INTERNATIONAL MARITIME ORGANIZATION

E

INTERSESSIONAL MEETING OF THE
WORKING GROUP ON REDUCTION OF
GHG EMISSIONS FROM SHIPS
5th session
Agenda item 4

ISWG-GHG 5/4/1
18 March 2019
ENGLISH ONLY

CONSIDERATION OF CONCRETE PROPOSALS ON CANDIDATE SHORT-TERM MEASURES

Energy efficiency improvement measure for existing ships

Submitted by Japan

SUMMARY

Executive summary:	This document identifies a possible approach for the reduction of GHG emissions from international shipping in the short-term and proposes a regulatory measure on energy efficiency of existing ships based on existing IMO instruments, which will contribute to the achievement of the 40% carbon intensity reduction target by 2030. This document also proposes the establishment of a correspondence group to further consider technical issues with technical expertise in order to develop the proposed measure by 2023.
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 46
Related documents:	Resolution MEPC.304(72), MEPC 72/17, MEPC 72/17/Add.1; MEPC 73/19, MEPC 73/19/Add.1, MEPC 73/5/1; MEPC 74/7/2 and MEPC 74/INF.23

Introduction

1 The Marine Environment Protection Committee, at its seventy-second session, adopted the *Initial IMO Strategy on reduction of GHG emissions from ships* (resolution MEPC.304(72)), setting out a vision to reduce GHG emissions from international shipping and phase them out as soon as possible in this century. Furthermore, the Strategy identifies levels of ambitions for the international shipping sector as follows: at least 40% carbon intensity reduction by 2030 compared to 2008 and at least 50% total annual GHG emissions reduction by 2050 compared to 2008.

2 As a planning tool of the IMO work to implement the Strategy, MEPC 73 approved a *Programme of follow-up actions of the Initial IMO Strategy on reduction of GHG emissions from ships up to 2023*, identifying timelines towards decisions on short-term measures by 2023. The programme of follow-up actions calls for submission of concrete proposals on short-term measures to MEPC 74.

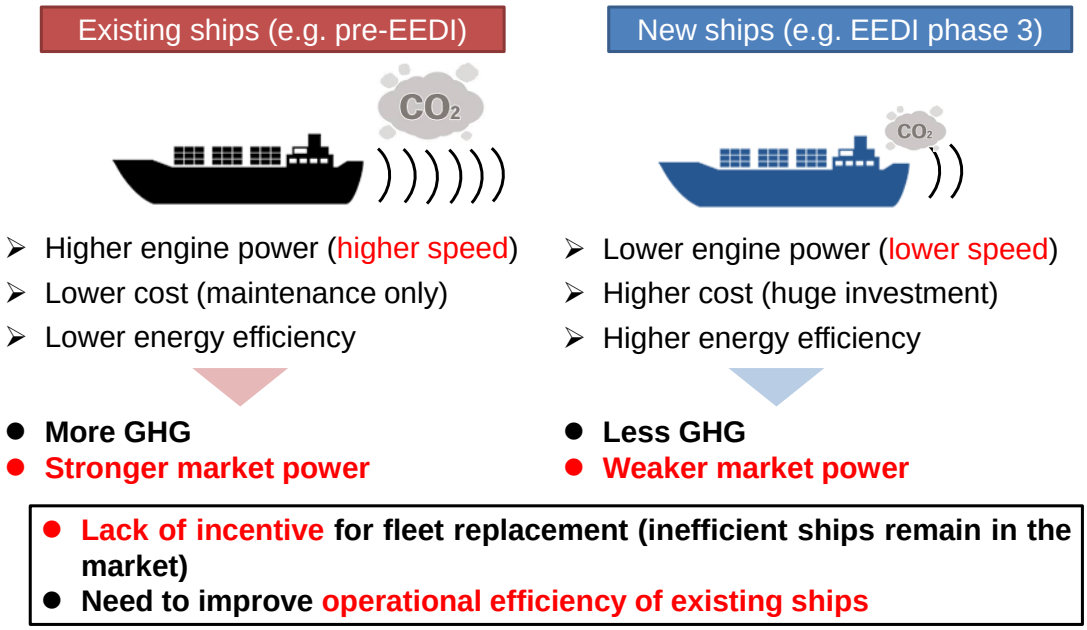
3 This document identifies a possible approach for the reduction of GHG emissions from international shipping in the short-term and proposes a regulatory measure on energy efficiency for existing ships based on existing IMO instruments, which will contribute to the achievement of the 40% carbon intensity reduction target by 2030. This document also proposes the establishment of a correspondence group to further consider technical issues with technical expertise in order to develop the proposed measure by 2023, in accordance with the programme of follow-up actions.

