MARINE & OFFSHORE DIVISION MANAGEMENT
Regulatory & Institutional

INTERSESSIONAL MEETING OF THE WORKING GROUP ON REDUCTION OF GHG EMISSIONS FROM SHIPS 8TH MEETING 24 TO 28 MAY 2021 MAJOR OUTCOMES OF THE ISWG GHG 8

SUMMARY

The eighth meeting of the Intersessional Working Group on Reduction of GHG Emissions from Ships (ISWG-GHG 8) was held remotely from 24 to 28 May 2021 under the chairmanship of Mr. Sveinung Oftedal (Norway).

Guidelines supporting the EEXI framework

ISWG GHG 8 finalized a new version of the draft Guidelines on the method of calculation of the attained energy efficiency existing ship index (EEXI), for adoption at MEPC 76 (**item 1** and annex 1 of this report) **:**

- ISWG GHG8 agreed to set the power of main engines at 83% of the limited installed power (MCRlim) or 75% of the original installed power (MCR), whichever is lower.
- ISWG considered that the proposals for additional alternative method to determine Vref, by using empirical data from sea trial tests were not mature enough to be included in the guidelines for adoption at MEPC 76 ; it has encouraged interested Member States and international organizations to cooperate on this issue with a view to incorporating alternative method in a future review of the guidelines.
- ISWG GHG8 agreed to include the fcorrection factor for ro-ro cargo ships (vehicle carriers) in the draft guidelines on the method of calculation of the attained EEXI, for ro-ro cargo (vehicle carriers) ships with DWT/GT of less than 0.35.

ISWG GHG 8 finalized a new version of the draft 2021 guidelines on survey and certification of the energy efficiency existing ship index (EEXI), for adoption at MEPC 76 (**item 2** and annex 2 to this report)**.**

- ISWG agreed that numerical calculations may be accepted as a replacement of model tests. In this regard, numerical calculations could be used independently.

ISWG GHG 8 finalized a new version of the Draft Guidelines on the Shaft/Engine Power Limitation System to comply with the EEXI requirements and use of a power reserve, for adoption at MEPC 76 (**item 3** and annex 3 to this report).

- ISWG agreed to incorporate the proposals in the draft guidelines to facilitate processes when a ship overrides the EPL or ShaPoLi limitations for safety reasons

Guidelines supporting the CII framework

ISWG GHG 8 finalized a new version of Draft Guidelines on operational carbon intensity indicators and the calculation methods (CII guidelines, G1) for adoption at MEPC 76 (**item 4** and annex 4 to this report)**.**

- ISWG GHG agreed to not change, as already accepted for Ro-ro cargo ship (vehicle carrier) and Ro-ro passenger, the metric from AER to cgDIST for ro-ro cargo ships.
- ISWG GHG agreed to not reflect onboard CO2 capture.
- ISWG GHG agreed to assess and discuss the proposals for correction factors and voyage exclusions using as guidance of assessment criteria proposed by France, which were based on similar criteria for EEDI correction factors. These criteria would primarily serve as guidance for decision making, and agreed to include in the resolution text of the draft CII calculation guidelines the need to further consider the proposals for correction factors with a view to enhancing the guidelines before entry into force of the short-term measure.
- ISWG also suggested that the correction factors should be included in a new set of guidelines, as appropriate, at MEPC 78 at the latest to allow for the industry to prepare the fleet before entry into force of the CII measure.
- ISWG suggested that the Correspondence Group, if established, could further consider possible approaches for voluntarily collecting, verifying and reporting CII data for trial purposes, including developing the associated reporting format and verification procedure to ensure reliability and transparency of these data.

ISWG GHG 8 finalized the Draft Guidelines on the reference lines for use with operational carbon intensity indicators (CII Reference line guidelines, G2), with a view of adoption at MEPC 76 (**item 5** and annex 5 to this report)**.**

- ISWG GHG agreed to keep the reference lines suggested by the CG. However, it recognized that these reference lines might be improved subsequently when more data would become available.
- ISWG noted that the manner to integrate High-Speed Crafts (HSC) in the CII framework would merit further consideration,
- ISWG GHG did not endorse proposal from Interferry to split the ro-ro cargo sector into two size bins, below and above 25,000 DWT,
- ISWG GHG did not retain proposal from World Shipping Council to split vehicle carrier fleet in three distinct reference lines.

Despite an obvious dissatisfaction from many representatives of Member States**, ISWG GHG 8 finalized the draft guidelines on the reference lines (G3) with a view to adoption by MEPC 76** (**item 6** and annex 6 to this report)**.**

- ISWG GHG supported a flat reduction factor at the global fleet level as a starting point. But, prior to entry into effect of the regulation, this approach should be refined in the guidelines to reflect ship-type specific values using updated data and information
- ISWG GHG considered that the IMO could continue to monitor development in annual carbon intensity improvement using both the AER (demand approach) and EEOI (supply approach) in parallel to the annual analysis of the fuel consumption data reported to the IMO DCS.
- ISWG GHG agreed to the principle that a reduction effort (Z-factor) could follow a non-linear curve until 2030, and that the stricter reduction rates after 2026 could be considered for confirmation as part of the review
- This non-linear curve will consist of three consecutive phases, with the understanding that the Z-factor for:

- phase 1(2020-22) is similar to business as usual carbon intensity improvement until entry-into-force ;
- phase 2 (2023-26) is defined as 2%;
- phase 3 (2027-30) will be further strengthened and developed taking into account the review of the short-term measure.

Years	
2020	1.0%*
2021	1.0%*
2022	1.0%*
2023	2.0%
2024	2.0%
2025	2.0%
2026	2.0%
2027	
2028	
2029	
2030	

ISWG GHG 8 has finalized the draft Guidelines on the operational carbon intensity rating of ships (CII Rating Guidelines-G4), with a view to adoption by MEPC 76 (**item 7** and annex 7 to this report)

- ISWG GHG has decided to keep the rating boundaries set by the CG, recalling that the reference lines were already size-dependent but recognized that some adjustments could still be done on this matter.
- ISWG GHG agreed that all proposals addressing inequities between ship types (i.e. correction factors, refined reference lines, etc.) should be considered holistically within the CG to be established by MEPC 76.

