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Agenda item 4

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PREVENTION OF AIR POLLUTION FROM SHIPS

The draft Interim Guidelines on Voluntary Verification of Energy Efficiency Design Index

Submitted by Japan and Norway

SUMMARY

Executive summary:	The Second Intersessional Meeting of the Working Group on Greenhouse Gas Emissions from Ships (GHG-WG 2) considered the verification process of the Energy Efficiency Design Index for new ships. Taking into account the outcome of GHG-WG 2, this document provides a proposed draft interim Guidelines on voluntary verification of the EEDI.
Strategic direction:	7.3
High-level action:	7.3.1
Planned output:	7.3.1.3
Action to be taken:	Paragraph 2
Related documents:	GHG-WG 2/2/14, GHG-WG 2/2/16 and MEPC 59/4/2

1 The second Intersessional Meeting of the Working Group on Greenhouse Gas Emissions from Ships (GHG-WG 2) considered the verification process of the Energy Efficiency Design Index (EEDI) for new ships. The group agreed to the concept of option three in document GHG-WG 2/2/14 (Norway) and agreed that the flowchart of the verification process and the skeleton draft guidelines for EEDI verification in document GHG-WG 2/2/16 (Japan) would be a good basis for further development of such guidelines. The group also acknowledged Japan and Norway for their intention to submit a more concrete proposal for such guidelines. Taking into account the outcome of GHG-WG 2, Japan and Norway developed the draft Interim Guidelines on Voluntary Verification of EEDI, as set out in the annex to this document.

Action requested of the Committee

2 The Committee is invited to consider the draft interim Guidelines on voluntary verification of the EEDI and take action as appropriate.

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ANNEX

DRAFT INTERIM GUIDELINES ON VOLUNTARY VERIFICATION OF THE ENERGY EFFICIENCY DESIGN INDEX

1 GENERAL

The purpose of these guidelines is to assist verifiers of Energy Efficiency Design Index (EEDI) of ships in conducting the verification, on a voluntary basis, of the EEDI which should be calculated in accordance with the Interim Guidelines on the Method of Calculation of the EEDI for New Ships ("EEDI Guidelines", hereafter), and assist shipowners, shipbuilders and manufacturers being related to the energy efficiency of a ship and other interested parties in understanding the procedures of the voluntary EEDI verification.

2 DEFINITIONS[1]

2.1 *Verifier* means an organization which conducts the voluntary EEDI verification in accordance with these guidelines, including Administrations, classification societies and other organizations which possess technical expertise necessary for conducting the EEDI verification.

2.2 *Ship of the same type* means a ship of which hull form (expressed in the lines such as sheer plan and body plan) excluding additional hull features such as fins and of which principal particulars are identical to that of the base ship.

2.3 *Ship of a similar type* means a ship of which hull form (expressed in the lines such as sheer plan and body plan) excluding additional hull features such as fins and of which principal particulars are largely identical to that of the base ship.

2.4 *Tank test* means towing test, self propulsion test and propeller open test.

3 APPLICATION

These guidelines are applied to new ships for which an application for the EEDI verification has been submitted to a verifier on a voluntary basis.

4 PROCEDURES FOR VERIFICATION

4.1 General

Attained EEDI should be calculated in accordance with the EEDI Guidelines. Voluntary EEDI verification should be conducted on two stages: preliminary verification at the design stage, and verification at the sea trial. The basic flow of the verification process is presented in the Figure 1.

4.2 Preliminary verification at the design stage

4.2.1 For the preliminary verification at the design stage, a shipowner should submit to a verifier an application for the verification and an EEDI Technical File containing the necessary information for the verification and other relevant background documents.

[1] Other terms used in these guidelines have the same meaning as those defined in the EEDI Guidelines.

4.2.2 EEDI Technical File, which is to be developed by either a shipowner or a shipbuilder, should include at least but not limited to:

.1 deadweight (DWT) or gross tonnage (GT) for passenger and ro-ro passenger ships, the shaft power of the main and auxiliary engines, the ship speed on deep water in the maximum design loaded conditions at the 75% of the maximum continuous rate (MCR) for the main engine, the specific fuel consumption (SFC) of the main engine at the 75% of MCR power, the SFC of the auxiliary engines at the 50% MCR power, and the electric power table for certain ship types as necessary, as defined in the EEDI Guidelines;

.2 power curves (kW – knot) estimated at design stage under full-loaded condition and sea trial condition;

.3 principal particulars and the overview of propulsion system and electricity supply system onboard;

.4 estimation process and methodology of the power curves at design stage;

.5 description of energy saving equipment; and

.6 calculated value of the Attained EEDI.

