OPPORTUNITY GREEN

IMO Briefing: 21st Session of the Intersessional Working Group on Reduction of Greenhouse Gas Emissions from Ships & 84th Session of the Marine Environment Protection Committee

ISWG: 20-24 April / MEPC: 27 April-1 May

Summary

The April 2026 IMO meetings will cover several crucial topics central to advancing the decarbonisation of international shipping.

Key discussions at ISWG21 will focus on definitions and reward guidelines for ZNZ fuels, and the LCA Framework, including default emission factors, methodological choices, certification systems, and sustainability considerations. A central point of discussion will be ensuring that these frameworks support a just and equitable transition, particularly for climate vulnerable developing countries, while providing transparency, predictability, and clear investment signals for industry.

At MEPC84, it will be critical to maintain momentum in safeguarding compliance with GHG targets, and providing a strong foundation for effective implementation of the NZF.

Note:

(1) **Decisions at these meetings are made by consensus**, based on the Chair's understanding of the views expressed during the meetings. **Member States must attend and intervene, or / and make written submissions to the meetings, to have their views considered.**

(2) Unless stated otherwise, all summaries are a synthesis of the text in the corresponding submission, and are not reflections of Opportunity Green's views.

(3) Some summaries are accompanied by Opportunity Green analysis or context not contained within the submissions, this analysis is clearly signposted in the text.

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List of Abbreviations

CII	Carbon Intensity Indicator
CCS	Carbon Capture and Storage
CoC	Chain of Custody
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
DCS	Data Collection System
DLUC	Direct Land Use Change
DNIs	Disproportionate Negative Impacts
EU ETS	European Union Emissions Trading Scheme
EU RED	European Union Renewable Energy Directive
FAME	Fatty acid methyl ester
FLL	Fuel Lifecycle Label
g/MJ	Grams per MegaJoule
gCO2eq/MJ	Grams of Carbon Dioxide equivalent per MegaJoule
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GFI	GHG Fuel Intensity
GFS	Global Fuel Standard
GHG	Greenhouse Gas
GISIS	Global Integrated Shipping Information System
GO	Guarantee of Origin
IACtHR	Inter-American Court of Human Rights
ICAO	International Civil Aviation Organization
ICJ	International Court of Justice
ILUC	Indirect Land Use Change
IMO	International Maritime Organization
IOPC Funds	International Oil Pollution Compensation Funds
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ISWG-GHG	Intersessional Working Group on GHG
ITLOS	International Tribunal for the Law of the Sea
JET	Just and Equitable Transition
LCA	Life Cycle GHG Intensity of Marine Fuels
LDCs	Least Developed Countries
LNG	Liquefied Natural Gas
MARPOL	International Convention for the Prevention of Pollution from Ships

MEPC	Marine Environment Protection Committee
MEPC ES.2	The 2nd Extraordinary Session of the MEPC
NZF	Net-Zero Framework
OCCS	Onboard Capture and Storage
PPA	Power Purchase Agreement
RU	Remedial Unit
SEEMP	Ship Energy Efficiency Management Plan
SFCS	Sustainable Fuel Certification Scheme
SIDS	Small Island Developing States
SU	Surplus Unit
The Fund	The Net-Zero Fund
ToR	Terms of Reference
TtW	Tank-to-Wake
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollars
WAPS	Wind-Assisted Propulsion System
WPS	Wind Propulsion System
WtT	Well-to-Tank
WtW	Well-to-Wake
ZNZ	Zero or Near-Zero emissions fuels and technologies

Section 1: Outcomes of the October 2025 IMO Meetings

1.1 Outcome of MEPC ES.2

The Second Extraordinary Session of the International Maritime Organization's (IMO) Marine Environment Protection Committee (MEPC ES.2), which convened 14 to 17 October 2025, was expected to mark a pivotal moment in international climate governance: the adoption of the IMO's Net-Zero Framework (NZF)[1], amongst other draft regulations. The NZF is a draft global regulation mandating emissions reductions across the international shipping industry.

If adopted at MEPC ES.2, the NZF would have proceeded to the 'acceptance' stage (2025- 2026), before its entry into force (2027) and operationalisation (2028). However, at MEPC ES.2, a simple majority of the IMO Member States present voted in favour of adjourning the meeting, and therefore delaying adoption of the NZF, for one year. This immediately prevented any further consideration of the adoption of the draft. The adjournment does not affect the content of the NZF itself, which remains in current form.

While disappointing, the one-year adjournment is an opportunity for countries to continue to build support for the NZF's adoption, including by clarifying foundational details that have been subject to limited discussion to date, such as the operationalisation of the IMO Net-Zero Fund and ZNZ definition and reward – key topics to be carried over into MEPC84.

Sustained cooperation at ISWG-GHG20 in the week following the MEPC ES.2 indicated broad recognition of the NZF's value and an interest in shaping its implementation. MEPC84 will be a crucial opportunity for Member States to continue positive engagement, prior to the reconsideration of the NZF later in 2026.

1.2 Voting Dynamics at MEPC ES.2

Of those attending MEPC ES.2 with voting rights and credentials in order, Member States voted in the following way:

MEPC ES.2 Voting Dynamics				
	Adjourn	Do not adjourn	Abstain	Not present
IMO Member State votes	57	49	21	8
Votes from Parties to MARPOL Annex VI[2]	36	46	0	0

1.3 Implications for the Net Zero Framework

The one-year adjournment raises key issues for consideration at MEPC84, including implications related to the dates and timelines presented in the text of the NZF.