Regarding the update of **the 2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP) (resolution MEPC.282(70))**,

- ISWG GHG has decided to keep the rating boundaries set by the CG, recalling that the reference lines were already size-dependent but recognized that some adjustments could still be done on this matter.
- ISWG GHG agreed that all proposals addressing inequities between ship types (i.e. correction factors, refined reference lines, etc.) should be considered holistically within the CG to be established by MEPC 76.
- ISWG GHG not agreed to a proposal for the SEEMP guidelines to include an option for compliance at company/fleet level.

Due to time constraints, the ISWG could not consider following items :

- Update of other existing guidelines, procedures and guidance (to be addressed by the CG) ;
- List of technical guidelines that could be consolidated into a mandatory carbon intensity code (to be addressed at next ISWG GHG.

Owing to the high amount of work still to be carried-out, a new Correspondence group on carbon intensity reduction should be established by MEPC 76 with some heavy tasks to carry out:

- develop draft guidelines on correction factors for certain ship types, operational profiles and/or voyages for the CII framework (new G5);
- further consider and finalize the draft updated Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP);
- further consider and update existing guidelines.

A new ISWG GHG 9 should be held also 18-22 October 2021, before MEPC 77.

Item 1 - Guidelines on the method of calculation of the attained EEXI

The attained Energy Efficiency Existing Ship Index (EEXI) is a measure of ship's energy efficiency (g/t*nm) and calculated by the following formula:

$$\frac{\left(\prod_{j=1}^{n} f_j\right)\left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}\right) + \left(P_{AE} \cdot C_{FAE} \cdot SFC_{AE}*\right) + \left(\left(\prod_{j=1}^{n} f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEeff(i)}\right) C_{FAE} \cdot SFC_{AE}\right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}**\right)}{f_i \cdot f_c \cdot f_l \cdot Capacity \cdot f_w \cdot V_{ref} \cdot f_m}$$

This formula may not be applicable to a ship having diesel-electric propulsion, turbine propulsion or hybrid propulsion system, except for cruise passenger ships and LNG carriers.

Ships falling into the scope of EEDI requirement can use their attained EEDI as the attained EEXI if the value of the attained EEDI is equal to or less than that of the required EEXI.

The Correspondence Group Correspondence on the Development of Technical Guidelines on Carbon Intensity Reduction (referred hereinafter as CG) considered and discussed the following items:

1. Definition of PME(i) ; Power of main engines ;
2. Definition of $P_{AE(i)}$; Power of auxiliary engines ;
3. Measures for pre-EEDI ships to obtain V_{ref} ; Ship speed) ;
4. Correction factor for ro-ro cargo and ro-ro passenger ships (f_{jRoRo}).

Following these discussions, ISWG GHG 8 had for its consideration three main remaining issues:

- setting the power of main engines (PME(i)) in the EEXI formula for cases where Shaft/Engine Power Limitation is installed ;
- determination of the accurate reference speed (Vref) for EEXI calculation;
- inclusion of a correction factor for ro-ro cargo ships (vehicle carriers).

Power of main engines (PME(i)) in the EEXI formula for cases where Shaft/Engine Power Limitation is installed

During the CG, members had common views that the upper bound of PME(i) should be 75% of the rated installed power (MCR), and that even in case of applying the Shaft / Engine Power Limitation, there should be a margin between PME(i) and the limited installed power of the engine (MCRlim).

In case where overridable Shaft / Engine Power Limitation is installed, PME(i) is 75% of the limited installed power (MCRlim) for each main engine. However, this was not a consensus of the CG.

Notwithstanding the above, for LNG carriers having steam turbine or diesel electric propulsion, the CG defined PME(i) to be 83% of MCRlim, which was also aligned with the EEDI formula. Besides, for those ship types, in order to avoid releasing of excessive natural boil-off gas to the atmosphere, allowance of the power necessary for combustion of such excessive natural boil-off gas was incorporated, to avoid releasing to the atmosphere or unnecessary thermal oxidation.

During the ISWG GHG 8, several delegations have stated that the power of main engines should be set at 87% of the limited installed power (MCRlim) or 75% of the original installed power (MCR), whichever is lower. They were of the view that setting PME(i) equal to 75% MCRlim instead of 87% MCRlim lowers both the ambition and the effectiveness of the EEXI by making it less representative of real operations of existing ships. Moreover, setting MCRlim at 75% cuts the EEXI's potential 2030 emissions reductions in half by crediting ships that reduce engine power in a

way that does not reduce emissions in-service.

In a broader consideration, the United States, supported by Tuvalu and Marshall Islands, shared significant concerns that the ShaPoLi could lead to reduced EEDI values without corresponding, real-world reductions in ship fuel consumption. This is because the ShaPoLi concept credits the ship's EEDI or EEXI with a reduction in the engine power safety margin, even though the ship does not normally use this power, even the operator still has access to this power in emergency situations.

Other delegations were of the opinion that the PME(i) should remain at 75% of MCRlim as currently included in the draft guidelines and in line with the EEDI calculations. Providing uniformity between the EEXI and the EEDI tools will prevent confusion when applying the guidelines. Consistency between EEXI and EEDI formulas is equally crucial in order to ensure a level playing field.

Japan recalled that the CG had considered a proposal to set the power of main engines at 83% MCRlim which could be considered as a compromise, whilst allowing sufficient margin for the ship.

Thus, ISWG GHG8 agreed to set the power of main engines at 83% of the limited installed power (MCRlim) or 75% of the original installed power (MCR), whichever is lower.

Determination of the accurate reference speed (Vref) for EEXI

For ships falling into the scope of the EEDI requirement, the ship speed Vref should be obtained from an approved speed-power curve as defined in the *2014 Guidelines on survey and certification of the energy efficiency design index (EEDI)*. PAE(i) is calculated in accordance with paragraph 2.2.5.6 of those Guidelines.

In this regard, the CG developed alternative methods to calculate PAE(i), which was to use the pre-certified value of the annual average figure and to use an approximation formula provided for each ship type.

The large majority of the members supported the use of sea trial records, while the views were split with regard to the draught condition of the sea trial and the conditions to ensure accuracy and robustness of the sea trial report.

- In case where the sea trial results under the EEDI draught condition, which might have been calibrated by the tank test, was available, the CG developed a formula to obtain the ship speed Vref using the sea trial record and power correction in accordance with the cubic law.
- In case where the sea trial results under the design load draught condition, which might have been calibrated by the tank test, was available, the CG developed a formula to obtain the ship speed Vref using the sea trial record.

