed the Energy Efficiency Design Index for new ships (MEPC.1/Circ.681) to create stronger incentives for further improvements in ships' fuel consumption. The purposes of IMO's EEDI are:

- to require a minimum energy efficiency level for new ships;
- to stimulate continued technical development of all the components influencing the fuel efficiency of a ship;
- to separate the technical and design based measures from the operational and commercial measures (they will/may be addressed in other instruments); and
- to enable a comparison of the energy efficiency of individual ships to similar ships of the same size which could have undertaken the same transport work (moved the same cargo).

2.3 The EEDI provides a transparent basis for comparison of the energy efficiency for individual ships and, when made mandatory, will require ship designers and builders to produce intrinsically energy-efficient ships. The reduction levels were considered in detail by MEPC 60 in March 2010 and will be concluded in September/October. Aan initial reduction of 10 to 30% is possible depending on ship type and size. Once the baseline is set the EEDI value will be tightened incrementally every five years, to keep pace with the technological developments. The EEDI will facilitate shipowners to purchase the most fuel efficient ships for their fleets and charterers and cargo owners in choosing the most energy-efficient ships for their operations.

EEDI coverage

2.4 The EEDI is developed for the larger segments of the world merchant fleet and would cover 87% of emissions from new ships covering the following ship types: oil and gas tankers, bulk carriers, general cargo and container ships, ro-ro carriers (roll-on-roll-off) and passenger ships. However, due to the long economic life of merchant ships, it would take about 20 years to reach this coverage without additional incentives. For ship types not covered by the current formula, suitable formulas will be developed in the near future addressing the largest emitters first.

The EEDI formula

2.5 The EEDI provides a specific figure for an individual ship design, expressed in grams of CO_2 per ship's capacity-mile (a smaller EEDI value means a more energy-efficient ship design) and calculated by the following formula based on the technical design parameters for a given ship:

$$\frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{nME} P_{ME(i)} C_{FME(i)} \cdot SFC_{ME(i)}\right) + \left(P_{AE} \cdot C_{FAE} \cdot SFC_{AE}*\right) + \left(\left(\prod_{j=1}^{M} f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEeff(i)}\right) C_{FAE} \cdot SFC_{AE}\right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}\right)}{f_i \cdot Capacity \cdot V_{ref} \cdot f_w}$$

That can be illustrated by the following simplified formula:

$$EEDI = \frac{CO_2\ emission}{transport\ work}$$

2.6 The CO_2 emission represents total CO_2 emission from combustion of fuel at design stage, including propulsion and auxiliary engines, taking into account the carbon content of the fuels in question. If shaft generators or innovative mechanical or electrical energy efficient technologies are incorporated on board a ship, these effects are deducted from the total CO_2 emission. If wind or solar energy is used on board a ship, the energy saved by such measures will also be deducted from the total CO_2 emissions, based on actual efficiency of the systems.

2.7 The transport work is calculated by multiplying the ship's capacity as designed (deadweight for cargo ships and gross tonnage for passenger ships) with the ship's design speed measured at the maximum design load condition and at 75% of the rated installed shaft power. Speed is the most essential factor in the formula and may be reduced to achieve the required index.

Status of the EEDI

2.8 The EEDI is circulated for trial purposes to ensure its feasibility and for further improvement of the calculation method, as necessary. The EEDI is expected to be made mandatory for new ships on completion of this improvement work, most probably by 2010.

Future developments

2.9 The current EEDI formula is not suitable for all ship types or all types of propulsion systems, e.g., ships with diesel-electric, turbine or hybrid propulsion systems will need additional correction factors and MEPC will consider the matter in detail at future sessions. For ship types not covered by the current formula, suitable formulas will be developed in the future addressing the largest emitters first.

Conclusions EEDI

2.10 The EEDI will establish a minimum energy efficiency requirement for new ships depending on ship type and size and is a robust mechanism that may be used to increase the energy efficiency of ships stepwise to keep pace with technical developments for many decades to come. The EEDI is a non-prescriptive mechanism that leaves the choice of what technologies to use in a ship design to the stakeholders as long as the required energy-efficiency level is attained enabling the ship designers and builders to use the most cost-efficient solutions.