Existing ships and new ships

4 New ships for which the building contract is placed on or after 1 January 2013 are subject to mandatory design efficiency requirement through the Energy Efficiency Design Index (EEDI) requirement. As the EEDI requirement has gradually been strengthened, fleet replacement with new ships will result in the gradual reduction of carbon intensity of the entire fleet.

5 However, ships are used for several decades, and thus ships existing today are likely to remain in the market in 2030. Therefore, up to 2030, the effect of fleet replacement with new ships on the entire fleet is quite limited. Furthermore, since the majority of existing ships today are not covered by the EEDI requirement (pre-EEDI ships), there will be a large number of ships to which no mandatory energy efficiency requirement is applied by 2030.

6 Under current market structure, there is limited incentive to replace existing ships with new ships. Existing ships were relatively free to install engines with superfluous power, depending on the market demands. On the other hand, new ships tend to install engines with optimized small power in order to meet the stringent EEDI requirement. Therefore, in the current shipping market, existing ships have stronger market competitiveness than new ships, while emitting more GHG than new ships. Such a situation discourages shipowners to invest in new ships.

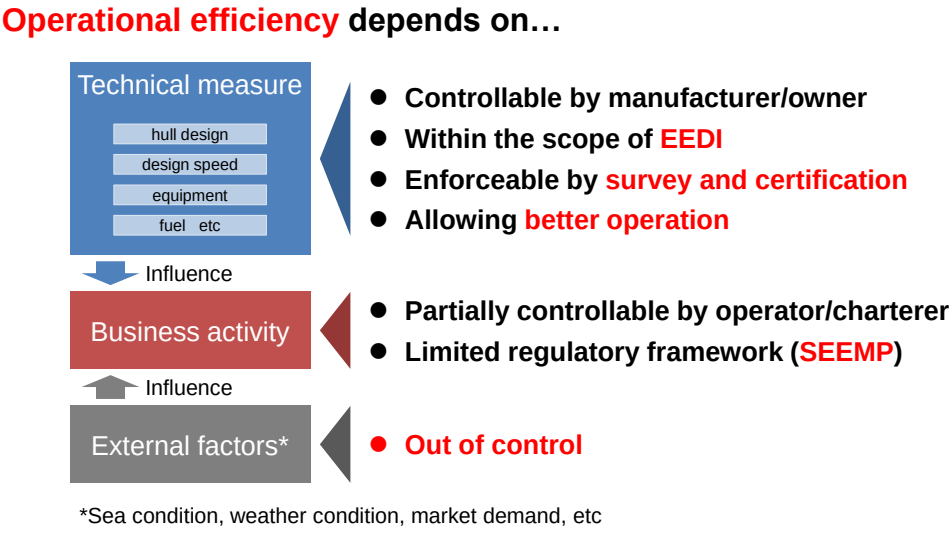


7 Therefore, in order to achieve the 2030 target, short-term measures should focus on improving energy efficiency of existing ships which are currently not sufficiently energy-efficient.

Addressing controllable and enforceable factor

8 In establishing a regulatory framework to improve energy efficiency of ships, the factors influencing operational energy efficiency should be firstly identified. Operational energy efficiency of a ship depends on various factors which could be categorized into three parts: i) technical factors, ii) business-related factors and iii) external factors.

9 Technical factors include hull design, design speed, equipment and fuel oil, which are the primary factors influencing the ship's efficiency. Business activity, such as schedule and route of operation, is another major factor influencing the ship's efficiency. However, the ship's efficiency also depends on external factors, such as sea condition, weather condition and market condition, which cannot be controlled by the ship. Even if identical ships are operated with the same route, schedule and cargo (the same technical condition and business activity), their operational efficiency will be different because of these external factors.



