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PREVENTION OF AIR POLLUTION FROM SHIPS

Draft interim Guidelines for the validation of Electric Power Tables for EEDI

Submitted by IACS, CLIA, ICS and INTERFERRY

SUMMARY

Executive summary:	This document proposes draft interim guidelines for the validation of the electric power table for the assessment of P_{AE} to be used within the framework of the EEDI
Strategic direction:	7.3
High-level action:	7.3.1
Planned output:	7.3.1.3
Action to be taken:	Paragraph 9
Related documents:	MEPC.1/Circ.681, MEPC.1/Circ.682; MEPC 59/4/28 and MEPC 59/WP.8

Introduction

1 The calculation of the EEDI, according to MEPC.1/Circ.681, requires the determination of the auxiliary power P_{AE} on the basis of the consumed electric power given in the electric power table (excluding propulsion) divided by the weighted average efficiency of the generators if the power used at normal seagoing is significantly different from the standard value given.

2 MEPC 59/4/28 (CLIA) introduced the electric load balance table (Electric Power Table-EPT) as an element to be considered in the calculation of the EEDI for cruise and passenger ships and provided suggestions for standard load groups and a standard format for the EPT. The Working Group at MEPC 59 agreed that guidance should be established for the EPT for those ships that come under paragraph 2.5.6.3 of the annex to MEPC.1/Circ.681, which could be an independent circular based on MEPC 59/4/28, and invited Member Governments and observer organizations to submit comments and further proposals to the next session.

3 Therefore, IACS established an internal project team to develop such guidance and conducted a workshop with relevant stakeholders to discuss practical solutions for the use and validation of EPT within the EEDI framework.

Proposal

4 This document provides at annex proposed draft interim guidelines for uniform validation of the EPT for the calculation of the required mechanical power P_{AE} to be used in the EEDI, for those ships that come under paragraph 2.5.6.3 of the annex to MEPC.1/Circ.681.

5 An analysis of the data necessary for the electrical loads has revealed that a verification of EPT may not be possible because the service factor of time for the different systems and components depends on the intended operation of an individual ship. Therefore, only validation is practically feasible.

6 A standard format for the EPT (within the EEDI framework) is needed to facilitate validation, to increase transparency and to make it an integral part of the EEDI documentation. In addition, identification tags for units listed in the EPT are suggested to further facilitate validation and transparency. The standard format for the EPT may be developed based on the proposal in document MEPC 59/4/28 (CLIA).

7 For the purpose of sea trial validation, a column should be added to the standard EPT to enable shipyards to mark load groups/units which can be validated during the sea trials and/or to note the expected value during sea trials.

Other findings and recommendations

8 In the course of development of this submission the following findings were made:

.1 the computation of a baseline using EPT data for P_{AE} may be difficult due to a lack of data available in publicly accessible databases. The most effective way to compute the first baseline using EPT data for passenger ships (based on delivered vessels) needs to be identified;

.2 the ambient conditions used for the calculation of P_{AE} as proposed defined in document MEPC 59/4/28 differ from the current classification requirements and should be further discussed;

.3 treatment of shaft generators within the EEDI framework should be re-examined for its correctness (because low efficiency of a shaft generator reduces the EEDI value); and

.4 it was noted that clearly separating propulsion power from passenger/cargo-related power requirements would help setting up a simpler and easier to interpret EEDI, compared to the version contained in MEPC.1/Circ.681. It was recalled that this proposal was already made in documents MEPC 59/4/38 (CESA) and GHG-WG 2/2/19 (INTERFERRY, *et al.*), and eventually not supported by IMO Member States at previous Working Group meetings.

Action requested of the Committee

9 The Committee is invited to consider the foregoing discussion and the draft interim guidelines provided at annex to this document, and decide as appropriate.

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ANNEX

DRAFT INTERIM GUIDELINES FOR THE VALIDATION OF "ELECTRIC POWER TABLES FOR EEDI" (EPT-EEDI)

1. INTRODUCTION

The purpose of these Guidelines is to assist Recognized Organizations in the validation of ship's Electric Power Tables (EPT) for calculation of Energy Efficiency Design Index (EEDI). As such, these Guidelines support the implementation of MEPC.1/Circ.681 "INTERIM GUIDELINES ON THE METHOD OF CALCULATION OF THE ENERGY EFFICIENCY DESIGN INDEX FOR NEW SHIPS" and MEPC.1/Circ.682 on "INTERIM GUIDELINES FOR VOLUNTARY VERIFICATION OF THE ENERGY EFFICIENCY DESIGN INDEX". This document will also assist shipowners, shipbuilders, ship designers, and manufacturers in relation to aspects of developing more energy efficient ships and also in understanding the procedures for the EPT-EEDI validation.

