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MARINE ENVIRONMENT PROTECTION COMMITTEE
61st session
Agenda item 5

MEPC 61/5/17
23 July 2010
Original: ENGLISH

REDUCTION OF GHG EMISSIONS FROM SHIPS

Decision criteria for establishing EEDI correction factors

Submitted by the United States

SUMMARY

Executive summary:	Compliance with the EEDI must reflect real improvements in energy efficiency for ships. As such, each component of the EEDI equation, including the correction factors, must be real and verifiable. This document recommends six criteria that should be considered before any correction factor is added to the EEDI equation.
Strategic direction:	7.3
High-level action:	7.3.2
Planned output:	7.3.2.1
Action to be taken:	Paragraph 22
Related documents:	MEPC 61/5/3, EE-WG 1/3/6, MEPC 60/4/1, MEPC 60/4/4, MEPC 60/4/20, MEPC 60/4/31, MEPC60/4/34 and MEPC 59/4/14

Background

1 At the Intersessional Meeting of the Working Group on Energy Efficiency Measures for Ships (EE-WG 1), the working group continued its efforts on further improvement of the draft text for mandatory requirements of the Energy Efficiency Design Index (EEDI). As part of these efforts, the working group continued discussion on correction factors to the EEDI equation. The correction factors f_i and f_j had been developed for ice-classed ships to represent constrained capacity due to ice strengthening and additional power needs to break ice. The correction factor f_w is intended to capture any decrease in speed under representative wave conditions.

2 At the Intersessional Meeting, the working group discussed an additional correction factor (f_{CSR}) proposed by China (MEPC 60/4/31). This correction factor was intended to represent loss in capacity for ships built under IACS Common Structural Rules (CSR) for bulk carriers and tankers. Greece, in document EE-WG 1/3/6, suggested that a similar correction factor (f_{GBS}) may be needed in the future for Goal Based Standards (GBS) for bulk carriers and tankers.

3 The working group also discussed additional applications for capacity f_i and power f_j. Greece, in document EE-WG 1/3/6, proposed that f_i should also be used to account for voluntary ship-specific structural enhancements made for safety reasons. INTERTANKO, in document MEPC 60/4/4, proposed a power correction factor for shuttle tankers stating that these ships require extra main engine power to perform dynamic positioning and to comply with redundancy requirements. INTERFERRY, in document MEPC 60/4/20, suggested that a power correction should apply on a ship-specific basis where voluntary measures for improved manoeuvrability or redundant propulsion are taken for safety reasons.

Introduction

4 The United States supports the establishment of EEDI standards, which provide a common metric to measure new ship efficiency and will serve an important role for increasing the efficiency of new vessels during construction and entry into service. For this effort to be successful, compliance with the EEDI must reflect real improvements in energy efficiency for ships. As such, each component of the EEDI equation, including the correction factors, must be real and verifiable.

5 The United States is concerned that application of inappropriate and/or unverifiable correction factors could weaken the EEDI standards to the point that these standards would have little or no impact on the energy efficiency of ships. It is important that correction factors be used carefully to minimize the risk of creating a loophole in the EEDI requirements. Below, the United States describes six criteria that must be met before a correction factor is added to the EEDI equation. The United States relates these criteria to several of the correction factors under discussion.

Ice-classed ships

6 The f_i and f_j correction factors, as applied to ice-classed ships, provide a good example of how EEDI correction factors can be developed using sound engineering practices and applied to a specific class of ships without compromising the intent of the EEDI requirements. In this case, the correction factors are both verifiable and real as shown by the following six criteria:

.1 Verifiable ship characteristics and application:
there are clearly defined categories of ice-classed ships which are needed to operate in polar regions. In addition, the parameters used to make the corrections can be measured and are therefore verifiable (perpendicular length, main engine power and capacity);

.2 Need for correction factor:
especially for IA super ice-classed ships, the structural reinforcement and intended service can lead to a significant increase in power demand and loss in capacity. This has a significant impact on the calculated EEDI for these vessels;

.3 Best addressed with a ship-specific solution:
vessels with ice-class characteristics are found among within multiple ship types (tankers, container ships, cargo ships). In addition, these vessels are subdivided into four categories based on the ice conditions for which they are designed. As such, a single correction cannot be applied to all ice-classed ships in a given ship category;

.4 Comprehensive, transparent analysis to develop correction factors:
Document MEPC 59/4/14 (Canada, Estonia, Finland, Norway and Sweden) presents an analysis of the differences between ice-classed and other ships based on a large amount of data for existing vessels. The reasons for higher calculated EEDI values for ice-classed ships are clearly identified;

.5 Clear instructions for determining correction factor:
Document MEPC 60/4/1 (Finland and Sweden) presents equations for each ship type and ice-class. In addition, minimum and maximum corrections are identified; and

.6 Does not create perverse incentives:
the correction factors are consistent with current ship designs and limits are placed on the size of the correction factors.