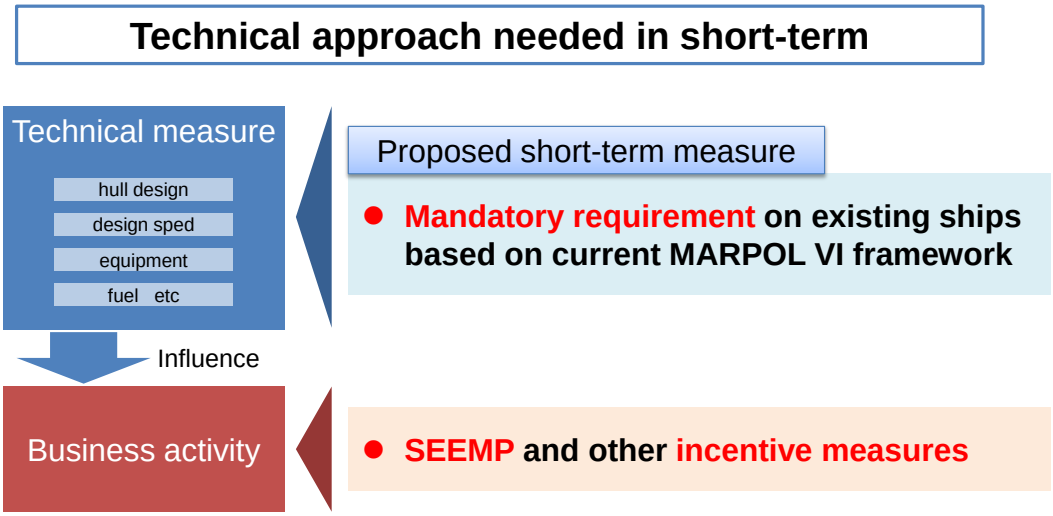
10 Among such factors influencing the ship's operational efficiency, the measure should address controllable and enforceable factors. Otherwise, ships might be unreasonably penalized due to uncontrollable factors. Furthermore, unless the measure is enforceable, robust compliance will not be secured and thus a level-playing field of international shipping market will be seriously distorted.

11 Technical measures are controllable and enforceable. Shipbuilders, manufacturers and shipowners can decide technical specification of ships, and there already exist a number of robust regulatory frameworks focusing on technical specification of ships under IMO's legal framework, such as MARPOL and SOLAS. In particular, technical specifications related to ships' energy efficiency, such as specific fuel consumption, design speed and fuel carbon intensity, are already incorporated in MARPOL Annex VI as the EEDI formula.

12 On the other hand, it is difficult to prescriptively regulate business activities. If the business activity is regulated in a prescriptive way, such as mandatory operational speed limit, the industry will face difficulties in accommodating to various shipping demands. Furthermore, it is legally and technically quite difficult to continuously monitor and regulate the business activity of a ship. Therefore, some flexibility is essential in any measures on business activities.

In this context, utilization of SEEMP or other incentive measures could be a more practical way to address business activities.

13 Therefore, Japan proposes that measures focusing on technical approach, based on current MARPOL framework, should be developed and adopted in the short-term by 2023.



Goal-based approach allowing multiple options

14 There is no "one-size-fits-all" measure for energy efficiency improvement in the shipping and shipbuilding sectors. Energy efficiency of existing ships can be improved through multiple ways, depending on circumstance of each ship. Thus, a goal-based approach allowing any options to achieve energy efficiency improvement should be the fundamental basis for regulatory measures in this area.

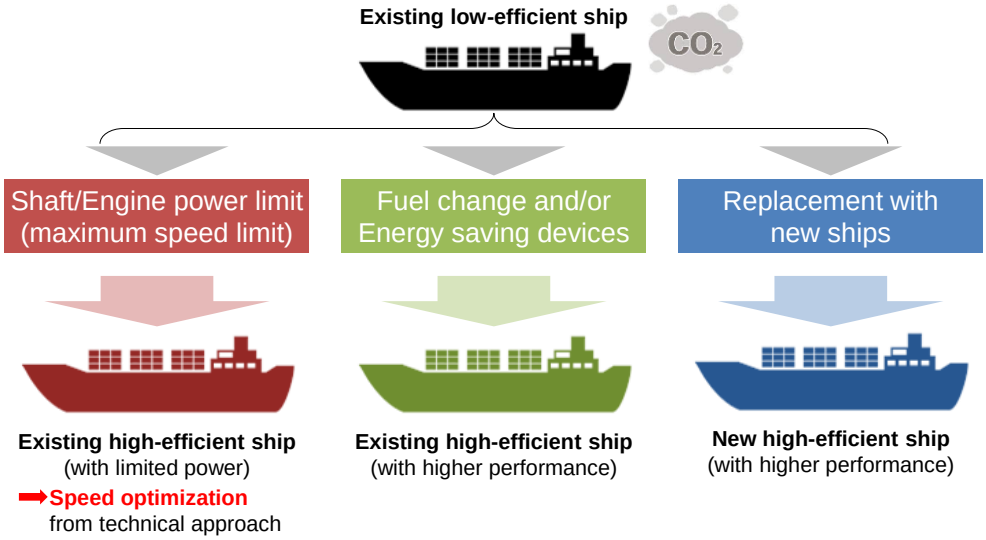
15 Ideally, an existing less-efficient ship could be replaced with a new ship with superior environmental performance, satisfying the most stringent phase of EEDI requirement. However, it is not realistic to impose legal obligations on shipowners to replace their ships, because fleet replacement should be decided based on each company's economic circumstances and business strategy.