Voluntary verification of the EEDI

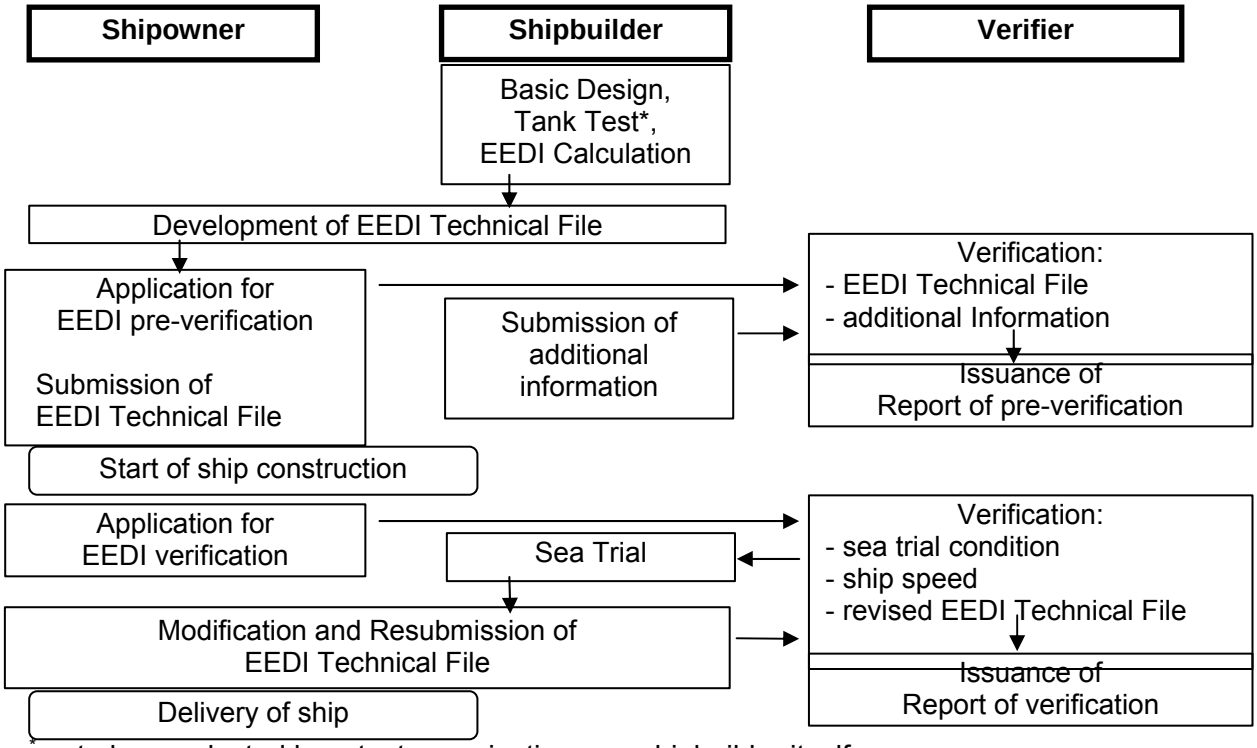
3 MEPC.1/Circ.682, Interim guidelines for voluntary verification of the EEDI was circulated on 17 August 2009.

Background

3.1 The purpose of the interim guidelines on voluntary verification of the EEDI, which was agreed by MEPC 59 as part of the package of technical and operational measures, is to assist verifiers of the EEDI in conducting the verification in a uniform manner. Uniform application of voluntary verification will capitalize on the experience from trials and will assist MEPC in its further consideration of possible mandatory application of the EEDI to new ships. The guidelines will also assist shipowners, shipbuilders as well as engine and equipment manufacturers, and other interested parties, in understanding the procedures of the voluntary EEDI verification.

Verification in two stages

3.2 The attained EEDI should be calculated in accordance with the EEDI Guidelines (MEPC.1/Circ.681). Voluntary EEDI verification should be conducted on two stages: preliminary verification at the design stage, and final verification at the sea trial, before issuance of the final report on the verification of the attained EEDI. The basic flow of the verification process is presented in figure 1.



* to be conducted by a test organization or a shipbuilder itself.

Figure 1 – Basic Flow of Verification Process

Preliminary verification at the design stage

3.3 For the preliminary verification at the design stage, a shipowner should submit to a verifier (e.g., a Maritime Administration or a Classification Society) an application for the verification and an EEDI Technical File containing the necessary information for the verification and other relevant background documents as required by the guidelines.