Common Structural Rules

7 The United States does not support the application of correction factors for CSR (or GBS which is related to CSR) for bulk carriers and oil tankers. In this case, the first, second, third, and fourth criteria listed above in paragraph 6 are not met. First, while the ship types can be verified (all tankers and bulk carriers subject to CSR), the proposed terms for the CSR correction cannot. The DWT of a ship with and without compliance to CSR cannot be determined because there is no scheme to design a ship in both a CSR and non-CSR condition.

8 Second, it is not clear that there is a need for a CSR correction. In document MEPC 60/4/34, IMarEST states that CSR can add 3% to 8% of hull steel weight and estimates that this would have a small impact on the EEDI, on the order of 0.5% to 1.4%. To put this into perspective, IMarEST estimates that this could be offset with a speed reduction between 0.05 and 0.10 knots. Such an impact on EEDI may be too small to require the complexity of an additional correction factor to the EEDI equation. In addition, this analysis of increased steel weight does not consider potential weight reductions through the use of improved structural design.

9 Third, by definition, Common Structural Rules are common to the majority of tankers and bulk carriers. As such, unique correction factors are not necessary within these ship types. Any common factors, such as CSR, should be addressed as part of the reduction rate and not through a correction factor. To the extent that new CSR requirements are created in the future for other ship types, this could be considered in future reviews of the EEDI standards.

10 Lastly, a comprehensive analysis has not been performed to quantify the impact of CSR on the EEDI. For instance, it is not clear how many ships, included in the reference line calculations, already met the CSR requirements, or at least had steel weight consistent with CSR ships. Figure 1 in document EE-WG 1/2/1 (China) presents baseline EEDI curves for tankers for different time periods. The baseline curve for 2000-2003 ships is only slightly lower than the baseline curve for 2004-2007 ships. This difference is so slight as to be within the error of the curve fits. In addition, no account is made for how the trend for increased vessel speed and power impacts the baseline curves in that same time frame.

Expanded use of capacity correction (f_i)

11 The United States recognizes the importance of safety in the marine environment. The United States believes that any impacts of the EEDI on safety should be considered in establishing the reduction levels associated with the EEDI. In addition, the United States applauds the efforts of any shipowners that make efforts to go beyond minimum safety requirements, such as those in CSR. The United States would hope to see these same shipowners striving to go beyond minimum efficiency requirements such as those anticipated for the EEDI. However, the United States is concerned that an open-ended correction factor, such as that proposed by Greece for voluntary ship-specific structural enhancements, may create a loophole that could render the EEDI requirement ineffective.

12 The biggest concern with a capacity correction factor for voluntary ship-specific structural enhancements is that it may not be verifiable (may not meet criterion 1). While the capacity and steel weight of the final ship design can be determined, the hypothetical steel weight of the same ship without "voluntary structural enhancements" may not be verifiable. In document EE-WG 1/3/6, Greece suggests that the increase in steel weight is known because the cost to the shipowner for any enhancements must be calculated. However, this assumes that there is a baseline vessel produced by the shipbuilder for which the shipowner is requiring enhancements. Creating a correction factor based on the difference in steel weight could result in the perverse outcome of "non-enhanced" designs being offered on the books simply for calculation of a capacity correction factor.

13 It is not clear that there is a need for a capacity correction factor for voluntary ship-specific structural enhancements (criterion 2). As discussed above, the structural enhancements associated with CSR are expected to have little effect on the attained EEDI for a ship. To the extent that additional voluntary enhancements are made, it is uncertain what additional impact this would have on the attained EEDI. It is not clear that the correction would add enough value to the EEDI equation to offset any associated additional complexity to the equation or the risk of adding an unverifiable component to the equation.