16 Instead, fuel changes, retrofitting or installation of additional energy-saving devices could also be an option to improve the ship's performance. Depending on supply capacity and availability of alternative fuels, fuel change could be a feasible option. For example, bio-diesels or electro-LNG may be applied to current diesel-propelled ships or LNG-fuelled ships respectively without substantial conversion in ships' propulsion system. Besides, retrofitting to improve cargo capacity or installation of energy-saving devices such as optimally-designed propeller will result in further efficiency improvement.

17 Even if a ship could not afford to bear such a substantial cost for fuel change or retrofitting, still, it is possible to improve the ship's energy efficiency in an easy and costless way. By installing a simple mechanical fuel index sealing system limiting the maximum engine power to the optimum level, the ship cannot be operated above the optimum level of power except for emergency situations, so that operational speed optimization can be achieved from technical approach. Unlike the operational speed, the engine power is easy to be monitored, controlled and verified, and controlling the engine power is enforceable under survey and certification within MARPOL Annex VI.

18 The concept of shaft/engine power limit has already been proposed in document MEPC 73/5/1 (Germany et al.) along with safety power reservation in case of emergency. The maximum engine power can be easily limited to the optimum level by changing a setting of fuel index sealing on the existing engine controlling system without retrofitting the complicated system.

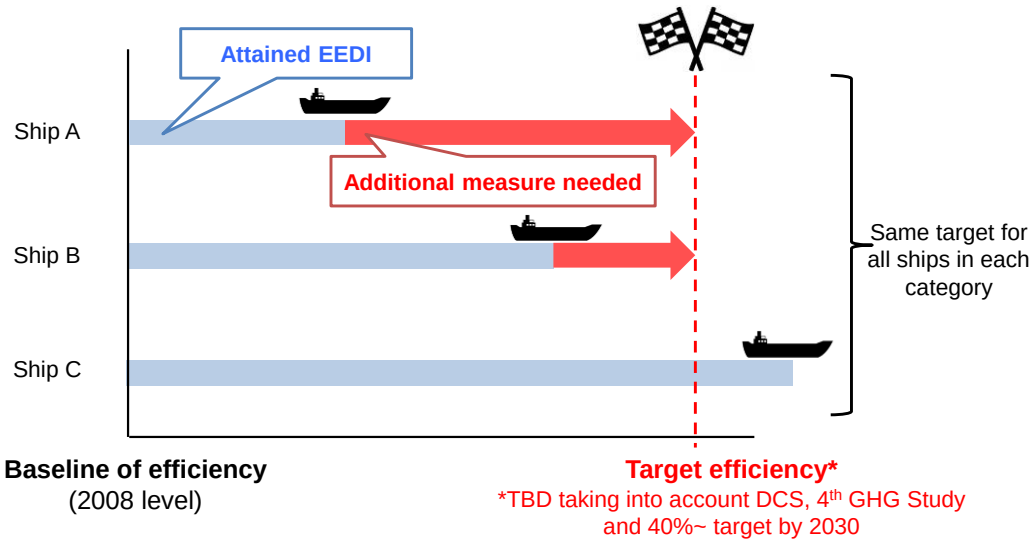
19 In summary, there are multiple options to improve energy efficiency of existing ships, and any of these options should be allowed under the goal-based approach as long as such options are verifiable. If a ship prefers saving capital cost, it can choose the shaft/engine power limit to the optimum level. If a ship prefers higher speed, it can choose technical improvement. It should be up to each ship to decide which option to take.