Designing an equitable revenue distribution and fund governance framework:

[1] International Maritime Organization, 2025, Circular Letter No.5005: Draft revised MARPOL Annex VI, available at: IMO DOCS

[2] The procedural motion to adjourn ES.2 in October 2025 was under Rule 31 of MEPC Rules of Procedure, which applied to the conduct of business rather than adoption of the draft measures. This enabled all IMO Member States present and voting to vote and influence the adoption of the NZF, irrespective of Annex VI status. In accordance with the relevant procedure for the amendment of Annex VI of MARPOL, only those who have ratified Annex VI will be able to vote on adoption of the NZF.

Enshrining principles of equity and fairness within the IMO Net-Zero Fund's operating rules will be essential to ensuring those most vulnerable to the impacts of both climate change and decarbonisation initiatives are not left behind during the maritime transition[3]. Equitable design of the IMO Net-Zero Fund will enable a just and inclusive transition worldwide. Clear fund governance structures that guarantee inclusive representation, accessibility to funds, and equity-focused disbursement may help to strengthen confidence in the NZF's fairness and effectiveness, increasing the likelihood of consensus at the next MEPC session.

Designing robust guidelines related to zero or near-zero GHG emission technologies, fuels and/or technologies (ZNZs):

The adjournment period offers an opportunity to enhance the technical robustness of the guidelines on ZNZs and lifecycle GHG (LCA) analysis[4]. Strengthening these elements will not only ensure environmental integrity but also help build confidence and consensus among Member States ahead of the NZF's reconsideration for adoption.

Updated implementation timeline:

The delay in adopting the NZF at MEPC ES.2 risks undermining progress toward the emissions-reduction targets established in the IMO 2023 GHG Strategy[5] and risks further misalignment between international shipping's decarbonisation and the Paris Agreement's 1.5°C goal[6].

The IMO 2023 GHG Strategy committed to set international shipping on track for:

- at least 20%, striving for 30%, emissions reductions by 2030, compared to 2008.
- at least 70%, striving for 80% emissions reductions by 2040.
- net-zero GHG emissions by or around, i.e. close to 2050.

Analyses suggest the NZF in its existing form would only achieve 8–10% emissions reductions[7]. The delay would likely only exacerbate this shortfall, creating regulatory uncertainty and allowing emissions to continue unabated.

The NZF set out the following milestones for implementation:

- Ship registration in the IMO GHG Fuel Intensity (GFI) Registry by 1 October 2027 and shall pay its first annual administration fee by 30 June 2028 (Regulation 38(2)).
- ZNZ rewards defined by the Committee no later than 1 March 2027 and every five years thereafter and the methodology to determine such reward (Regulation 39(3)).

[3] Opportunity Green, 2025, A just and equitable transition for shipping, available at: https://opportunitygreen.org/climate-justice/reports/a-just-and-equitable-transition-for-shipping/
[4] Opportunity Green, 2025, IMO Net-Zero Framework: opportunities for ambitious action, available at: https://opportunitygreen.org/shipping/guides/imo-net-zero-framework/
[5] International Maritime Organization, 2023, 2023 IMO Strategy on Reduction of GHG Emissions from Ships, available at: https://www.imo.org/en/ourwork/environment/pages/2023-imo-strategy-on-reduction-of-ghg-emissions-from-ships.aspx
[6] Opportunity Green, 2025, Adjournment of the IMO's Net-Zero Framework, available at: https://opportunitygreen.org/shipping/briefings/imo-net-zero-framework-adjournment-oct-2025-implications/
[7] Transport & Environment, 2015, IMO Net-Zero Framework: Assessing the impact of the IMO's draft Net-Zero Framework, available at: https://uploads.transportenvironment.org/production/files/Impact-of-the-IMOs-draft-Net-Zero-Framework-April-2025.pdf

- Determine the mechanism for reviewing and defining the price of a Tier 1 and Tier 2 remedial unit by 1 January 2028, for the reporting periods starting 2031 and onwards (Regulation 36(10)).
- Ships to calculate the attained annual GFI after the end of calendar year 2028 and after the end of each calendar year thereafter (Regulation 33(1)).
- Initial pricing of remedial units set for reporting periods between 2028-2030. Tier 1 remedial unit shall be USD 100 per tonne of CO2eq, and Tier 2 remedial unit shall be USD 380 per tonne of CO2eq, both on a well-to-wake basis (Regulation 36(8)).

With adoption deferred until at least October 2026, each of these milestones will need to be considered in light of the one-year delay, requiring text-based amendments to align with the regulatory calendar.

Section 2: The April 2026 IMO Meetings at a glance

2.1 Key issues to be discussed at ISWG21 (20 – 24 April)

In document **MEPC 84/7/14**, the **IMO Secretariat** provides a summary of ISWG-GHG 20, held 20th – 24th October 2025. The main debates surrounded: whether or not to begin developing or revising guidelines, provisions, guidance and other documents to support implementation of the NZF; further consideration of the LCA framework, and the development of the terms of reference (ToR) for the 5th IMO GHG Study.

2.1.1 GHG Fuel Intensity (GFI)

A central point of discussion is how the Registry should align with existing frameworks, particularly the IMO Data Collection System (DCS) and Carbon Intensity Indicator (CII), to avoid duplication and minimise admin burden. Several submissions from Member States advocate for full procedural integration, including expanding existing verification guidelines to cover GFI and ensuring consistency with fuel certification systems (e.g., Fuel Lifecycle Labels). There are also open questions around data verification, treatment of electricity (including use of Power Purchase Agreements and Guarantees of Origin), and how to incorporate emerging technologies such as Onboard Carbon Capture and Storage (OCCS).