14 In the long run, a correction factor for structural enhancements may be appropriate if the following conditions were met:

.1 the CSR requirements would need to be modified to include voluntary safety specifications that call for structural enhancements beyond the minimum CSR requirements. Clearly defined specifications for voluntary structural enhancements, similar to ice-class ratings, would help address verification concerns (criterion 1); and

.2 to the extent that such voluntary safety ratings are developed, there should be a comprehensive and transparent analysis of the impact of such enhancements on the EEDI (criterion 4). The relative impact and need for the correction could then be determined using this data and possibly satisfy criterion 2. The analysis could also be used to create a method for determining a correction as specified in criterion 5. Assuming that the correction factor would accurately represent voluntary additional CSR specifications, it would promote safer designs for specific vessels within a ship type and could satisfy criteria 3 and 6.

Expanded use of power correction (f_j)

15 In many ways, the concept of a power correction factor for redundant power raises larger concerns than the capacity correction factor for voluntary structural improvements. In both cases, the correction factor would be difficult to verify (criterion 1). In this case, the issue is whether it can be verified that the additional power is only used as redundant power in emergency situations, or if the additional power is used regularly as part of daily operations. Because power is a first-order component of the EEDI equation, there could be an incentive to minimize the maximum continuous rated power (MCR) used in the equation. If a strong verification procedure is not in place, this creates a perverse incentive to manipulate the power correction factor to create an artificially low MCR (criterion 6). Under this situation, "redundant" power would then be used during typical in-use operation, creating a loophole in the EEDI requirements.

16 The power term in the EEDI equation is currently based on 75 per cent of MCR, rather than full MCR. In this way, the EEDI equation already considers a significant power margin. Concern has been expressed that some owners may specify a lower MCR to reduce EEDI then operate at a higher percentage of MCR. This incentive is directionally offset by the real world need for redundant power. Due to concerns that it could lead to even more opportunity for perverse outcomes, the United States would have serious concerns with any correction factors for the voluntary addition of redundant power such as suggested by INTERFERRY. In any case, the United States believes that the analysis and verification requirements for such a concept should be set very high. In the case of ferries, or other ship types for which the working group has recommended that further development of the EEDI baselines are needed, the use of redundant power could be considered in the reference line and in the stringency of the reductions.

17 INTERTANKO, in document MEPC 60/4/4, proposed a power correction factor of 0.77 for dual-engine shuttle tankers between 80,000 and 160,000 DWT. This proposal appears to meet many of the criteria listed above. However, in order to better consider the proposal, it would be useful to have an error analysis performed, and an explanation of the data overlap between the single and dual-engine vessels (see Figure 1 in document MEPC 60/4/4). In addition, the EEDI values for the dual-engine shuttle tankers should be compared to the reference line curve for tankers. An analysis should be performed in order to verify whether the power use for dual-engine vessels is higher than for single engine vessels, such as might occur if the dual-engine vessels typically go faster than the single engine vessels.

Wave and wind correction factor (f_w)

18 The United States appreciates the efforts that have been made to develop the wave correction factors for ships. Our understanding of the intent of f_w is to ensure that the reference power and speed of the vessel, used in the EEDI equation, represent typical in use weather conditions. In this way, the EEDI requirements will influence ship designs in a way that improves efficiency during operating conditions that ships would most likely see in use. The f_w factor is different from any other correction factors in the sense that the factor would apply to the whole population of ships, while other factors would be applied to a particular group of ships which have specific characteristics (such as ice-class), for the purpose of putting those particular ships in the level playing field with other ships.

19 The United States understands that f_w would be set as 1.0 in the application of the required EEDI, at least in its initial phase. The United States also notes the suggestion in annex 3 to document MEPC 60/4/36 (Japan) that the EEDI values with calculated f_w value (not equal to 1.0) by the simulation guidelines (to be agreed) could be an optional indication on the international certificate relating to the EEDI. The United States understands that this issue will be further considered.

Interaction between correction factors

20 The addition of correction factors to the EEDI equation increases the complexity of the equation. Beyond issues related to verification, the interaction between these correction factors must be considered. If multiple correction factors are used, it is important that the correction factors be used carefully to prevent double-counting of the corrections in the EEDI equation.

Recommendations

21 The United States recommends that the following six criteria should be considered before any correction factor is added to the EEDI equation:

.1 verifiable ship characteristics and application;

.2 need for correction factor;

.3 best addressed with a ship-specific solution;

.4 comprehensive, transparent analysis to develop correction factors;

.5 clear instructions for determining correction factor; and

.6 does not create perverse incentives.

Action requested of the Committee

22 The Committee is invited to take into account the above criteria when considering issues related to correction factors, and take action as appropriate.

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