2. OBJECTIVES

These Draft Interim Guidelines provide a framework for the uniform application of the EPT-EEDI validation process for those ships that come under MEPC.1/Circ.681, section 2, paragraph .5.6, subparagraph .3.

3. DEFINITIONS

3.1. *Applicant* means an organization, primarily a shipbuilder or a ship designer, which requests the voluntary EPT-EEDI validation in accordance with these Guidelines.

3.2 *Validator* means a Recognized Organization which conducts the voluntary EPT-EEDI validation in accordance with these Guidelines.

3.3 *Validation* for the purpose of these Guidelines means review of submitted documents and survey during construction and sea trials.

3.4 *Standard EPT-EEDI-Form* refers to the layout given in appendix A that contains the EPT-EEDI results that will be the subject of validation. Other supporting documents submitted for this purpose will be used as reference only and will not be subject to validation.

3.5 P_{AE} herein is defined as per definition in MEPC.1/Circ.681.

3.6 *Ship Service and Engine-room Loads* refer to all the load groups which are needed for the hull, deck, navigation and safety services, propulsion and auxiliary engine services, engine-room ventilation and auxiliaries and ship's general services.

3.7 *Diversity Factor* is the ratio of the "total installed load power" and the "actual load power" for continuous loads and intermittent loads. This factor is equivalent to the product of service factors for load, duty and time.

4. APPLICATION

4.1 These Guidelines are applicable to ships as stipulated by MEPC.1/Circ.681, section 2, paragraph .5.6, subparagraph .3.

4.2 These Guidelines should be applied on a voluntary basis for new ships for which an application for an EPT-EEDI validation has been submitted to a validator.

4.3 The steps of the validation process include:

- Review of documents during the design stage
  - Check if all relevant loads are listed in the EPT
  - Check if reasonable service factors are used
  - Check the correctness of the P_{AE} calculation based on the data given in the EPT
- Survey of installed systems and components during construction stage
  - Check if a randomly selected set of installed systems and components are correctly listed with their characteristics in the EPT
- Survey of sea trials
  - Check if [selected units/loads specified in EPT are] [the predicted overall value for P_{AE} under sea trials conditions is] observed

5. SUPPORTING DOCUMENTS

5.1 The applicant should provide as a minimum the ship electric balance load analysis.

5.2 Such information may contain shipbuilders' confidential information. Therefore, after the validation, the validator should return all or part of such information to the applicant at the applicant's request.

5.3 A special EEDI condition during sea trials may be needed and defined for each vessel and included into the [agreed] [approved] sea trial schedule. For this condition a special column should be inserted into the EPT.

6. PROCEDURES FOR VALIDATION

6.1 General

6.1.1 P_{AE} should be calculated in accordance with the EPT-EEDI Guidelines. Voluntary EPT-EEDI validation should be conducted in two stages: preliminary validation at the design stage and final validation during sea trials. The validation process is presented in figure 1.