There are concerns relating to methodological choices within the GFI framework, including how to account for zero-emission energy sources and innovative technologies. Submissions include defining and incorporating energy from wind propulsion systems (WPS), solar, and shore power, alongside the use of conversion factors to ensure fair comparison with conventional fuels. Significant technical work remains, particularly on methodologies for calculating energy contributions from WPS, accounting for additional operational factors (e.g., ice conditions), and clarifying system boundaries (e.g., electricity transfer between ships). The proposed introduction of an energy multiplier for ZNZ fuels remains contentious, with diverging views on its eligibility criteria, value, and duration.

2.1.2 Draft guidelines on ZNZs

A draft of the ZNZ reward guidelines is presented, resulting from intersessional work by an informal discussion group. The key issues are:

- What mechanism should be used to grant rewards?

- What methodology should be used to calculate the emissions avoided by using ZNZs?
- Should reward rates differentiate by fuel/technology type and/or by region to reflect lifecycle impacts not captured in standard LCA, regional cost variations, and pathway-specific sustainability considerations?

Strong positions are conveyed from both sides on the issue of differentiation vs agnosticism with respect to fuels and technologies. Opinions on the reward mechanism broadly favour the reverse auction option. The need for the ZNZ reward guidelines to align with the LCA Guidelines and the 2023 IMO GHG Strategy is highlighted, and urgency is encouraged to develop all the necessary components of the ZNZ reward process efficiently. To avoid jeopardising a just and equitable transition, it is noted that broader sustainability impacts of ZNZs which fall outside the scope of the LCA should be considered in the ZNZ guidelines, and the proportion of funds available for ZNZ rewards should be set at a reasonable level to allow sufficient funds for the other disbursement categories which support a just and equitable transition.

2.1.3 The Net-Zero Fund

Similar to the above, submissions on the Net-Zero Fund focus on three core topics: establishment, administration and governance; revenue disbursement, and a just and equitable transition.

The key questions around establishment, administration and governance concern the legal and institutional structure under which the Fund should be established and by whom it should be administered, and the composition and mandate of the Fund's governing body to ensure diverse representation, transparency and accountability, and effectiveness. Revenue disbursement is a critical issue, as it determines the value, types and beneficiaries of financing issued. Submissions comment on the methodology for distributing revenues across the three categories set out in draft Regulation 41 (ZNZ rewards, just and equitable transition, and administrative and operational costs); the criteria for eligibility to receive funds, and the selection of implementing entities. Revenue disbursement has direct consequences on the Fund's ability to support a just and equitable transition. This is emphasised, and suggestions are offered as to how the Fund could best support developing countries, including ensuring the financing is accessible, especially to those countries who have historically faced barriers; directing funds to mitigate DNIs, and aligning fund disbursement with national development priorities, particularly for SIDS and LDCs.

2.1.4 LCA Guidelines

One key area of debate under the LCA Guidelines is the design of chain of custody (CoC)[8] models (e.g., mass balance[9], book-and-claim[10], physical segregation[11]), with trade-offs

[8] Chain of custody models refers to various traceability systems that track materials- in this case ZNZ fuels- from production to use, to ensure its environmental claims are credible. It's like a 'paper trail' showing that the fuel you bought really came from a verified sustainable source.

[9] Mass balance allows for the mixing of sustainable fuels with conventional fuels, provided the total sustainable output claimed does not exceed the certified input volume.

[10] Book-and-claim means that instead of delivering the physical fuel to the ship, a company can buy credits representing the environmental benefit of sustainable fuels produced elsewhere.

[11] Physical segregation is when sustainable fuels are kept physically separate from conventional fuels from production through to ship use.

between scalability and environmental integrity. Concerns focus on risks of double counting, weak traceability, and fraud if design parameters, such as balance periods and system boundaries, are not sufficiently stringent. Linked to this, the governance and recognition of Sustainable Fuel Certification Schemes (SFCS) remain unresolved, including the role of Member States, data reporting requirements, and alignment between fuel certification and ship-level emissions reporting. Ensuring transparency, comparability, and protection of commercially sensitive data are also key considerations.

A second set of issues relates to default emission factors and broader methodological gaps in lifecycle accounting. There is ongoing debate over how to define and apply 'representativeness' and 'conservativeness', with a need for scientifically robust, high-end default values to avoid under-reporting emissions. Significant divergences in proposed values, particularly for LNG, biodiesel, and ammonia, highlight risks to consistency and environmental integrity. Cross-cutting challenges include limited progress in developing default factors, lack of clarity on treatment of indirect land-use change (ILUC), and incomplete methodologies for emerging pathways such as onboard carbon capture and storage (OCCS). Broader concerns also include how to address sustainability themes (e.g., land use, water, social impacts) without undermining comparability or creating regulatory gaps, as well as whether the current framework adequately captures indirect climate impacts and avoids incentivising high-emission or unsustainable fuel pathways. Section 4 provides further detail on these topics.

2.2 Key issues to be discussed at MEPC84 (27 April – 1 May 2026)

Despite the one-year adjournment of a decision to adopt the Net-Zero Framework from October 2025, discussions on the Framework are expected to resume at MEPC84 in April. Two primary positions are emerging (1) adoption of the NZF as it was approved at MEPC83 in April 2025, (2) a weakened approach with either a single-tier Global Fuel Standard (GFS) (as opposed to the current two-tier option) or no economic element[12]. The direction taken will have significant implications for both the pace and equity of maritime decarbonisation.