On the other hand, in case where the sea trial results were neither under the EEDI draught nor design load draught condition, the CG could not identify a reliable method to calibrate the results to the EEDI draught condition.

Then, the CG considered a formula to obtain the approximated ship speed Vref,app to be obtained from statistical mean of distribution of ship speed and engine power. The formula consists of the statistical mean of the ship speed in the category (Vavg) adjusted by the ratio of main engine power.

The CG defined the performance margin mV to be 5% of the average ship speed or 1 knot, whichever was lower, and incorporated it in the draft guidelines.

ISWG GHG 8 had for its consideration proposal from BIMCO and RINA for amending the draft EEXI calculation guidelines by including a simplistic, though still accurate, additional alternative method to determine Vref, by using empirical data from sea trial tests or the daily ship performance recordings. The in-service performance measurements are to be taken while the ship is underway and at two conditions: one at the reference condition and one at or close to the EEXI condition. The alternative method and the associated result for Vref should be verified by the recognized organization prior to issuing the International Energy Efficiency Certificate (IEEC).

Greece supported the proposal put forward by BIMCO and RINA by including an alternative method to determine *Vref*, by using empirical data from sea trial tests or the daily ship performance recordings. It also proposed that the utilization of ROs certified sea trial results of non–EEDI ships at any non–EEDI draught, as this is the option currently used to certify EEDI on bulk carriers and other ship types, should be allowed. The method of extrapolation from ballast draught to design draught has been proven to yield accurate results in practice over many decades, allowing for the calculated speed to be representative of the actual operational speed of the ship.

Greece was of the view that allowing the extrapolation of a pre–EEDI ship design draught to EEDI (maximum) draught would assist specifically the bulk carriers to comply with the guidelines as the calculations will be based on more accurate data and yield a more accurate *Vref* compared to the alternative statistical method proposed by CG which may have no direct relevance to this specific ship type.

Several delegations expressed interest for these proposals which were understood to offer pragmatic solutions in the determination of the reference speed, in particular for ships which do not have sea trial data on board. Other delegations, whilst supporting the concepts in principle and the continuation of the work on these approaches, expressed concerns in particular with regard to the lack of reference to international standards, the role of verifiers and the absence of calibration of the drought conditions.

ISWG considered the proposals were not mature enough to be included in the guidelines for adoption at MEPC 76. It encouraged interested Member States and international organizations to cooperate on this issue with a view to incorporating alternative method in a future review of the guidelines.

Correction factor for ro-ro cargo and ro-ro passenger ships (fjRoRo)

The CG had defined an alternative correction factor for ro-ro cargo and ro-ro passenger ships (fjRoRo) and incorporated it in the draft guidelines, aiming at reflecting the efficiency improvements by means of Shaft/Engine Power Limitation.

MARPOL Annex VI amendments adopted by resolution MEPC.203(62) in June 2011 introduced for the first time mandatory energy efficiency measures, including EEDI requirements. However, at that time, the Committee agreed to exclude ro-ro type ships from the first phase of implementation of EEDI requirements.

In April 2014, the Committee adopted further MARPOL Annex VI amendments including ro-ro fleet in the EEDI framework. It was agreed to introduce a correction factor in the EEDI reference line for ro-ro cargo ships (vehicle carrier) having a ratio of DWT/GT lower than 0.3, thus recognizing the inherent efficiency gain for ships with a large volumetric capacity (i.e. a greater GT) at a given DWT.

According to data of ro-ro cargo ships (vehicle carriers) in the 2020 IHS database, the ratio DWT/GT has decreased over the years and the average is about 0.35. While this development is positive in terms of fleet performance, it cannot be transposed to existing ships owing to the possibility to

proceed to the necessary retrofit. Moreover, approximately 90%, do not comply with the Required EEXI.

Therefore a correction factor for the calculation of the Attained EEXI of ro-ro cargo ships (vehicle carrier) with a DWT/GT < 0.35 should be introduced so that the EEXI would be fair.

A large majority supported the inclusion of this correction factor which would better reflect the reality of the vehicle carrier fleet, even some delegations highlighted that around 85% of the vehicle carrier fleet would benefit from the proposed correction factors which may therefore constitute a considerable relaxation of the EEXI requirements for this segment

Following discussion, ISWG GHG8 agreed to include the following correction factor for ro-ro cargo ships (vehicle carriers) in the draft guidelines on the method of calculation of the attained EEXI, for ro-ro cargo (vehicle carriers) ships with DWT/GT of less than 0.35:

$$f_{cVEHICLE} = \left(\frac{(DWT/_{GT})}{0.35}\right)^{-0,8} \quad for \quad \frac{DWT}{GT} < 0.35$$

where 0.8 in the exponent is consistent with the value used for fc factor for ro-ro passenger ships (resolution MEPC.308(73)).

New version of the draft guidelines on the method of calculation of the attained energy efficiency existing ship index (EEXI) – annex 1 of the present report

ISWG finalized the draft guidelines on the method of calculation of the attained EEXI, together with a draft MEPC resolution for their adoption, with a view to adoption by MEPC 76.

Item 2 - Draft guidelines on survey and certification of the attained EEXI

The attained EEXI should be calculated in accordance with regulation 20A of MARPOL Annex VI and the *Guidelines on the method of calculation of the attained Energy Efficiency Existing Ship Index (EEXI) (item 1)*. The *2013 Guidance on treatment of innovative energy efficiency technologies for calculation and verification of the attained EEDI (MEPC.1/Circ.815)* should be applied for calculation of the attained EEXI, if applicable.

Having incorporated the use of sea trial records in the draft EEXI calculation guidelines, the CG considered the conditions to ensure accuracy and robustness of the sea trial report. The CG developed conditions on sea trials conducted by existing ships, with a reference to ISO 15016:2002, and incorporated them in the draft guidelines.

Verification of the attained EEXI in relation to numerical calculations

The ISWG further considered and discussed the verification of the attained EEXI in relation to numerical calculations.

The CG developed a method to verify the results of the numerical calculations with a reference to the defined quality standards (e.g. the ITTC standards).

The estimated speed-power curve obtained from the tank test or numerical calculations and the sea trial results calibrated by the tank test should be reviewed on the basis of the relevant documents in accordance with the EEDI Survey and Certification Guidelines, the defined quality standards (e.g. ITTC 7.5-03-01-02 and ITTC 7.5-03-01-04 in its their latest revisions) and the verification of the numerical setup with parent hull or the reference set of comparable ships.