4.2.3 Sea trial conditions should be set in full-loaded condition, if possible – e.g., in case of tankers.

4.2.4 The SFC of the main and auxiliary engines should be quoted from the approved NO_x Technical File. For the confirmation of the SFC, a copy of the approved NO_x Technical File should be submitted to the verifier. In case NO_x Technical File has not been approved at the time of the application for preliminary verification, the test reports provided by manufacturers should be used. In this case, at the time of the sea trial verification, a copy of the approved NO_x Technical File should be submitted to the verifier.

<NOTE> SFC in the NO_x Technical File are the values of a parent engine, and the use of such value of SFC for the EEDI calculation for member engines may have the following technical problems for further consideration:

- *The definition of "member engines" given in NO_x Technical Files is broad and specification of engines belonging to the same family group may vary; and*

- *The rate of NO_x emission of the parent engine is the highest in the group/family – i.e. CO_2 emission, which is in the trade-off relationship with NO_x emission, can be lower than the other engines in the group/family.*

Thus, for member engines of which specifications are different from the parent engine, how to determine SFC should be considered further. For instance, measured values of SFC at test bed of manufacturers could be used.

4.2.5 The power curves used for the preliminary verification at the design stage should be based on reliable results of tank test. A tank test for an individual ship may be omitted based on technical justifications such as availability of the results of tank tests for ships of the same/similar type.

4.2.6 The verifier may request the shipbuilder for additional information on top of those contained in Technical File, as necessary, to examine the calculation process of the Attained EEDI. The estimation of the ship speed at the design stage much depends on each shipbuilder's experiences, and it may not be practicable for any person/organization other than the shipbuilder to fully examine the technical aspects of experience-based parameters such as the roughness coefficient and wake coefficient. Therefore, the preliminary verification should focus on the calculation process of the Attained EEDI that should follow the EEDI guidelines.

<NOTE> A possible way forward for more robust verification is to establish a standard methodology of deriving the ship speed from the outcomes of tank test, by setting standard values for experience-based correction factors such as roughness coefficient and wake coefficient. In this way, ship-by-ship performance comparison could be made more objectively by excluding the possibility of arbitrary setting of experience-based parameters. If such standardization is sought, this would have an implication on how the ship speed adjustment based on sea trial results should be conducted in accordance with paragraph 4.3.8 of these Guidelines.

<NOTE> For ensuring the quality of tank tests, it would be desirable in the future that an organization conducting a tank test be authorized by the Administration or an organization recognized by it in accordance with the guidelines developed by the Organization.

4.2.7 Additional information that the verifier should request the shipbuilder to provide directly to it (i.e. not to be contained in Technical File) includes but not limited to:

.1 descriptions of a tank test facility; this should include the name of the facility, the particulars of tanks and towing equipment, and the records of calibration of each monitoring equipment;

.2 lines of a model ship and an actual ship for the verification of the appropriateness of the tank test; the lines (sheer plan, body plan and half-breadth plan) should be detailed enough to demonstrate the similarity between the model ship and the actual ship;

.3 lightweight of the ship and displacement table for the verification of the deadweight;

.4 detailed report on the method and results of the tank test; this should include at least the tank test results at sea trial condition and at full-loaded condition;

.5 detailed calculation process of the ship speed, which should include the estimation basis of experience-based parameters such as roughness coefficient, wake coefficient; and

.6 reasons for exempting a tank test, if applicable; this should include lines and tank test results of the ships of same/similar type, and the comparison of the principal particulars of such ships and the ship in question. Appropriate technical justification should be provided for regarding the tank test unnecessary.

4.2.8 Such additional information may contain shipbuilders' confidential information. Therefore, after the verification, the verifier should return all or part of such information to the shipbuilder at its request.

4.3 Verification of the Attained EEDI at sea trial

4.3.1 Prior to the sea trial, a shipowner should submit the application for the verification of EEDI together with the final displacement table and the measured lightweight, or a copy of the survey report of deadweight, as well as a copy of NO_x Technical File as necessary.