Fair treatment for all ships

20 In applying new measures on existing ships, efforts which have already been made should be carefully taken into account in order to secure fairness among ships. Some existing ships might be designed with superior environmental performance, while others might not. Such "efforts" should be captured and reflected in the new measure. For example, attained EEDI or other simplified metrics could be utilized to capture such efforts.

21 Applying the same target for all ships under each category (ship type and size) utilizing a metric compatible with EEDI is a simple way to secure such fairness. The more effort a ship has made in attained EEDI, the less additional measures the ship should take. The target, or the level of energy efficiency requirement, should be decided for each category of ships. It will be further considered and decided based on sufficient data on technical feasibility and future projection of an entire fleet as of 2030 in order to achieve the 2030 target set out in the GHG Strategy.



Structure of proposed short-term measure

22 Reflecting the above approach (technical approach, goal-based and fair treatment for all ships), Japan proposes a regulatory measure on energy efficiency for existing ships based on existing IMO instruments. The proposed measure consists of the following three policy pillars.

Calculation of energy efficiency performance

23 First, existing ships shall calculate their energy efficiency performance, using a simplified index to be developed and defined as Energy Efficiency Existing Ship Index (EEXI). The metrics of EEXI should be compatible with that of EEDI, and thus attained EEDI can be used as an alternative to EEXI. A specific calculation method of EEXI should be further developed and stipulated in guidelines to be developed by the Organization.

Mandatory design efficiency improvement

24 Then, each ship shall improve its energy efficiency performance to meet the mandatory requirement (required EEXI) to be set by the Organization under MARPOL Annex VI. Each ship can choose suitable measures for the ship, such as shaft/engine power limit to the optimum level, fuel change, energy saving device, retrofitting and/or any other options.

25 The levels of the required EEXI will be decided by the Organization for each category (ship type and ship size), taking into account sufficient data on technical feasibility and future projection of an entire fleet as of 2030 in order to contribute to the 2030 target set out in the GHG Strategy.

Enforcement (survey and certification)

26 The improved energy efficiency performance meeting the required EEXI shall be verified by the Administration or a recognized organization (RO). Similarly to EEDI requirements on new ships, an International Energy Efficiency (IEE) certificate shall be issued, while some simplification could be considered for the verification procedure of existing ships.

27 The requirement is enforced within the system of survey and certification under MARPOL Annex VI. The initial survey shall be conducted before the IEE certificate is issued, and general or partial survey shall be conducted if necessary, according to the circumstances. In order to secure consistent implementation of the measure, compliance to the requirement should be checked by the Administration and the port States through port State control (PSC) and other enforcement actions in accordance with MARPOL Annex VI.

Legal framework

28 The proposed measure can be developed under the existing legal framework of MARPOL Annex VI. Regardless of existing and new ships, it simply falls in the basic framework under MARPOL Annex VI, consisting of Chapter 4 (Regulations on energy efficiency for ships) and Chapter 2 (Survey, certification and means of control).

MARPOL Annex VI

Criteria	Relevant regulation	Note
Evaluation of existing ships	Reg. 20 (Attained EEDI), EEDI guidelines (calculation)	Simplified calculation method (EEXI) for existing ships needed
Design efficiency target	Reg. 21 (Required EEDI)	Adjusted target (required EEXI) for existing ships needed
Shaft power limit with safety power reserve	EEDI guidelines (calculation, survey and certificate)	Amendments proposed by MEPC 73/5/1
Survey and certificate	Reg. 5-9, HSSC guidelines	IEE certificate for existing ships needed
PSC/detection/enforcement	Reg. 10-12, PSC guidelines	

29 Similarly to other mandatory requirement on technical specification of ships, each existing ship should meet the required EEXI by the date of the first renewal survey after entry into force of the amendment to MARPOL Annex VI. Therefore, if the proposed measure is adopted in 2022, it is expected to enter into force in 2024, and consequently all existing ships will meet the required EEXI by 2029, which is consistent with the 2030 target year set out in the GHG Strategy.

30 The draft amendments to MARPOL Annex VI are set out in annex 1 to this document. Guidelines on detailed procedures of calculation, verification and other relevant issues, including draft amendment to the form of the IEE Certificate, should be developed by the Organization.

Scope of application

31 Since the proposed measure is to be established based on the existing legal framework of MARPOL Annex VI as described above, the scope of ship types to which the proposed measure applies should be the same as that of the current EEDI requirement on new ships, namely, ships falling into one or more of the categories in regulations 2.25 to 2.35, 2.38 and 2.39 of MARPOL Annex VI.