RINA proposed some modifications to the draft guidelines in order to support the use of numerical methods as an equivalent to model tests for the purposes of estimating the reference speed Vref.

The texts of paragraphs 4.2.2.7 and 4.2.8 were amended by CG to indicate that estimation of speed-power curves could be accomplished by tank test or numerical calculations. However, in the last version of the draft guidelines, the texts of paragraph 4.2.2.7 were amended again to say that estimated speed-power curves should be obtained from tank test and numerical calculations, in order to be consistent with the text in paragraph 2.3. However, paragraph 4.2.8 retains the or wording, creating an inconsistency within the draft guidelines regarding the applicability of numerical calculations.

IACS shared the view that the usage of numerical calculations could be allowed, under certain conditions, to replace model tests. As an example, in model tests where the EEDI draught was not considered originally, it would be possible to complement these with numerical calculations.

Accordingly, the following modifications to paragraph 2.3 were proposed:*

> "2.3 *Tank test* means model towing tests, model self-propulsion tests and model propeller open water tests. Numerical calculations may be accepted ~~as equivalent to model propeller open water tests or used~~ to complement the tank tests conducted (e.g. to evaluate the effect of additional hull features such as fins, etc. on ships' performance), or as a replacement of model tests provided that the methodology and numerical model used have been validated/calibrated against parent hull sea trials and/or model tests, with the approval of the verifier."

Numerical calculations may be accepted as a replacement of model tests. In this regard, numerical calculations could be used independently.

To reflect the above consideration, modifications to sub-paragraph 7 of paragraph 4.2.2 of the draft guidelines are proposed as follows:

> ".7 an estimated speed-power curve under the EEDI condition, or under ~~the design~~ a different load draught to be calibrated to the EEDI condition, obtained from tank test and/or numerical calculations, if available."

Some delegations suggested that further work would be needed to refine the proposals, notably to ensure standardization of the numerical calculations.

Nevertheless, ISWG GHG 8 agreed to include the proposals in the draft guidelines.

New draft version 2021 guidelines on survey and certification of the energy efficiency existing ship index (EEXI) – annex 2 to this report

Hence, ISWG GHG 8 finalized the draft guidelines on survey and certification of the attained EEXI, with a view to adoption by MEPC 76.

Item 3 - Draft Guidelines on the Shaft/Engine Power Limitation System to comply with the EEXI requirements and use of a power reserve

The CG considered use of a power reserve by un-limiting the shaft / engine power limitation.

ISWG GHG 8 considered following output from industry consultation on EEXI by the Nautical Institute (NI) and the Royal Institution of Naval Architects (RINA) :

- **Precautionary override**. There will be occasions when a ship overrides the EPL or ShaPoLi limitations for safety reasons in anticipation of requiring access to reserve power but does not subsequently use the reserve power. Provision should be made for such events and that reporting should be limited to logbook entry for the event and subsequent resetting of the limitation system. This issue has not been considered in any detail by the CG or the Committee and is not provided for in the current guidance.
- **Ready access to reserve power**. The minimization of the time required to access reserve power will reduce the number of situations where override systems have to be used in anticipation of events and requirements that may not materialize. There are situations where instant access is required so minimizing complexity and access times is essential.
- **Preference for bridge control of overrides**. To facilitate ready access to reserve power the preference should be for override from the bridge without a requirement for attendance in the machinery space.
- **Reserve power button**. The preference is for simple, sealed button access, from the bridge, giving immediate access to reserve power.
- **Reserve power button**. The preference is for simple, sealed button access, from the bridge, giving immediate access to reserve power. A clearly labelled, coloured button, under glass/Perspex, protected by a simple seal, with no delay in accessing power reserve will reduce the need for precautionary override and access.

ISWG GHG 8, mindful of the need to safeguard the safety of ships and crews, agreed to incorporate the proposals in the draft guidelines.

New draft version 2021 guidelines on the shaft / engine power limitation system to comply with the EEXI requirements and use of a power reserve – annex 3 of the present report

ISWG GHG 8 finalized the draft guidelines for their adoption, with a view to adoption by MEPC 76

Item 4 - Draft Guidelines on operational carbon intensity indicators and the calculation methods (CII guidelines, G1)

The following items were in particular considered and discussed by ISWG GHG 8 :

1. The formula of CII of individual ships, especially the proxies for transport work;
2. The need and concrete proposals on introducing certain correction factors and voyage exclusions;
3. The CII of individual ships for trial purposes on a voluntary basis.

The formula of CII of individual ships

The CG recognized that only one single metric should be taken as the mandatory CII for each and every ship type and the mandatory CII should be calculated on the basis of the Data Collection System (DCS).

Hence, the attained annual operational CII of individual ships is calculated as the ratio of the total mass of CO2 emitted to the total transport work undertaken in a given calendar year.

$$\text{Attained CII}_{ship} = M / W$$

However, since the data on cargo/passenger on board a ship have not been covered by the IMO DCS, the dead weight tonnage (DWT) or gross tonnage (GT) has to be taken as a proxy for these vessels.

For easy reference, the metric calculated as "CO2 emissions / (DWT × Distance travelled)" is referred to as AER, while the metric calculated as "CO2 emissions / (GT×Distance travelled)" is referred to as cgDIST.

Indeed, cgDIST was chosen as the mandatory CII for Cruise passenger ship having non- conventional propulsion, Ro-ro cargo ship (vehicle carrier) as well as Ro-ro passenger ship in the draft G1, while AER was applied to all other ship types under consideration.

INTERFERRY suggested to ISWG that all ro-ro type ships (cargo/passenger/vehicle carriers) should make use of GT as the measure of capacity for the purposes of the CII framework. For volume carriers like ro-ro cargo ships, cgDIST would provide a more fair and robust outcome than AER, which would unfairly favour smaller size ships to the detriment of larger size ships.

Many delegations were of the view that the proposal would require further analysis, and the ISWG GHG 8 agreed to not change the metric to cgDIST.

ISWGH also considered document proposal to reflect onboard CO2 capture in the CII calculation guidelines, as onboard CO2 capture is one of GHG emissions reduction technologies aimed by the CII. It was also proposed in the same vein to amend the formula for calculation of the mass of CO2 emissions (M) to cover all CO2 capture systems by inclusion of a variable with the mass of CO2 captured from flue gas measured.