Final verification of the Attained EEDI at sea trial

3.4 Prior to the sea trial, a shipowner should submit the application for the verification of the EEDI together with the final displacement table and the measured lightweight, as well as other technical information as necessary. The verifier should attend the sea trial and confirm compliance in accordance with the guidelines and the EEDI guidelines.

Issuance of the EEDI verification report

3.5 The verifier should issue the Report on the Preliminary Verification of EEDI after it verified the Attained EEDI at design stage in accordance with the guidelines. Following the sea trial, the verifier should issue the final report on the verification of the attained EEDI after it verified the Attained EEDI at the sea trial in accordance with the guidelines.

Status of the verification guidelines

3.6 The guidelines should be applied on a voluntary basis to new ships for which an application for EEDI verification has been submitted to a verifier. If the EEDI is made mandatory in the future, the guidelines will form part of the regulatory framework governing the scheme.

Guidance for the development of a SEEMP

4 MEPC.1/Circ.683, Guidance for the development of a SEEMP was circulated on 17 August 2009.

Introduction

4.1 The purpose of the Ship Energy Efficiency Management Plan (SEEMP) is to establish a mechanism for a company and/or a ship to improve the energy efficiency of ship operations. Preferably, the ship-specific SEEMP is linked to a broader corporate energy management policy for the company that owns, operates or controls the ship, recognizing that no two shipping companies or shipowners are the same. It should also be recognized that the international fleet of merchant vessels comprises a wide range of ship types and sizes that differ significantly in their design and purpose, and that ships operate under a broad variety of different conditions.

4.2 Sea transport has a justifiable image of conducting its operations in an energy-efficient way, and in a manner that creates little impact on the global environment. It is nevertheless the case that enhancement in efficiencies can reduce fuel consumption, save money, and decrease the environmental impacts from ships. While the yield of individual measures may be small, the collective effect across the entire fleet will be significant. In global terms it should be recognized that operational efficiencies delivered by a large number of ships will make a valuable contribution to reducing global carbon emissions.

Practical approach

4.3 Mandatory management plans are used to regulate a range of ship operations where traditional command and control regulations would not work, and is also the chosen option for reduction of GHG emissions from operation of ships engaged in international trade. To regulate ship operations by traditional prescriptive regulations (as is the customary practice for technical regulations) is not feasible, e.g., to determine the most energy-efficient speed, optimum ship handling practices or the preferred ballast conditions for all ships in a set of regulations could hardly be done and keeping it updated would not be possible. A management plan is a familiar tool for the shipping industry and provides a flexible

mechanism where shipowners and operations can choose the most cost-effective solutions for their ships and their operations.

4.4 The SEEMP provides an approach for monitoring ship and fleet efficiency performance over time and forces the responsible persons and entities at each stage of the plan to consider new technologies and practices when seeking to optimize the performance of the ship. The Second IMO GHG Study 2009 indicates that a 20% reduction on a tonne-mile basis by mainly operational measures is possible and would be cost-effective even with the current fuel prices, and the SEEMP will assist the shipping industry in achieving this potential.

4.5 The circular provides guidance for the development of a SEEMP that should be adjusted to the characteristics and needs of individual companies and ships. The SEEMP is intended to be a management tool to assist a company in managing the ongoing environmental performance of its vessels and, as such, it is recommended that the plan be implemented in a manner which limits any onboard administrative burden to the minimum necessary.

Ship-specific plan

4.6 The SEEMP should be developed as a ship-specific plan by the shipowner, operator or any other party concerned, e.g., the charterer. The SEEMP seeks to improve a ship's energy efficiency through four steps: *planning*, *implementation*, *monitoring*, and *self-evaluation and improvement*. These components play a critical role in the continuous cycle to improve ship energy management. With each iteration of the cycle, some elements of the SEEMP will necessarily change while others may remain as before.

Guidance on best practices for fuel-efficient operation of ships

4.7 The circular contains guidance on best practices related to voyage performance, optimized ship handling, hull and propulsion system maintenance, the use of waste heat recovery systems, improved fleet management, improved cargo handling and energy management. It also covers areas such as fuel types, compatibility of measures, age and operational service life of a ship as well as trade and sailing area.