The choice between these options will determine if the NZF can deliver the outcomes of the IMO 2023 GHG Strategy. Scenarios without an economic element, or with weakened standards, will be unable to deliver the emissions reductions required in the Strategy and even less so in accordance with the Paris Agreement. Importantly, removal of the economic element is likely to create substantial policy uncertainty and investment risk, by eliminating a clear and predictable carbon price signal, thereby failing to bridge the cost gap between fossil fuels and ZNZs, and increasing the risk of stranded assets and delayed investment decisions across the fuel supply chain and fleet transition.

2.2.1 Adopting the Net-Zero Framework 'as is'

The NZF as currently approved combines a two-tier GFI structure with credit trading, creating both compliance incentives and a mechanism to generate stable and predictable revenues. These revenues are critical not only for supporting truly sustainable fuel uptake, but also for

[12] Smith, T and Spiegelenberg, F., 2026, Uncertainty at the IMO: Three scenarios and their consequences for shipping's transition, available at: https://globalmaritimeforum.org/insight/three-scenarios-and-their-consequences-for-shippings-transition/

enabling a just and equitable transition, particularly for Small-Island Developing States (SIDS) and Least Developed Countries (LDCs) that are most exposed to the impacts of both accelerating climate change and higher transport costs [13]. Without such mechanisms, alternative approaches risk imposing costs on these countries without providing the financial support needed to manage the transition.

The NZF 'as is' is not without limitations[14], representing a significant compromise by Member States from initial more ambitious proposals after years of detailed discussions. It remains the only option currently on the table capable of providing the strong signal needed to drive investment in ZNZ fuels and provides a firm foundation to increase future ambition and achieve a just and equitable transition for climate-vulnerable countries.

The **Solomon Islands and Mexico *(in MEPC 84/7/34)*** support adopting the NZF as it was approved at MEPC83, highlighting the considerable progress that has been made since ISWG-GHG20 in October 2025, to further develop the necessary implementing instruments of the Framework. In particular, work on the development of draft guidelines related to the calculation and verification of the attained annual GFI, ZNZ rewards and methodology to determine such rewards, the definition, evaluation, approval, monitoring and publication of uptake of ZNZs; as well as ongoing progress on SFCSs, IMO LCA Framework, and the IMO Net-Zero Fund. As such the sponsors argue that the Framework is sufficiently mature, feasible, and capable of delivering meaningful emissions reductions while supporting a just and equitable transition. The proposal emphasises that the NZF is the only proposal containing both a goal-based marine fuel standard and a maritime GHG emissions pricing mechanism that can bring the shipping sector closer to delivering the commitments in the 2023 IMO GHG Strategy.

Fiji, Kiribati, Nauru, Palau, Solomon Islands, Tuvalu and Vanuatu *(in MEPC 84/7/28)* similarly reiterate their support for the NZF 'as is' and argue that the text should not be reopened beyond editorial changes. However, if it is reopened for substantive changes, the co-sponsors will propose the amendments set out in MEPC 84/7/36, including a global levy. Fiji et al highlight that the 1-year delay in the adoption of the NZF risks derailing the timelines agreed in the 2023 IMO GHG Strategy, which are aligned to the needs of climate-vulnerable countries, and emphasise the urgency of action. The co-sponsors recall that the NZF represents a delicate balance, is the result of compromise from all sides and, while falling short of 1.5°C, is the only politically viable option to achieve a just and equitable transition of the shipping sector in line with the 2023 IMO GHG strategy. The submission emphasises than any further compromise — including removing the economic element, weakening compliance, weakening implementation, or adopting the NZF in phases — would jeopardise the integrity of the NZF. Lastly, given the delay to the NZF as the mid-term measures of the IMO GHG Strategy, the co-sponsors urge strengthening the CII of

[13] Opportunity Green, 2025, The IMO must champion ambition and equity in shipping climate talks, available at: https://opportunitygreen.org/climate-justice/press-releases/imo-must-champion-ambition-equity-in-critical-shipping-climate-talks/

[14] Opportunity Green, 2025, 5 reasons why the IMO's Net-Zero Framework fails to support a just and equitable transition, available at: https://opportunitygreen.org/climate-justice/insights/5-reasons-why-imo-net-zero-framework-fails-to-support-just-equitable-transition/

the short-term measures to compensate and ensure the achievement of absolute emissions reductions this decade.

The **Solomon Islands** ***(in MEPC 84/7/39)*** adds that the NZF is the best available negotiated framework to deliver the 2023 IMO GHG Strategy and rejects calls to restart negotiations, arguing that this is not realistic and would delay urgent climate action. The submission emphasises that points made in the Argentina et al submission (section 2.2.3) are not new and were considered in previous negotiations, noting that aligning ambition with current fuel market conditions is inconsistent with the IMO's objective to drive uptake of ZNZ fuels.

Brazil ***(in MEPC 84/7/37)*** focuses on rebuilding consensus around the NZF as it was approved at MEPC83, with only necessary adjustments to the implementation timelines to reflect the adjournment period. The sponsor also highlights the importance of advancing priority guidelines (including GFI calculation, ZNZ rewards, and the functioning of the Net-Zero Fund). The proposal cautions against reopening key design elements of the Framework and supports maintaining established IMO procedures, including tacit acceptance, to avoid further delays.