Several delegations, although supporting the proposal in principle, expressed the view that the technology was not deemed mature enough to be integrated at this stage in the CII framework. Consequently, ISWG GHG 8 agreed to not reflect onboard CO2 capture.

Correction factors and voyage exclusions

The CG considered the need and concrete proposals on introducing certain correction factors and voyage exclusions in CII calculation:

- Three categories of correction factors were discussed, namely the correction factors for ice-classed ships, for ships carrying refrigerated containers (reefers), and for ships with cargo-heating/cooling systems or other cargo handling gears.
- The scenarios of voyage exclusion proposed to be excluded from the CII calculation included those specified in Regulation 3.1 of MARPOL Annex VI, sailing in ice conditions, prolonged period without distance travelled, severe weather conditions, dynamic positioning (DP) operations as well as disproportionate fuel consumptions.

Few convergent views were formed. As a result, the CG included the correction factors for ice-classed ships in the draft G1 and put the other correction factors in the square brackets for further consideration.

> 4.3.1 For ships with ice class, the following specific correction factors may be applied:
>
> .1 capacity correction factor for ice-classed ships (*fi*), as given in paragraph 2.2.11.1 in the 2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (see resolution MEPC.308(73)); and
>
> .2 correction factor (*fm*), for ice-classed ships having IA Super and IA or equivalent,3 as given in paragraph 2.2.19 of the 2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships as amended by resolution MEPC.322(74).

Regarding the voyage exclusions, there was no objection to exclude the scenarios stipulated in Regulation 3.1 of MARPOL Annex VI (any emission necessary for the purpose of securing the safety of a ship or saving life at sea) from the CII calculation.

For other scenarios, since no clear convergent view had been formed, the CG put all the scenarios beyond Regulation 3.1 of MARPOL Annex VI in the square brackets for further consideration:

- sailing in ice conditions;
- fuel consumption with no distance travelled for a prolonged period;
- sailing in severe sea states;
- fuel consumption during dynamic positioning operations of shuttle tankers for cargo loading at offshore locations and ship-to-ship transfer.

It was highlighted that the exclusions needed anyway to be exceptional and irregular, or frequent occurrences would result in the exclusion of a large number of voyages.

In view of the limited time available at this session to consider all proposals in detail, ISWG GHG 8 agreed to assess and discuss the proposals for correction factors and voyage exclusions using as guidance of assessment criteria proposed by France, which were based on similar criteria for EEDI correction factors.

France proposes the four following criteria to assess the possibility and the appropriateness of inserting correction factors and voyage exclusions (hereinafter called "CF/VE") in the CII framework:

> ***Criteria 1: Policy justification***. The need for any CF/VE should be demonstrated by transparent analysis evidencing the disproportionate negative impact of the measure on the attained CII for ships exhibiting verifiable heterogeneity of design features, cargo needs or operating profile that are not sufficiently addressed through the shape of the reference lines, the reduction factors or the width of the rating bands.
>
> ***Criteria 2: Accuracy***. The parameters and calculation formulas of correction factors should be based on robust analysis in order to ensure that they accurately reflect the issue they aim to address and do not have "over-correction" effects.
>
> ***Criteria 3: Applicability.*** The CF/VE should be practically implementable and controllable for all ships concerned without excessive complexity.
>
> ***Criteria 4: Capacity to assess their effects***. Before setting up any CF/VE, a transparent analysis of their effects in terms of carbon intensity reduction for international shipping should be undertaken, if possible using actual data rather than estimates, in order to be able to adjust the reduction factors accordingly, as appropriate.

ISWG agreed that these criteria would primarily serve as guidance for decision making, and agreed to include in the resolution text of the draft CII calculation guidelines the need to further consider the proposals for correction factors with a view to enhancing the guidelines before entry into force of the short-term measure.

ISWG also suggested that the correction factors should be included in a new set of guidelines, as appropriate, at MEPC 78 at the latest to allow for the industry to prepare the fleet before entry into force of the CII measure.

The CG established by MEPC 76 would be instructed to consider the various proposals for CF/VE for the development of a new set of guidelines.

The CII of individual ships for trial purposes on a voluntary basis

It was pointed out that the DWT or GT may not be the most suitable elements to represent the capacity of all ship types and both AER and cgDIST would punish a ship with higher payload utilization thus incentivizing lower loads and more ballast voyages.

In fact, compared with the total distance travelled, the use of laden distance in CII calculation may alleviate the biasness in AER and cgDIST. Besides, the energy efficiency operational indicator (EEOI) as defined in document *MEPC.1/Circ.684 on Guidelines for voluntary use of the ship energy efficiency operational indicator (EEOI)* had readily developed a set of metrics to indicate the CO2 emission per transport work. However, the reference lines and rating boundaries could not be developed on these metrics, due to the limitation of the current DCS.

For instance, compared with DWT or GT, the number of available lower berths and the length of the lanes may be more appropriate to represent the capacity of a cruise passenger ship and a ro-ro ship, respectively.

To gain sufficient supporting data for decision-making in the review, CG incorporated a set of trial CIIs in the draft G1 for use on a voluntary basis. It was recognized that a standardized reporting format and verification procedure for the additional voluntary data was needed for the sake of consistency, transparency and reliability. Since there was no mandate for CG to consider the approaches for voluntarily collecting and reporting data beyond current IMO DCS for trial purposes, this issue was suggested to be further considered by ISWG-GHG 8.

ISWG considered the inclusion of operational CII of individual ships for trial purpose in the G1 Guidelines, recalling that the collection of CII data of individual ships for trial purposes would be on a voluntary basis, to be decided by the flag Administration.

ISWG suggested that the Correspondence Group, if established, could further consider possible approaches for voluntarily collecting, verifying and reporting CII data for trial purposes, including developing the associated reporting format and verification procedure to ensure reliability and transparency of these data.

IACS seeked clarity on whether or not it is expected that this voluntary data will be verified. If it is to be verified, then additional amendments to the *2017 Guidelines for Administration verification of ship fuel oil consumption data* (resolution MEPC.292(71)) would be necessary to provide the provision of additional information and documentation necessary for such verification.

Several members noted that the IMO DCS currently does not require the reporting of cargo related information, and to that purpose expressed the view that it would be beneficial to initiate a workstream on reviewing the information collected under IMO's DCS to consider possible changes to the system, which could also support the review of the short- term measure to be finalized by 2026.