4.3.2 The verifier should attend the sea trial and confirm:

.1 propulsion and power supply system, particulars of the engines, and other relevant items described in the EEDI Technical File;

.2 draft and trim;

.3 sea conditions;

.4 ship speed; and

.5 shaft power of the main engine.

4.3.3 Draft and trim should be confirmed by the draft measurements taken prior to sea trial. Draft should be within [X%] of and trim should be within [XXcm] of the assumed conditions used for estimating the power curves.

4.3.4 Sea conditions should be measured in accordance with [ISO15016:2002 or the equivalent].

4.3.5 Ship speed should be measured in accordance with [ISO15016:2002 or the equivalent] and at more than two points of which range includes the 75% of MCR power.

4.3.6 The shaft power of the main engine should be measured by shaft power meter or estimated by fuel rack. Otherwise, it should be measured by a method which the engine manufacturer recommends and the verifier approves.

4.3.7 The shipbuilder should develop power curves based on the measured ship speed and the measured shaft power of the main engine at sea trial. For the development of the power curves, the shipbuilder should calibrate the measured ship speed, if necessary, by taking into account the effects of wind, tide and waves in accordance with [ISO15016:2002 or the equivalent].

4.3.8 The shipbuilder should compare the power curves obtained as a result of the sea trial and the estimated power curves at the design stage. In case differences are observed, the Attained EEDI should be recalculated, as necessary, in accordance with the following:

.1 for ships for which sea trial is conducted in full-loaded condition (e.g., tankers): the Attained EEDI should be recalculated using the measured ship speed at sea trial at 75% of MCR power; and

.2 for ships for which sea trial cannot be conducted in full-loaded condition (e.g., dry bulkers): if the measured ship speed at 75% of MCR power of the main engine at the sea trial conditions is different from the expected ship speed on the power curve at the corresponding condition, the shipbuilder should recalculate the Attained EEDI by adjusting ship speed in full-loaded condition by an appropriate correction method that is agreed by the verifier.

An example of possible methods of the speed adjustment is given in Figure 2:

<NOTE> Further consideration would be necessary for speed adjustment methodology in 4.3.8.2. One of concerns relates to a possible situation where the power curve for sea trial condition is estimated in excessively conservative manner (i.e. power curve is shifted in a leftward direction) with the intention to get an upward adjustment of the ship speed by making the measured ship speed at sea trial easily exceed the lower-estimated speed for sea trial condition at design stage.

4.3.9 In case where the Attained EEDI is calculated at the preliminary verification by using SFC based on the manufacturer's test report due to the non-availability at that time of the approved NO_x Technical File, the shipowner or the shipbuilder should recalculate the Attained EEDI by using SFC in the approved NO_x Technical File.