32 On the other hand, with regard to contract dates, further consideration on scope of existing ships to which the proposed measure applies should be needed. Currently, *existing ship* is defined by regulation 2.22 of MARPOL Annex VI, which does not include EEDI phase 0 and phase 1 ships although these ships have already existed in the market. However, if the level of the required EEXI was set to be more stringent than the current EEDI phase 0 and 1 levels, then, the phase 0 and phase 1 ships could also be subject to the new requirement.

Impact of the measure

33 The impacts of a measure on States should be addressed and taken into account as appropriate before adoption of the measure, as stated by the Strategy. The impact of GHG reduction measures could be either positive (e.g. less fuel cost) or negative (e.g. more capital cost). In this part, this document provides some initial analysis on both positive and negative impacts which might be brought by the proposed measure, and suggests possible measure to mitigate negative impact, if necessary.

Impacts on GHG emissions reduction

34 The proposed measure is a goal-based measure aiming at contributing to the 40% carbon intensity reduction from the whole of international shipping by 2030. It is a mandatory requirement to be rigidly enforced under MARPOL Annex VI, which certainly ensures positive impact on international shipping's contribution to mitigate climate change.

Impacts on transportation cost

35 According to *Maritime Economics, Third Edition* (Stopford, 2009), the cost of running a ship consists of i) operating costs, ii) periodic maintenance, iii) voyage costs, iv) cargo-handling costs and iv) capital costs. Although a detailed breakdown might differ depending on each ship and business pattern, it is found that voyage costs, mainly consisting of fuel cost, and capital costs are the major factors which may impact transportation costs in international shipping (See figure 6.4 below, extracted from Stopford 2009).

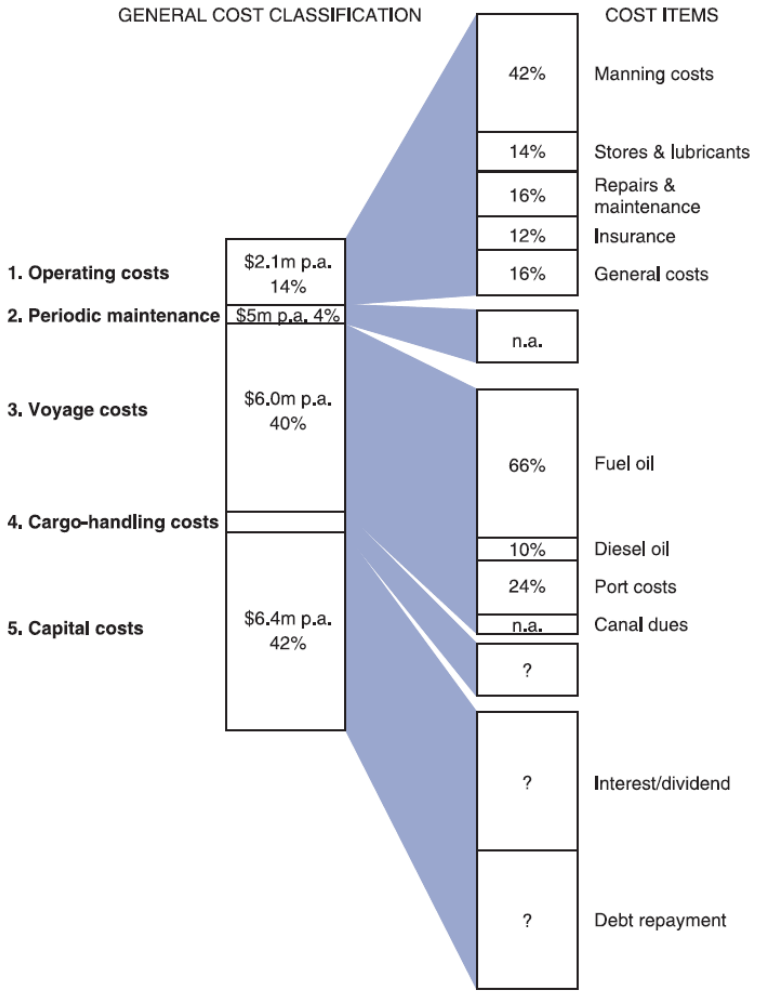


Figure 6.4
Analysis of the major costs of running a bulk carrier
Source: Compiled by Martin Stopford from various sources
Note: This analysis is for a 10-year-old Capesize bulk carrier under the Liberian flag at 2005 prices. Relative costs depend on many factors that change over time, so this is just a rough guide.