New version 2021 guidelines on operational carbon intensity indicators and the calculation methods (CII guidelines, G1) – annex 4 to this report

ISWG GHG 8 finalized the draft guidelines on operational carbon intensity indicators and the calculation methods for their adoption, as set out in annex 5, with a view to adoption by MEPC 76.

Item 5 - Draft Guidelines on the reference lines for use with operational carbon intensity indicators (CII Reference line guidelines, G2)

One reference line is developed for each ship type to which regulation 22B of MARPOL Annex VI applies, based on the specific indicators stipulated in Guidelines on operational carbon intensity indicators and the calculation methods (G1).

For a defined group of ships, the reference line is formulated as follows:

$$CII_{ref} = aCapacity^{-c}$$

- where CIIref is the reference value of year 2019,
- capacity is identical with the one defined in the specific carbon intensity indicator (CII) for a ship type;
- a and c are parameters estimated through median regression fits, taking the attained CII and the Capacity of individual ships collected through IMO DCS in year 2019 as the sample.

The concrete results were calculated by CG using the data in 2019 from the IMO DCS, thus avoiding a back-calculation to the year 2008.

Split reference baselines

In draft G2, the reference line for most ship types were developed as a single and continuous curve over ship capacity. To avoid significant biasness, split (separate) reference lines were developed for bulk carriers, general cargo ships, gas carriers and LNG carriers. However, for gas carriers and LNG carriers, a continuous regression line could hardly be made, due to the significant different distribution patterns of different size groups.

In discussing the opportunity to develop split reference lines within specific ship types depending on their size, ISWG GHG 8 agreed to keep the reference lines suggested by the CG. However, it recognized that these reference lines might be improved subsequently when more data would become available.

ISWG noted that the manner to integrate High-Speed Crafts (HSC) in the CII framework would merit further consideration, despite the small number of ships concerned. To that purpose it has suggested consideration of this very specific matter within the CG to be established at MEPC 76.

At the opposite, proposal from Interferry to split the ro-ro cargo sector into two size bins, below and above 25,000 DWT, proposal from World Shipping Council to split vehicle carrier fleet in three distinct reference lines, were not retained.

2021 guidelines on the reference lines for use with operational carbon intensity indicators (cii reference lines guidelines, G2) – annex 5 to this report

ISWG GHG 8 finalized the draft guidelines on the reference lines with a view to adoption by MEPC 76.

Item 6 - Draft Guidelines on the operational carbon intensity reduction factors relative to reference lines (CII Reduction factor guidelines, G3)

The reduction factors of ship types have been set at the levels to ensure that, in combination with other relevant requirements of MARPOL Annex VI, the reduction in CO2 emissions per transport work by at least 40% by 2030, compared to 2008, can be achieved as an average across international shipping.

The attained annual operational CII of international shipping as a whole is calculated as the ratio of the aggregated mass (in grams) of CO2 (aggregated M) emitted to the aggregated mass (in tonne*nmiles) of transport work(aggregated W) undertaken by all individual ships of representative ship types in a given calendar year, as follows:

Attained CII shipping = aggregated M / aggregated W

The use of ship type specific or flat reduction factors

There were two methodological approaches to assign the reduction factors to ship types :

- One approach was to assign the ship-type specific reduction factors, taking into account the average annual reduction rate of the entire international shipping, the relative carbon intensity level, the improvement already made, the uncertainties in the estimated achievement and the potential for further improvement of each ship type (ship type specific).
- The other approach was to use the average gap of international shipping against 2030 target as the uniform gap of each and every ship type (flat reduction factors).

The members of CG and also ISWG GHG 8 who preferred ship specific reduction highlighted that different ship types had achieved different carbon intensity improvements and would have different potential for further improvements. In their view, it would be unfair if a flat reduction factor was applied to all ship types regardless of the contribution already made and the capability for further improvement.

For instance, Intercargo and Intertanko were opposed to flat reduction, owing to difficulty for bulkers and tankers to make as much effort as others. On a slightly different approach, Denmark raised that some ships have also achieved great reduction whereas some did not. It would be unfair to have flat reduction.

However, the overwhelming majority supported a flat reduction factor at the global fleet level as a starting point.

But, prior to entry into effect of the regulation, this approach should be refined in the guidelines to reflect ship-type specific values using updated data and information, in parallel with further consideration of the proposals for correction factors.

The Correspondence Group set up at MEPC 76 will be requested to work on this view a view to report to MEPC 78, noting that any future change in ship-type specific reduction factors should not impact the agreed overall fleet reduction rate before the review of the measure before 2026.

CII calculation methods and reduction rates

Based on different understandings of the “transport work”, there are generally two types of measurements of the operational carbon intensity of international shipping:

- one is referred to as “demand-based measurement” (Option 1A), indicating the CO2 emissions per actual transport work of international shipping (similar to EEOI of individual ships);
- and the other one is referred to as “supply-based measurement” (Option 2A), indicating the CO2 emissions per transport work proxy (similar to AER or cgDIST of individual ships).

In demand-based measurement, the carbon intensity of international shipping had improved by 31.8% in year 2018 relative to year 2008, while in supply-based measurement the improvement

was 22.0%. Members of the CG had been split in supporting the two main different conceptual and the associated CII reduction factors for the period 2019-2030 of 10% and 21.5%, respectively.

Delegations supporting the demand-based method expressed the view that this approach would more accurately reflect the energy efficiency performance of the fleet as it also reflects the actual amount of cargo transported, instead of a capacity proxy (deadweight or gross tonnage). These delegations also stated that whereas the IMO DCS did not contain cargo-related information to support individual EEOI calculations, the EEOI could still be used to calculate the progress of the fleet. And the associated reduction rate for the period to 2030 (10%) would be a realistic and achievable reduction rate and would avoid unduly penalization of ships caused by elements outside of their control.

On the other hand, delegations in favor of a supply-based measurement expressed the view that the level of ambition of at least 40% carbon intensity reduction by 2030 in the Initial Strategy was agreed on the basis of using the AER metric, therefore the reduction rate up to 2030 would also have to be expressed in AER to maintain that level of ambition. These delegations further recalled that the CII reference lines had been calculated on the basis of the AER since the DCS only allows for AER carbon intensity calculations.

Several of the delegations supporting the supply-based approach further supported reduction rates until 2030 of 31% to 53% and up to 75%, expressing the view that only these numbers would ensure a reduction pathway consistent with the Paris Agreement in line with the latest climate science.