Pacific Environment ***(in MEPC 84/7/45)*** recalls the advisory opinions recently issued by the ICJ, IACHR, and ITLOS which confirm that all States face binding legal obligations under numerous international legal instruments to reduce GHG emissions to a 1.5°C-aligned level, to protect and preserve the marine environment, and to fulfil their climate finance commitments. The primary legal instruments are the Paris Agreement under the UNFCCC, customary international law, which is binding on all states, regardless of their signatory status to any agreement, the United Nations Law of the Sea (UNCLOS) and international human rights law. Pacific Environment note that the obligations fall broadly into two categories: reducing GHG emissions and preventing environmental harm, and providing climate finance and support from developed to developing countries. Pacific Environment emphasises that the adoption of the NZF would help States to comply with these existing international legal obligations in an internationally coordinated way, although the sponsors note that further emissions reduction measures are required to put global shipping on a 1.5°C-aligned pathway. Finally, the submission underlines that - even if States do not adopt the NZF - they remain bound to act to achieve their international legal obligations, and failure to do so may carry significant legal consequences.

Norway ***(in MEPC 84/7/25)*** highlights the precarious state of the climate due to burning fossil fuels, and proposes that the Secretariat liaise with the World Meteorological Organisation (WMO), the IPCC and other relevant organisations to provide regular updates on the status of climate change and its impacts.

2.2.3 Alternatives to the approved NZF

A key issue expected to dominate negotiations on this topic is the role of economic measures in driving the uptake of scalable ZNZ fuels. Proposals that remove the economic element entirely would rely solely on GFI targets, without credit trading, carbon pricing, or revenue-generating mechanisms such as the proposed Net-Zero Fund. The economic element currently included in the NZF represents a significant compromise from initial, more ambitious proposals, and was approved by Members States after years of discussion.

OG analysis: New proposals, such as those outlined below, to weaken, or remove, the economic element would provide little to no effective enforcement or demand signal, increasing the likelihood of delayed implementation and leaving the transition largely dependent on voluntary industry action.

Furthermore, industry is clear that clarity and stability are key elements required to enable decarbonisation investment for first-movers[15]. While the NZF "as is" provides a clear path to guide investment decisions, new proposals would fail to establish this[16].

Argentina, Liberia, and Panama *(in MEPC84/7/38)* propose replacing the NZF with a market-based approach to adjusting the GFI trajectory, explicitly removing the economic element. Under this model, the GFI would only tighten in response to demonstrated affordability, availability, and uptake of low-carbon fuels.

OG analysis: This proposal removes the predictable and stable economic elements of the NZF "as is", creating a clear barrier to early industry investment. The approach also means that the emissions reductions required by the GFI trajectory are dependent on market dynamics, meaning they could be delayed or stall entirely if market conditions do not evolve rapidly. This risk is heightened by the proposed removal of the Net-Zero Fund, the primary mechanism by which the NZF "as is" would incentivize the uptake of fuels which can offer substantial emissions reductions, which are not currently commercially viable or available at scale, through reinvestment of revenues collected from non-compliance. The proposed approach is instead likely to favour further uptake of fuels like LNG[17], which are already commercially available but cannot deliver meaningful emissions reductions.

Meanwhile, **Japan *(in MEPC84/7/49)*** aims to provide a basis for a discussion among Member States by outlining possible options to address concerns raised at ES.2, whilst explicitly noting that these do not represent their national preferences. The submission highlights divergent views (1) against a 'global carbon tax' and the establishment of an IMO Net-Zero Fund (2) the stringency and feasibility of GFI targets, particularly the elimination of LNG. Japan sets out potential options, including replacing mandatory payments to the Fund by allowing greater use of surplus units, revising base and direct compliance targets, and maintaining a technology-neutral approach to fuel assessment.

OG analysis: The two options outlined by Japan would remove the stable and predictable economic elements of the NZF "as is", replacing these instead with a surplus unit market where price is variable and uncertain. The instability which would be caused by both options is also emphasised by the fact that, in the event of non-compliance, ships could be liable to Port State

[15] International Chamber of Shipping, 2025, Global shipping industry reaffirms support for the IMO Net Zero Framework, available at: https://www.ics-shipping.org/statement/global-shipping-industry-reaffirms-support-for-the-imo-net-zero-framework/

[16] T Smith and F Spiegelenberg, 2026, Uncertainty at the IMO: Three scenarios and their consequences for shipping's transition, available at: https://globalmaritimeforum.org/insight/three-scenarios-and-their-consequences-for-shippings-transition/

[17] C Eason, 2026, Net-Zero Framework alternative would see LNG dominate, says Maersk Carbon Center, available at: https://www.tradewindsnews.com/regulation/net-zero-framework-alternative-would-see-lng-dominate-says-maersk-carbon-center/2-1-1968605

Control actions, which may include detention or refusal of entry, meaning operators would face both unpredictable compliance costs and potentially severe operational disruptions, making it difficult to plan investments and compliance strategies with confidence.

The removal of the economic element is also a key focus of the submission from **Algeria, Bahrain, Iraq, Kuwait, the Russian Federation, Saudi Arabia, Somalia, and the United Arab Emirates *(in MEPC 84/7/30)***, which calls for a "technology-neutral" approach, opposes "punitive" measures, and explicitly rejects centrally determined market-based mechanisms such as carbon pricing or levies.

OG analysis: This signals a clear resistance to the current NZF design- particularly its economic elements- and advocates for a NZF with fewer binding measures.

The **United States *(in MEPC 84/7/41)*** expresses strong opposition to the continuation of the NZF, citing a clear lack of consensus and potential 'dire economic consequences' for the shipping industry, energy producers, and global consumers. It argues that the NZF would promote 'expensive, unproven, and unavailable fuels', risk disruption to global trade, and extend IMO beyond its decision-making mandate. The U.S proposes that any future IMO GHG emissions approach should avoid 'financial penalties, carbon taxes, levies or multilateral funds' and must not 'disadvantage any fuel types', instead adopting an 'energy-all' approach that supports conventional fuels, LNG, nuclear, and biomass-based fuels. It also calls for ensuring reliability of the existing fleet, avoiding 'rigid mandates' and phasing out regional schemes to prevent duplicative frameworks. Lastly, the submission further recommends ending consideration of the NZF, not resuming ES.2, proposing that alternative approaches are developed based on affordability, availability, and scalability, and that any future agreement use an explicit acceptance procedure for entry into force.