A sample form of a SEEMP is presented below for illustrative purposes

Name of Vessel:		GT:	
Vessel Type:		Capacity:	
Date of Development:		Developed by:	
Implementation Period:	From: Until:	Implemented by:	
Planned Date of Next Evaluation:			

1 MEASURES

Energy Efficiency Measures	**Implementation** (including the starting date)	**Responsible Personnel**
Weather Routeing	<Example> Contracted with [Service providers] to use their weather routeing system and start using on trial basis as of 1 July 2012.	<Example> The master is responsible for selecting the optimum route based on the information provided by [Service providers].
Speed Optimization	While the design speed (85% MCR) is 19.0 kt, the maximum speed is set at 17.0 kt as of 1 July 2012.	The master is responsible for keeping the ship speed. The log-book entry should be checked every day.

2 MONITORING

- Description of monitoring tools (e.g. the EEOI, or another suitable indicator/tool)

3 GOAL

- Measurable goals

4 EVALUATION

- Procedures of evaluation

The Energy Efficiency Operational Indicator (EEOI)

5 MEPC.1/Circ.684, Guidelines for voluntary use of the ship EEOI was circulated on 17 August 2009.

Introduction

5.1 Although ships are the most fuel efficient mode of mass transport, the Second IMO GHG Study 2009 identified a significant potential for further improvements in energy efficiency by operational measures, such as fleet management, voyage optimization and energy management. The Study estimated that 10 to 50% reductions of CO_2 emissions (on a capacity·mile basis) are possible through the combined use of these measures. Saving energy at the operational stage is presently addressed by the SEEMP where the Energy Efficiency Operational Indicator (EEOI) will be used as the monitoring tool and to establish benchmarks for different ship segments of the world fleet categorized by ship type and size.

Purpose of the EEOI

5.2 MEPC has developed Guidelines for voluntary use of the ship Energy Efficiency Operational Indicator to establish a consistent approach for measuring ships energy-efficiency at each voyage or over a certain period of time, which will assist shipowners and ship operators in the evaluation of the operational performance of their fleet. As the amount of CO_2 emitted from ships is directly related to the consumption of bunker fuel oil, the EEOI can also provide useful information on a ship's performance with regard to fuel efficiency.

5.3 The EEOI enables continued monitoring of individual ships in operation and thereby the results of any changes made to the ship or its operation. The effect of retrofitting a new and more efficient propeller would be reflected in the EEOI value and the emissions reduction could be quantified. The effect on emissions by changes in operations, such as

introduction of just in time planning or a sophisticated weather routing system, will also be shown in the EEOI value.

EEOI coverage

5.4 The EEOI can be applied to almost all ships (new and existing) including passenger ships, however it cannot be applied to ships that are not engaged in transport work, such as service and research vessels, tug boats or FPSOs, as it is the transport work that is the input value together with emissions (fuel consumed x CO_2 factors for different fuel types).

The EEOI formula

5.5 The EEOI provides a specific figure for each voyage. The unit of EEOI depends on the measurement of cargo carried or the transport work done, e.g., tonnes CO_2/(tonnes·nautical miles), tonnes CO_2/(TEU·nautical miles) or tonnes CO_2/(person·nautical miles), etc. The EEOI is calculated by the following formula, in which a smaller EEOI value means a more energy efficient ship:

$$EEOI = \frac{actual\ CO_2\ emission}{peformed\ transport\ work}$$

5.6 The actual CO_2 emission represents total CO_2 emission from combustion of fuel on board a ship during each voyage, which is calculated by multiplying total fuel consumption for each type of fuel (distillate fuel, refined fuel or LNG, etc.) with the carbon to CO_2 conversion factor for the fuel(s) in question (fixed value for each type of fuel).

5.7 The performed transport work is calculated by multiplying mass of cargo (tonnes, number of TEU/cars, or number of passengers) with the distance in nautical mile corresponding to the transport work done.

Status of the EEOI

5.8 The EEOI is circulated to encourage shipowners and ship operators to use it on a voluntary basis and to collect information on the outcome and experiences in applying it. The EEOI will be used as a monitoring tool in the SEEMP and to establish benchmarks.

GHG module in GISIS

5.9 To collect EEOI data and make them accessible to Member States and the shipping industry, a GHG module was established in GISIS (IMO's central database) to enable further research work and the establishment of benchmarks for different ship segments (type and size). A sample data in the GHG module is presented below. When fuel consumption data, cargo quantity and voyage distance are completed, the CO_2 emission and the voyage index will be calculated automatically:

HFO tonnes	LNG (tonnes)	MDO (tonnes)	Cargo unit	Distance (n.miles)	CO_2 emission	Voyage index
44.46	---	2	475.2	967	145	315
108.78	---	0.8	1051.2	1861	341	174

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