Some supports of supply approach highlighted that the comprehensive impact assessment of the short-term measure had not assessed those reduction rates, but had only modelled the 10% and 21.5% reduction rates that were considered by the CG.

At a first stage, a majority of Member States supported at least until the review of the measure by 2026, a 22% reduction rate until 2030 should be the absolute minimum reduction rate to avoid endangering achieving at least 40% carbon intensity reduction by 2030.

But ISWG agreed to the Chair's proposal to table a compromise paper, with content as follows. The discussion on this proposal opened a quite lively debate which put into relief political oppositions.

Consideration of a possible compromise on calculation methods

ISWG GHG8 considered that the Organization could continue to monitor development in annual carbon intensity improvement using both the AER and EEOI in parallel to the annual analysis of the fuel consumption data reported to the IMO DCS.

It was suggested that the Organization continues to do so to make sure that the fleet will meet the targets set in the Initial Strategy. This monitoring exercise could also inform the review of the short-term measure at the review stage before 2026.

Consideration of a possible compromise on the CII reduction rates

With the regard to the reduction rates, some delegations, referring to the already achieved carbon intensity improvements, kept stating that an 11% reduction rate would be in line with the objectives of the Initial strategy while other delegations estimated that this rate should be above 22%.

Many delegations suggested that the reduction effort (Z-factor) could follow a non-linear curve until 2030, and that the stricter reduction rates after 2026 could be considered for confirmation as

part of the review. On the opposite, some delegates feared that an added effort concentrated on the last years of the decade would be unbearable for shipping sector.

The compromise proposed by the Chair sets up a non-linear approach, in respect of the following three conditions :

- the selected reduction rates will achieve the levels of ambitions set out in the Initial Strategy;
- the selected reduction rates fall within the scope of the levels of reduction assessed in the comprehensive impact assessment accompanying the draft amendments to MARPOL Annex VI on the short-term measure;
- the Z-factors for the different phases can be verified by the method of calculation set out in the draft G3 guidelines.

This non-linear curve will consist of three consecutive phases, with the understanding that the Z-factor for:

- phase 1 is similar to business as usual carbon intensity improvement until entry-into-force ;
- phase 2 is defined as 2%;
- phase 3 will be further strengthened and developed taking into account the review of the short-term measure.

Years	
2020	1.0%*
2021	1.0%*
2022	1.0%*
2023	2.0%
2024	2.0%
2025	2.0%
2026	2.0%
2027	
2028	
2029	
2030	

A majority of delegations did express support for the phased approach, whereas the respective level of reduction raised many comments.

Many delegations expressed their concern that such a reduction path is unlikely to meet the 2030 level of ambition of reducing carbon intensity of international shipping by at least 40% by 2030, compared to 2008, and even more the objective “well below 2°C above preindustrial levels” and to limit the temperature increase to 1.5°C above pre-industrial levels. “This position is not the way forward” (USA representative).

But given that the fact of returning to MEPC 76 without any proposal would have been a stinging failure for this ISWG, and would have augured badly for the results of next MEPC (Norway, Mexico, Japan, Russia expressed themselves in that sense), a small majority - mainly relying on States with conservative approaches of the climate issue- has nevertheless emerged.

New draft Guidelines on the operational carbon intensity reduction factors relative to reference lines (CII Reduction factor guidelines, G3) (annex 6 to this report, but not yet available from IMO Secretariat)

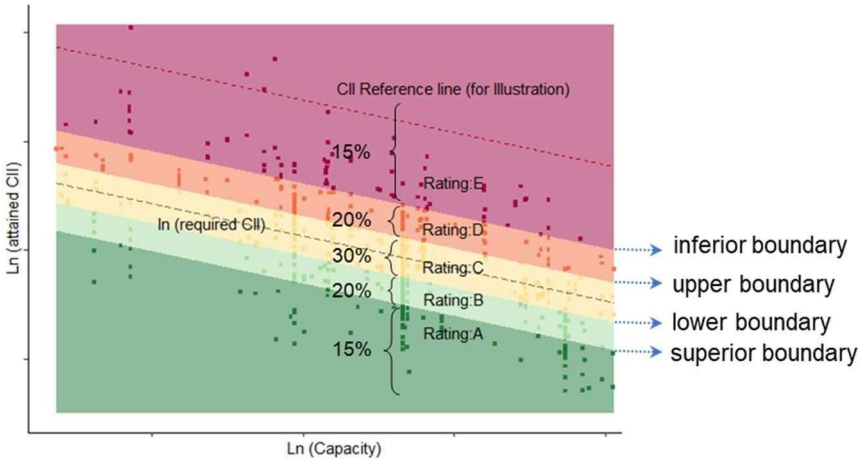
Despite an obvious dissatisfaction from many representatives of Member States, ISWG GHG 8 finalized the draft guidelines on the reference lines (G3) with a view to adoption by MEPC 76.

The Chair ascertained that he will reflect the split views on this topic in his report to MEPC 76.

Item 7 - Draft Guidelines on the operational carbon intensity rating of ships (CII Rating Guidelines-G4)

Operational carbon intensity rating means to assign a ranking label from among the five grades (A, B, C, D and E) to the ship based on the attained annual operational carbon intensity indicator, indicating a major superior, minor superior, moderate, minor inferior, or inferior performance level.

To facilitate the rating assignment, for each year from 2023 to 2030, four boundaries are defined for the five-grade rating mechanism, namely superior boundary, lower boundary, upper boundary, and inferior boundary.



Some potential approaches to set the size-dependent rating boundaries were presented to CG, including the use of commercial size categories and the introduction of certain size-dependent correction parameters. However, a majority of the CG members did not support to further correct the rating boundaries by ship size

ISWG GHG 8 has decided to keep the rating boundaries set by the CG, recalling that the reference lines were already size-dependent but recognized that some adjustments could still be done on this matter.

It agreed that all proposals addressing inequities between ship types (i.e. correction factors, refined reference lines, etc.) should be considered holistically within the CG to be established by MEPC 76.

Hence, proposals to widen the rating band for smaller general cargo ships and containerships or to develop size- dependent correction factors for bulk carriers and tankers to adjust the rating boundaries, have been referred to this coming CG.

New draft Guidelines on the operational carbon intensity rating of ships (CII Rating Guidelines-G4)

ISWG GHG 8 has finalized the CII Rating Guidelines (G4), with a view to adoption by MEPC 76.