OG analysis: The United States' submission does not fully reflect the areas of emerging consensus achieved at the IMO. Analysis suggests that failure to adopt the NZF will lead to greater uncertainty over investment in new vessels and fuels, causing additional costs for States, shipping companies, and consumers[18]. Furthermore, the Framework is expected to generate USD 10-15bn USD per year through its penalties for non-compliance, which would be used to support industry in the uptake of ZNZ fuels and associated infrastructure, as well as ensuring a just and equitable transition for developing countries.

Fiji, Kiribati, Nauru, Palau, Tuvalu and Vanuatu express their support for adopting the NZF "as is" in ***MEPC 84/7/28*** (along with the Solomon Islands). However, should the text be reopened for substantive changes, the submission proposes the following amendments in ***MEPC 84/7/36***:

- Increasing the Z-factor (Z_T)[19] for direct compliance to 100 every year starting from 2029
- Making the reporting period the end of every year

[18] Global Maritime Forum, 2025, A guide to the IMO's Net-Zero Framework, available at: https://globalmaritimeforum.org/news/a-guide-to-the-imos-net-zero-framework/

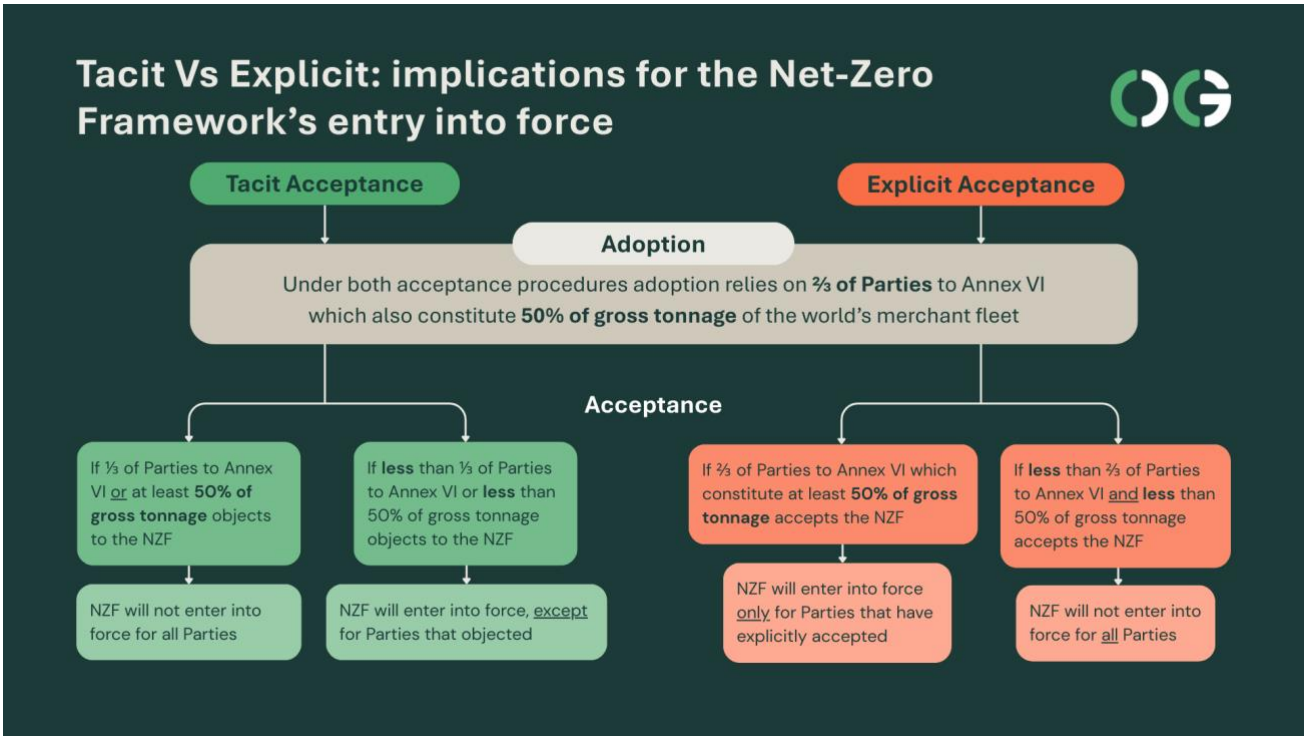
[19] The annual GFI reduction factor to ensure continuous improvement of the ship's GHG fuel intensity

- Removing the surplus unit mechanism, leaving paying for remedial units as the only way to balance a compliance deficit

Price of remedial units 2029-31[20]	Draft NZF (USD)	MEPC84/7/36 proposal (USD)
Tier 1	100	300
Tier 2	380	380

2.1.4 Acceptance procedure: tacit vs explicit

OG analysis: Discussions on the NZF will be an important topic at MEPC84, as such there will likely be negotiations on the acceptance procedure. The choice between tacit and explicit acceptance procedure will have direct implications for the effective implementation and enforcement of the NZF[21]. Adopting the NZF with tacit acceptance would provide a clear and predictable pathway to timely implementation, which would support earlier investment in ZNZ fuels and secure a foundation to build upon for a just and equitable transition. By contrast, accepting via explicit acceptance would delay the entry into force of the NZF, stagnating the potential ZNZ market and undermining the credibility of the agreement.