Extracted from Maritime Economics, Third Edition (Stopford, 2009)

36 The proposed measure may have either positive or negative impact on both voyage and capital costs. Having considered possible consequence of compliance, Japan is of the view that the proposed energy efficiency requirement on existing ships may bring positive impact on reduction of voyage costs and limited impact on capital costs, leading to net positive impact on reduction of the total ship running cost.

37 First, the energy efficiency requirement may lead to smaller voyage cost by saving fuel consumption. Since it mandates energy efficiency improvement for each ship, complying with the requirement equals reduction of fuel consumption per transport work. The volume of fuel saving depends on the level of the required EEXI (X% of efficiency improvement equals X% of fuel saving, if transport work is the same). Therefore, once the level of the required EEXI is determined by the Organization, the level of voyage cost reduction will be estimated.

38 Second, the energy efficiency requirement might increase capital cost, but such impact could be limited. In general, mandatory energy efficiency requirement could lead to higher ship price in order to introduce the latest technologies. However, feasibility of meeting the most stringent EEDI requirement (phase 3 requirement) as of today for new ships has

currently been considered and analysed by the Correspondence Group on EEDI review subject to regulation 21.6 of MARPOL Annex VI, which will be concluded at MEPC 74. Therefore, by setting the level of the required EEXI within the level of the latest required EEDI, the estimated impact on the capital cost will be limited to the level which has already been considered at the EEDI review process.

39 Still, there could be cases in which application of the latest technologies might lead to substantial cost or technical challenges for existing ships. Thus, the proposed measure allows multiple options to improve energy efficiency, to minimize the capital cost, depending on each ship's circumstances based on the shipowner's decision. For example, if a ship could not afford to bear substantial cost for fuel change or retrofitting, shaft/engine power limit to the optimum level can be an option without substantial investment (see paragraph 17).

40 In summary, Japan is of the view that the proposed energy efficiency requirement on existing ships has positive impacts on reduction of GHG emissions and potentially on reduction of voyage cost, and that the impacts on transportation cost will be limited. Quantitative analysis on detailed breakdown of such potential impact may be conducted in parallel with consideration of level of efficiency requirement, based on data to be gathered by the Data Collection System and the Fourth IMO GHG Study, before adoption of the measure.

Technical issues to be further considered

41 Upon agreeing on the aforementioned structure of regulatory measure on energy efficiency of existing ships based on existing IMO instruments, the following technical issues should be further considered:

.1 calculation method for energy efficiency of existing ships (EEXI), taking into account balance between accuracy and simplicity;

.2 the level of energy efficiency requirement for existing ships (required EEXI), as well as scope of its application, taking into account sufficient data on technical feasibility and future projection of the entire fleet as of 2030;

.3 technical information and guidance to assist the use of shaft/engine power limit, including effectiveness, feasibility, verification, etc; and

.4 development of draft guidelines on detailed procedures of calculation, verification and other relevant issues.

42 The issue identified in subparagraph 41.3 of this document has already been dealt with partially in the context of EEDI review, based on proposal in document MEPC 73/5/1 (Germany et al.) on shaft power limit and safety power reserve. Although document MEPC 73/5/1 focuses on new ships, the idea can be applied to existing ships as well.

43 These items are quite technical and will require substantial work with technical expertise on ship design, operation and verification procedures. Noting that the Intersessional Working Group on Reduction of GHG emissions from ships (ISWG-GHG) will be tasked with various working items including issues related to mid-/long-term measures, impact assessment procedure, capacity-building and technical cooperation, Japan proposes the establishment of a correspondence group to further consider the above items with technical expertise. Proposed terms of reference of the correspondence group are set out in annex 2 to this document.

Proposal

44 In view of developing an effective short-term measure by 2023 in accordance with the *Programme of follow-up actions of the Initial IMO Strategy on reduction of GHG emissions from ships up to 2023*, Japan proposes that regulatory measure on energy efficiency of existing ships, as described in paragraphs 22 to 32 of this document, should be further considered with a view to approval by MEPC 78 (spring 2022) and adoption by MEPC 79 (autumn 2022), noting that early approval and adoption is not precluded.

45 In order to accelerate the discussion and consideration on technical issues related to the proposed measure, as described in paragraph 41, Japan proposes that MEPC 74 establishes a correspondence group to address these issues with terms of reference set out in annex 2 to this document.

