INTERNATIONAL MARITIME ORGANIZATION

E

MARINE ENVIRONMENT PROTECTION COMMITTEE
76th session
Agenda item 6

MEPC 76/6/9
7 April 2021
Original: ENGLISH
Pre-session public release: ☒

ENERGY EFFICIENCY OF SHIPS

Proposed amendments to the *2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*

Submitted by IACS

SUMMARY

Executive summary:	This document proposes amendments to the revised *2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*, to add a C_F conversion factor between fuel consumption and CO_2 emissions to be applied for ethane fuel
Strategic direction, if applicable:	3
Output:	3.5
Action to be taken:	Paragraph 10
Related documents:	MEPC 59/4/10; MEPC 74/18, MEPC 74/18/Add.1; MEPC 75/6/1 and MEPC 76/5/1

Introduction

1 The Energy Efficiency Design Index (EEDI) was adopted by the Committee in 2011 to reduce the energy consumption of the international marine transportation sector and incentivize innovations in energy efficiency technology. Each new ship is required to calculate and report the attained EEDI of its ship design, calculated using the relevant guidelines and verified during sea trials.

2 MEPC 74 adopted resolution MEPC.322(74) on *Amendments to the 2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (resolution MEPC.308(73))*, as set out in annex 16 to document MEPC 74/18/Add.1 (MEPC 74/18, paragraph 5.129). Further, the draft amendments to the *2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships* introducing a new section 3 for mandatory reporting of attained EEDI values and related information, were deferred by MEPC 74 to MEPC 75 (MEPC 75/6/1). The draft amendments have been forwarded to the Correspondence Group on Air Pollution and Energy Efficiency established at MEPC 75, which reported the results of its work in document MEPC 76/5/1.

Discussion

3 IACS members note that the increase in North American shale gas products, mainly natural gas (methane) exports, which has developed in recent years, has also led to the development of new trades with other by-products of that process, notably ethane and LPG. This in turn has promoted the development of gas carriers designed specifically for shipping larger parcels of ethane/ethylene/LPG products; the Very Large Ethane Carrier (VLEC) fleet has emerged.

4 In some cases these VLECs are fitted with engines which are designed to burn ethane as fuel in accordance with the provisions of paragraph 16.9 of the annex to the *Amendments to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)* (resolution MSC.370(93)), which permits the burning of cargo gases alternative to natural gas, provided the same level of safety is ensured.

5 IACS notes that *the 2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships* adopted by resolution MEPC.308(73), as amended, (referred to as the "2018 Guidelines") details the C_F conversion factor between fuel consumption and CO_2 emissions to be applied in the EEDI calculations under paragraph 2.2.1 thereof, and includes a tabulation of the expected fuels to which the C_F conversion factor is to be applied. That table is reproduced below for reference. IACS notes that ethane is not included within this list of fuels.

Type of fuel	Reference	Lower calorific value (kJ/kg)	Carbon content	C_F (t-CO_2/t-Fuel)
1 Diesel/Gas Oil	ISO 8217 Grades DMX through DMB	42,700	0.8744	3.206
2 Light Fuel Oil (LFO)	ISO 8217 Grades RMA through RMD	41,200	0.8594	3.151
3 Heavy Fuel Oil (HFO)	ISO 8217 Grades RME through RMK	40,200	0.8493	3.114
4 Liquefied Petroleum Gas (LPG)	Propane	46,300	0.8182	3.000
	Butane	45,700	0.8264	3.030
5 Liquefied Natural Gas (LNG)		48,000	0.7500	2.750
6 Methanol		19,900	0.3750	1.375
7 Ethanol		26,800	0.5217	1.913

6 Further, IACS notes that document MEPC 59/4/10 submitted by Society of International Gas Tanker & Terminal Operators (SIGTTO) previously provided information to the Committee for the development of the C_F conversion factors and further background information for consideration of CO_2 conversion factors for ships using liquefied gases as fuel. This document contained details for deriving the conversion factors, including an ethane factor of 2.93 in table 3 thereof, however at that time transport of ethane was not undertaken as a bulk liquid cargo. IACS has verified and supports the given derivation process and, to three decimal places, supports a C_F conversion factor for ethane of 2.927; derivation is shown below:

.1 Carbon Content of Ethane: the carbon content of ethane (C_2H_6) is derived from the atomic weights (in atomic mass units) of carbon (12.011), hydrogen (1.0079) and molecular weight of ethane (30.0694):

$$\frac{24.022}{30.0694} = 0.7989$$

.2 C_F (t-CO_2/t-Fuel): the C_F factor for ethane is derived from the carbon content of ethane multiplied by the ratio of molecular weight of CO_2 (44.0098, while taking atomic weight of oxygen as 15.9994) to carbon:

$$0.7989 \times \frac{44.0098}{12.011} = 2.927$$

7 The fuel parameters tabulated under paragraph 2.2.1 of the 2018 Guidelines also include generic lower calorific values (LCV) for the given fuels. Paragraph 2.2.7.1 of the 2018 Guidelines states that LCV of LNG (48,000 kJ/kg) is in reference to the 2006 IPCC Guidelines. While noting slight variations in the publicly available values for ethane LCV and referring to the 2006 IPCC Guidelines, IACS suggests a value of 46,400 kJ/kg.

Proposal

8 In order to facilitate harmonized application of the C_F conversion factor in the 2018 Guidelines, IACS proposes to amend the 2018 Guidelines to also cover ethane as an existing gas carrier fuel; it may also be applied to ships falling under the provisions of resolution MSC.391(95) on the *International Code of Safety for Ships Using Gases or other Low-Flashpoint Fuels (IGF Code)*.

9 Default values for "Lower Calorific Value", "Carbon Content" and "C_F" are proposed of 46,400 kJ/kg, 0.7989 and 2.927 respectively, with additions to the table under paragraph 2.2.1 of the 2018 Guidelines shown below:*

Type of fuel	Reference	Lower calorific value (kJ/kg)	Carbon content	C_F (t-CO_2/t-Fuel)
1 Diesel/Gas Oil	ISO 8217 Grades DMX through DMB	42,700	0.8744	3.206
2 Light Fuel Oil (LFO)	ISO 8217 Grades RMA through RMD	41,200	0.8594	3.151
3 Heavy Fuel Oil (HFO)	ISO 8217 Grades RME through RMK	40,200	0.8493	3.114
4 Liquefied Petroleum Gas (LPG)	Propane	46,300	0.8182	3.000
	Butane	45,700	0.8264	3.030
5 Ethane		46,400	0.7989	2.927
~~5~~ 6 Liquefied Natural Gas (LNG)		48,000	0.7500	2.750
~~6~~ 7 Methanol		19,900	0.3750	1.375
~~7~~ 8 Ethanol		26,800	0.5217	1.913

* Tracked changes are indicated using "strikeout" for deleted text and "grey shading" to highlight all modifications and new insertions, including deleted text.

Action requested of the Committee

10 The Committee is invited to consider the information contained in this document, in particular the proposals in paragraphs 8 and 9 above, and take action as appropriate.