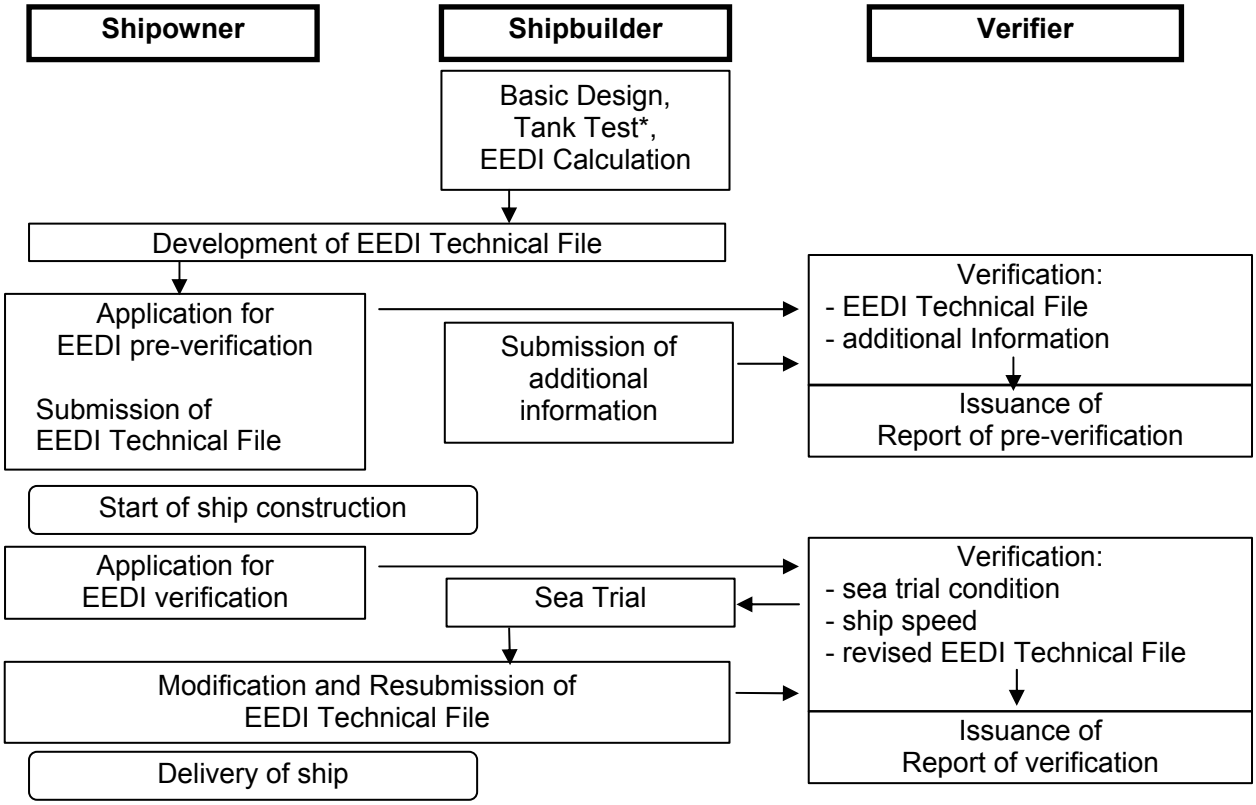
4.3.10 The shipowner or the shipbuilder should revise an EEDI Technical File, as necessary, by taking into account the results of sea trial. Such revision should include, as applicable, the adjusted power curve based on the results of sea trial (namely, modified ship speed at 75% of MCR power of the main engine at full-loaded condition) and SFC described in the approved NO_x Technical File, and the recalculated Attained EEDI based on these modifications.

4.3.11 The EEDI Technical File, if revised, should be submitted to the verifier for the confirmation that the (revised) Attained EEDI is calculated in accordance with the EEDI Guidelines.

5 ISSUANCE OF THE EEDI VERIFICATION REPORT

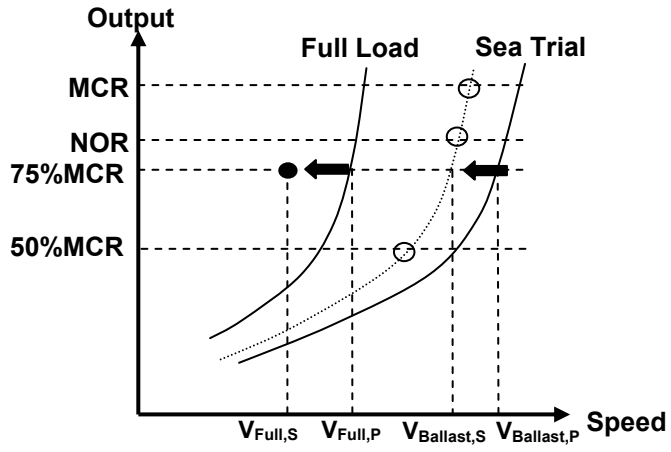
5.1 The verifier should issue the Report on the Preliminary Verification of EEDI after it verified the Attained EEDI at design stage in accordance with Sections 4.1 and 4.2 of these Guidelines.

5.2 The verifier should issue the report on the Verification of EEDI after it verified the Attained EEDI after the sea trial in accordance with Sections 4.1 and 4.3 of these Guidelines.



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

Figure 1 – Basic Flow of Verification Process



$V_{Full,S} = V_{Full,P} \times (V_{Ballast,S} / V_{Ballast,P})$

$V_{Ballast,P}$:estimated ship speed at sea trial conditions on the power curve estimated at design stage
$V_{Ballast,S}$:ship speed obtained as a result of the sea trial
$F_{Full,S}$: adjusted ship speed by the results of sea trial, in full-loaded condition
$F_{Full,P}$:estimated ship speed in full-loaded condition at design

Figure 2 – An Example of Possible Ship Speed Adjustment