Actions requested of the Working Group

46 The Group is invited to consider the proposals set out in this document and take action as appropriate.

***

ANNEX 1

DRAFT AMENDMENTS TO MARPOL ANNEX VI
(Energy efficiency improvement measure on existing ships)
(shown as additions/~~deletions~~)

Regulation 2
Definitions

24 Major Conversion means in relation to chapter 4 a conversion of a ship:

.5 which substantially alters the energy efficiency of the ship and includes any modifications that could cause the ship to exceed the applicable required EEDI as set out in regulation 21 or required EEXI as set out in regulation 21A.

Regulation 5
Surveys

4 Ships to which chapter 4 of this Annex applies shall also be subject to the surveys specified below, taking into account Guidelines adopted by the Organization[**]:

.6 For ships for which the building contract is placed before [1 January 20XX], the verification of the ship's EEXI according to regulation 20A shall take place at the first intermediate or renewal survey identified in paragraph 1 of this regulation, whichever is the first, on or after 1 January [2025].

.7 Notwithstanding paragraph 4.6 of this regulation, a general or partial survey, according to the circumstances, after a major conversion of a ship to which regulation 20A applies. The survey shall ensure that the ship's EEXI is recalculated as necessary and meets the requirement of regulation 21A.

Regulation 20A
Energy Efficiency Existing Ship Index (EEXI)

1 The EEXI shall be calculated for:

.1 each ship for which the building contract is placed before [1 January 20XX]; and

.2 each ship for which the building contract is placed before [1 January 20XX], which has undergone a major conversion,

which falls into one or more of the categories in regulations 2.25 to 2.35, 2.38 and 2.39 of this Annex. The EEXI shall be specific to each ship and shall indicate the estimated performance of the ship in terms of energy efficiency. The EEXI shall be verified either by the Administration or by any organization duly authorized by it[*].

[**] Refer to the 2014 Guidelines on survey and certification of the Energy Efficiency Design Index, as may be amended.

[*] Refer to Code for Recognized Organizations (RO Code), adopted by the MEPC by resolution MEPC.237(65), as may be amended.

2 The EEXI shall be calculated taking into account guidelines** developed by the Organization.

3 For each ship to which regulation 20 of this annex applies, the attained EEDI may be used as an alternative to EEXI.

Regulation 21A
Required EEXI

1 For each:

.1 ship for which the building contract is placed before [1 January 2020]; and

.2 ship for which the building contract is placed before [1 January 2020], which has undergone a major conversion,

which falls into one of the categories in regulations 2.25 to 2.31, 2.33 to 2.35, 2.38 and 2.39 and to which this chapter is applicable, the EEXI shall be as follows:

EEXI ≤ Required EEXI = (1-Y/100) × Reference line value as defined in regulation 21 of this Annex

where Y is the reduction factor specified in table 3 for the required EEXI compared to the EEDI Reference line.

Table 3. Reduction factors (in percentage) for the EEXI relative to the EEDI Reference line

Ship type	Size	Reduction factor
Bulk carrier	*	*
Gas carrier	*	*
Tanker	*	*
Container ship	*	*
General cargo ship	*	*
Refrigerated cargo carrier	*	*
Combination carrier	*	*
LNG carrier	*	*
Ro-ro cargo ship (vehicle carrier)	*	*
Ro-ro cargo ship	*	*
Ro-ro passenger ship	*	*
Cruise passenger ship having nonconventional propulsion	*	*

[* numbers to be considered]

***

** Guidelines on the method of calculation of the Energy Efficiency Existing Ship Index to be developed by the Organization.

ANNEX 2

DRAFT TERMS OF REFERENCE OF A CORRESPONDENCE GROUP TO CONSIDER TECHNICAL ISSUES ON THE ENERGY EFFICIENCY IMPROVEMENT MEASURE ON EXISTING SHIPS

The correspondence group is instructed to:

.1 consider possible calculation method for energy efficiency of existing ships (EEXI), taking into account balance between accuracy and simplicity;

.2 consider the level of energy efficiency requirement for existing ships (required EEXI), as well as scope of its application, taking into account technical feasibility and future projection of the entire fleet as of 2030;

.3 develop draft amendment to MARPOL Annex VI and draft guidelines on detailed procedures of calculation, verification and other relevant issues; and

.4 provide a progress report to MEPC 75 and MEPC 76, and submit a final report to MEPC 77.