The tacit acceptance procedure (also known as 'accepted unless rejected') has been the primary mechanism used at the IMO since the 1970s for bringing amendments into force, including for the International Convention for the Prevention of Pollution from Ships (MARPOL)[22],

[20] The draft NZF currently states these values for 2028-30, but it is generally agreed that timelines will be shifted by one year if the NZF is adopted in autumn 2026.

[21] Opportunity Green, 2026, Tacit Vs Explicit Acceptance Procedure - Implications for IMO's Net Zero Framework, available at: https://opportunitygreen.org/shipping/briefings/tacit-vs-excplicit-acceptance-imo-net-zero-framework/

[22] International Maritime Organization, Adopting a convention, Entry into force, Accession, Amendment, Enforcement, Tacit acceptance procedure, available at: https://www.imo.org/en/about/conventions/pages/default.aspx

under which Annex VI hosts the proposed NZF. Through this procedure, amendments typically enter into force within 18-24 months, unless during that period an objection is communicated to the IMO by at least one third of Parties to Annex VI or by a group of Parties whose combined merchant fleets constitute no less than 50% of the gross tonnage of the world's merchant fleet[23]. As acceptance is automatic in the absence of objection, Parties are not required to complete domestic ratification or legislative approval processes before the amendment enters into force.

Explicit acceptance (also known as 'rejected unless accepted' procedure) requires two thirds of the Parties to Annex VI and which constitute at least 50% of the gross tonnage of the world's merchant fleet, to actively complete domestic legal and administrative processes before confirming acceptance – a process that has previously resulted in substantial delays or amendments failing to enter into force altogether[24].

Section 3: Consideration of guidelines and other policy instruments

3.1 GHG Fuel Intensity (GFI)

The submissions in this section comment on methodological, procedural and administrative matters regarding the calculation and verification of ships' GFI. These features will be included in the GFI Guidelines, which are under development and of which a draft is presented. A ship's GFI will determine its compliance with the NZF, and therefore how many RUs it must purchase or how many SUs it is awarded. The method used to calculate the GFI is therefore a contested issue, and one that will influence the NZF's concrete impact.

The **IMO Secretariat *(in MEPC 84/7/19)*** provides an update on the preparatory work it has initiated to ensure the timely establishment of the IMO GFI Registry, which was broadly supported by delegations at ISWG-GHG 20 and reaffirming that it does not pre-empt decisions to be taken by MEPC or allocate additional IMO budget resources. The work has developed initial function requirements for the Registry including: user management, GFI reporting management, GFI calculation and verification, transactions management, accounts statement management, and integration. It also considers potential interactions and synergies with the Global Integrated Shipping Information System[25] (GISIS) and similar registries.

Norway and the United Kingdom (in ISWG-GHG 21/2/1) led an informal discussion group in the intersessional period since ISWG-GHG20 to advance the work on the GFI. They present the outcome of those discussions, noting that they do not necessarily reflect their own view. The submission contains: 1) a draft of the GFI Guidelines; 2) draft text for adding an energy multiplier to the GFI guidelines[26]; 3) draft amendments to the 2022 Guidelines for Administration verification of ship fuel oil consumption data and operational carbon intensity (resolution MEPC.348(78)) to also cover verification of the GFI; and 4) draft guidance for determining the

[23] MARPOL, Article 16 (2)(f)(iii)

[24] International Maritime Organization, Adopting a convention, Entry into force, Accession, Amendment, Enforcement, Tacit acceptance procedure, available at: https://www.imo.org/en/about/conventions/pages/default.aspx

[25] GISIS is a web-based platform that provides access to various modules of information related to IMO conventions, maritime safety, security and environment, available at: https://gisis.imo.org/Public/Default.aspx

[26] this text is included as it formed part of discussions but was not necessarily supported by all members of the informal discussion group

energy derived from wind propulsion systems (WPS), to serve as the basis for the Working Group's further development.

1) Draft GFI Guidelines

The submission proposes that the requirement to submit information concerning the GFI and GHG avoided from the use of ZNZ stipulated in draft regulation 37.1 and Annex XII also be included in the ZNZ guidelines, and offer a suggested definition of zero-emission energy sources: "Energy from zero-emission energy sources means all energy for propulsion or for the operation of any equipment on board derived from wind propulsion systems (WPS), solar photovoltaics, and other renewable primary energy sources installed on board."

It proposes that the minimal energy requirements, e.g. to power pumps or position the WPS, will be included in the total attained annual GFI of the ship and not differentiated from fuel usage, however they should be counted towards the GFI of any specific energy source for reporting under draft appendix XII, except photovoltaic, for which they are considered to be zero. Given the complexity of WPS and nuclear energy systems, the co-sponsors recommend that guidelines for these be developed in separate sections, including a conversion factor for port-supplied electricity and WPS systems to accurately reflect their energy saving contributions, and propose a conversion factor for each. These sources provide direct propulsive power with little or no conversion loss, whereas significant amounts of energy are lost when converting fuel into propulsive power. Therefore, using the same calculation would artificially minimise the effect of using electric energy or wind propulsion on the attained annual GFI calculation.

The submission identifies the following areas which require further work: OCCS; heat supplied through water pipes from port side; determining additional energy consumption attributable to ice class and sailing in ice conditions; calculation examples; clarification of the accounting of electricity produced on one ship but used by another.