Item 8 - Update of the 2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP) (resolution MEPC.282(70))

The SEEMP was unlikely to be finalized at this session as the finalization on the CII guidelines was a prerequisite for the further development of the SEEMP guidelines.

ISWG GHG 8 considered three main issues:

- audit and verification of the SEEMP;
- compliance on a company/fleet level basis;
- the structure of the SEEMP Guidelines.

Audit and verification – Structure of the SEEMP

ISWG GHG 8 has decided to keep the rating boundaries set by the CG, recalling that the reference lines were already size-dependent but recognized that some adjustments could still be done on this matter.

It agreed that all proposals addressing inequities between ship types (i.e. correction factors, refined reference lines, etc.) should be considered holistically within the CG to be established by MEPC 76.
IACS recommends that for ships, to which draft new regulation 28 applies, the Committee decides whether the SEEMP should be:

- a ship specific management plan, but revised to comply with draft new regulation 26.3 and describing how the ship will comply with draft new regulation 28; or
- an auditable company management system for energy efficiency, which could be achieved by recommending that the SEEMP be updated to apply the provisions of sections 2, 3, 4, 5, 6, 7, 9, 11 and 12 of the ISM Code or the equivalent provisions of another relevant recognized standard (e.g. ISO 50001:2018).

In the latter approach, the SEEMP would become a Company document associated with the Company and ship specific certification (similar to the certification provisions of the ISM Code). However, the draft amendments to MARPOL Annex VI do not provide for such certification.

Should the Committee consequently consider that the SEEMP should remain a ship specific management plan, it would imply that the verification of the SEEMP would be:

- the means of verifying data submitted to the IMO DCS and the ship's carbon intensity rating;
- the means of verifying performance of the ship between annual verifications;
- the means confirming that corrective actions are being implemented.

Referring to that additional verification audits applicable to ships rated D for three consecutive years or E in any year, the current draft amendments to MARPOL Annex VI do not make the issuance of Statement of Compliance related to fuel oil consumption and operational carbon intensity rating subject to the verification of the SEEMP. The issuance of Statement of Compliance is subject to verification of the data submitted by the Company to the Administration in accordance with draft new regulations 27 and 28 only.

Making issuance of the Statement of Compliance (or indeed the validity of the IEEC) subject to SEEMP verification, as well as the verification of data submitted to the Administration in accordance with draft new regulations 27, 28 and 6.6, would require modifications to the draft amendments to MARPOL Annex VI.

Compliance on company fleet level base

ISWG GHG 8 also considered a proposal for the SEEMP guidelines to include an option for compliance at company/fleet level.

CLIA and WSC provided a detailed discussion of the advantages of a "Fleet-Level Monitoring" (FLM). It points that a CII monitoring system focusing on individual ships will invariably lead the owners and operators to put their efforts on those ships that receive lower ratings rather than resulting in their retirement. On the contrary, FLM can encourage new and innovative investments in shipboard technologies, alternative fuels and the introduction of high performing ships.

Denmark also considered that the short-term measure should include a fleet-averaging approach as an optional compliance mechanism.

Some delegations expressed support for the proposed approach, highlighting that it could provide opportunities to incentivize the uptake of low-carbon technologies and ships.

Some other delegations, whilst seeing merit in the proposed mechanism, considered that it would be premature to include such option in the SEEMP guidelines but that it could be further considered as part of the mid- and long-term measures.

Many delegations expressed concerns regarding the proposed approach, especially regarding its legal implications, i.e. that a fleet averaging approach was not in line with the current structure of the MARPOL Convention which is based on an individual ships' compliance, and the inequity that this approach could have for companies with small fleets.

According to this proposal, less efficient ships and more efficient ships that belong to the same fleet could be balanced. The proposal was supported and opposed. The Group considered that it might be difficult to include compliance at company/fleet level basis into the guidelines, since this was not addressed in the MARPOL amendments. One member noted that such a fleet averaging program should not be addressed in the guidance as this would be a regulatory change that affects not just the fleets that can average, but their competitiveness with other fleets and/or smaller fleets that cannot average as easily. The Group agreed not to include the proposal at this stage but to seek clarification from the Committee on whether this issue could be dealt with in the guidelines or whether it should be addressed at the level of the Convention.

Thus, ISWG GHG 8 agreed not to include this option in the updated SEEMP Guidelines.

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Due to time constraints, the ISWG could not consider following items :

- Update of other existing guidelines, procedures and guidance (to be addressed by the CG) ;
- List of technical guidelines that could be consolidated into a mandatory carbon intensity code (to be addressed at next ISWG GHG.

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Terms of reference of working groups to be considered by MEPC 76

Correspondence group on carbon intensity reduction

The CG is instructed to:

- further consider and finalize the draft updated *Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP)*,
- further consider and update existing guidelines, procedures or guidance, taking into account comments and decisions made at ISWG-GHG 8 and MEPC 76, including
    - 2017 Guidelines for administration verification of ship fuel oil consumption data (resolution MEPC.292(71));
    - 2017 Guidelines for the development and management of the IMO Ship Fuel Oil Consumption Database (resolution MEPC.293(71));
    - Procedure on Submission of data to the IMO data collection system of fuel oil consumption of ships from a State not Party to MARPOL Annex VI (MEPC.1/Circ.871); and
    - Procedures for port State control, 2019 (resolution A.1138(31));
- develop draft guidelines on correction factors for certain ship types, operational profiles and/or voyages for the CII framework (new G5)
- develop in new or existing guidelines specific guidance on:
    - the audit and verification processes of SEEMP including verification of revised SEEMP for ships required to develop a plan of corrective actions (PCA);
    - report, verification and submission of data for trial CIIs on voluntary basis;
- submit an interim report to MEPC 77, and a final report to MEPC 78 in 2022, to be first considered by ISWG-GHG 10

ISWG-GHG 9 (October 2021)

The ISWG is instructed to :

- consider any issue arising from the interim report of the Correspondence Group on Carbon Intensity Reduction;
- further consider the scope of and timeline for development of a mandatory carbon intensity code;
- further consideration of concrete proposals to encourage the uptake of alternative low-carbon and zero-carbon fuels, including the development of lifecycle GHG/carbon intensity guidelines for all relevant types of fuels and incentive schemes;
- further consideration of concrete proposals to reduce methane slip and emissions of Volatile Organic Compounds (VOCs);
- submit a written report to MEPC 77.

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TABLE OF ANNEXES