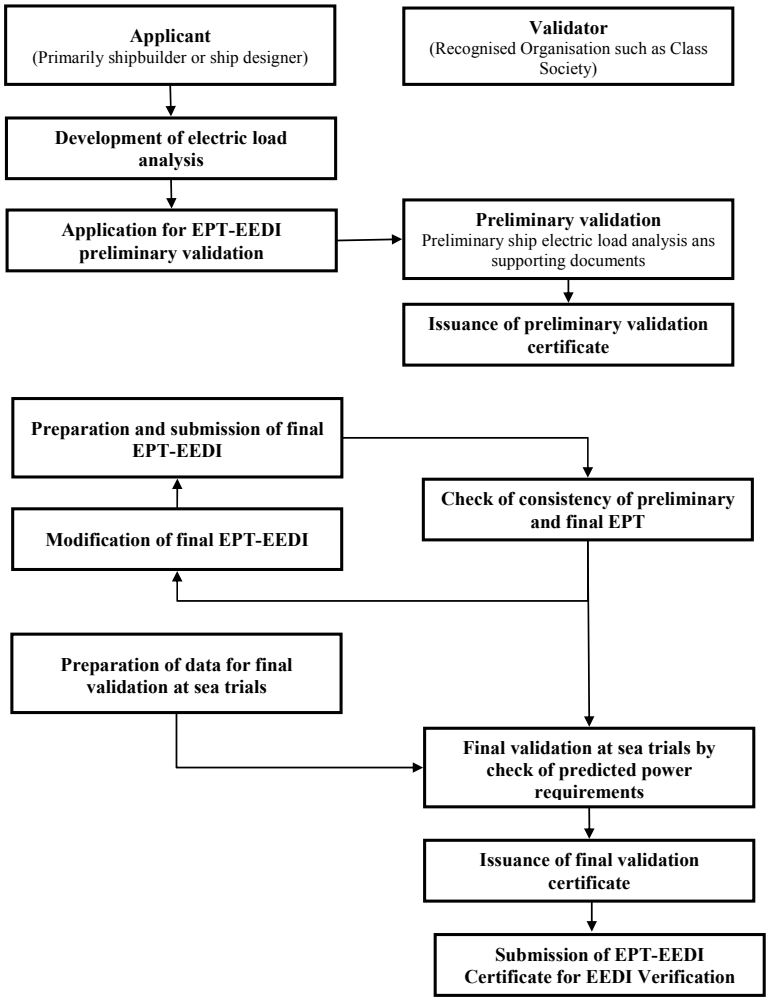

Figure 1 – Basic Flow of EPT-EEDI Validation Process

6.2 Preliminary validation at the design stage

6.2.1 For the preliminary validation at the design stage, the applicant should submit to a validator an application for the validation of EPT-EEDI inclusive of EPT-EEDI Form and all the relevant and necessary information for the validation as supporting documents.

6.2.2 The applicant should supply as a minimum the supporting data and information, as specified in appendix B (to be developed).

6.2.3 The validator may request from the applicant additional information on top of those contained in these Guidelines, as necessary, to enable the validator to examine the calculation process of the EPT-EEDI. The estimation of the ship EPT-EEDI at the design stage depends on each applicant's experiences, and it may not be practicable to fully examine the technical aspects and details of each machinery component. Therefore, the preliminary validation should focus on the calculation process of the EPT-EEDI that should follow the best marine practices.

Note: A possible way forward for more robust validation is to establish a standard methodology of deriving the ship EPT by setting standard formats as agreed and used by industry.

6.3 Final validation

6.3.1 The final validation process as a minimum shall include the check of ship electric load analysis to ensure that all electric consumers are listed; their specific data and the calculations in the power table itself are correct and are supported by sea trial results. If necessary, additional information has to be requested.

6.3.2 For final validation the applicant shall revise the EPT-EEDI Form and supporting documents as necessary, by taking into account the characteristics of the machinery and other electrical loads actually installed on board the ship. The EEDI condition at sea trials shall be defined and the expected power requirements in these conditions documented in the EPT. Any changes within the EPT from design stage to construction stage should be highlighted by the shipyard.

6.3.3 The preparation for the final validation includes a desk top check comprising:

- consistency of preliminary and final EPT
- changes of service factors (compared to the preliminary validation)
- all electric consumers are listed
- their specific data and the calculations in the power table itself are correct
- in case of doubt, component specification data is checked in addition

6.3.4 A survey prior to sea trials is performed to ensure that machinery characteristics and data as well as other electric loads comply with those recorded in the supporting documents. This survey does not cover the complete installation but selects randomly a number [to be defined] of samples.

6.3.5 For the purpose of sea trial validation, the surveyor will check [the data of selected systems and/or components given in the special column added to the EPT for this purpose] [the predicted overall value of electric load] by means of practicable measurements with the installed measurement devices.

7. ISSUANCE OF THE EPT-EEDI STATEMENT OF VALIDATION

7.1 The validator should stamp the EPT-EEDI Form [as Noted] after it validated the EPT-EEDI in the preliminary validation stage in accordance with these Guidelines.

7.2 The validator should stamp the EPT-EEDI Form [as Endorsed] after it validated the final EPT-EEDI in the final validation stage in accordance with these Guidelines.

APPENDIX A

Electric Power Table Form for Energy Efficiency Design Index (EPT-EEDI Form) and Statement of Validation

Ship ID:
IMO No. _____
Ship' s Name_____
Shipyard:_____
Hull No.:_____

Applicant:
Name:_____
Address:_____
_____

Validation Stage:
☐ Preliminary validation
☐ Final validation

Summary Results of EPT-EEDI

Load Group	Seagoing Condition (MEPC.1/Circ.681)		Remarks
	Continuous Load (kW)	Intermittent Load (kW)	
Ship Service and Engine-room Loads			
Accommodation [and Cargo] Load			
Total installed load			
Diversity Factor			
Normal seagoing load			
Weighted average efficiency of generators			
PAE			

Supporting Documents

Title	ID or Remarks

Validator details:
Organization: _____
Address: _____
_____

This is to certify that the above-mentioned electrical loads and supporting documents have been reviewed in accordance with [EPT-EEDI Guideline] and the review shows a reasonable confidence for use of the above PAE in EEDI calculations.

The date of review:_____ Statement of validation No._____
This statement is valid on condition that the electric power characteristics of the ship do not change.

Signature of Validator

_____
Printed Name:

_____