2) Energy Multiplier

The co-sponsors discuss the energy multiplier in a separate annex due to diverging opinions on its inclusion among Member States during the informal discussions. The draft GFI guidelines (annex 1) are drafted to facilitate the integration of text on the multiplier, should inclusion be agreed. The options laid out for the multiplier are: eligibility criteria; value of the multiplier; period for which it can be applied; grandfathering clause; review to decide on extension of the multiplier based on ZNZ uptake. Two alternatives eligibility criteria are proposed:

1. Fuel oil types based on a list of fuel pathway codes as per the 2024 LCA Guidelines OR fuel pathways which are based on H2 from renewable electricity; energy from shore power below a certain GHG intensity threshold; energy derived from zero-emission energy sources.
2. Fuel oil types, energy from shore power, and energy derived from zero-emission energy sources qualifying as ZNZs

Energy Multiplier

What is it? An energy or ZNZ multiplier increases the impact of ZNZ use in determining a ship's compliance (calculating its attained GFI), or its eligibility for reward. It provides incentives for the uptake of specific fuels and fuel pathways by offering a higher factor for counting certain fuels towards GFI compliance (tentatively 2x).

Pros: The idea is to de-risk first movers and unlock investment in early-phase ZNZs, especially those which currently have high marginal abatement costs but long-term potential and therefore require significant investment to scale up and/or reach commercial viability.

Cons: In theory, the multiplier would be applied exclusively to ultra-low emissions energy sources, but as this list has not been defined, there is also a risk that less sustainable fuels and technologies may end up benefitting from this mechanism. Brazil (MEPC 84/7/35) expresses concern that linking reward value to the energy used rather than GHG avoided offers a perverse incentive. There is also a risk that these inflated compliance values would consume a significant portion of available revenues, narrowing the reach of the Net-Zero Fund. As Palau and Tuvalu (ISWG-GHG21/2/15) note, the distorting effect of the multiplier would also either reduce GHG avoided, compromising the effectiveness of the NZF, or reduce revenues raised for the Net-Zero Fund through the compliance mechanism. Due to this and the majority of the proposed multiplier-eligible ZNZs being capital intensive, the multiplier could have negative implications for a just and equitable transition. Concerns are raised that a multiplier contravenes draft Regulations 39 and 41 of the NZF. Both submissions that comment on the energy multiplier (MEPC84/7/35, Brazil and ISWG-GHG21/2/15, Palau and Tuvalu) oppose its inclusion in the GFI Guidelines.

3) Verification of GFI

Based on the significant overlap with the verification of the data related to the IMO Data Collection System (IMO DCS) and CII, the co-sponsors recommend expanding the existing *2022 Guidelines for Administration verification of ship fuel oil consumption data and operational carbon intensity* (resolution MEPC.348(78)), to also cover elements required for GFI, rather than developing new guidelines. The submission recommends that the further development of the verification guidelines should consider and align with the relevant processes and documentation produced on the fuel certification side, e.g. the fuel lifecycle label (FLL). Norway and the United Kingdom identify the following needs:

- Further guidance on using Power Purchase Agreements (PPAs) and GO to apply actual GHG intensity values for electricity delivered to ships
- Clarifying the documentation and verification of actual TtW emission factors
- How to include the verification of the GFI for ships using OCCS

4) WPS Guidance

The co-sponsors discuss WPS in a separate annex, proposing three methods for calculating the energy derived from WPS: (1) an analytical power model combined with statistical weather data; (2) a ship-specific power model combined with hindcast weather data; (3) direct thrust

measurement (this is still under development). The co-sponsors note that the higher tiers offer more accurate measurements but carry higher monitoring requirements.

ISO and ITTC *(in MEPC 84/7/21)* provide a procedure for establishing a predictive model of power saving from wind propulsion installation so that wind energy can be incorporated into the NZF. The co-sponsors note that document MEPC 82/7/9 (IWSA) outlined the formula to calculate the wind propulsion energy delivered to the ship for the attained GHG Fuel Intensity (GFI), by a wind assisted propulsion system. The co-sponsors present the ITTC Procedure 7.5-04-01-02 (2024), which is an alternative method of calculating the energy generated by wind propulsion by turning the WPS on and off for 15-minute intervals in varying conditions and measuring the difference in ship speed. They note than an updated version of the procedure is scheduled for release in 2027. **ITTC *(in MEPC 84/7/22)*** describes a method to estimate energy savings from wind-propulsion systems using digital simulation tools in combination with model testing and note that an update is also due for release in 2027.

China *(in ISWG-GHG 21/2/6)* posits that the reporting and verification requirements under the NZF should be aligned and integrated with existing IMO processes, namely the IMO DCS and the CII, in order to ensure data verifiability, avoid duplicate verification, reduce administrative burdens, and provide procedural integration. The submission suggests a sequential process facilitating the alignment of these requirements and proposes that GFI compliance and ZNZ rewards be handled within a single integrated procedure, whereby ZNZ rewards are applied directly to offset any compliance deficit before remedial units are purchased. They note that the 2024 SEEMP (Ship Energy Efficiency Management Plan) Guidelines and the '2022 Guidelines for Administration verification of ship fuel oil consumption data and operational carbon intensity' (resolution MEPC.348(78)) could reflect the integrated processes, and that the IMO GFI Registry and NZF guidelines should reflect the corresponding procedures and suggest textual amendments to resolution MEPC.348(78).

3.3 The Net-Zero Fund

Submissions in this section make proposals regarding the establishment and operation of the Net-Zero Fund, which will gather and disburse revenues from the sale of RUs. Suggestions are made as to the administrative and governance structures of the Fund, how revenues should be disbursed, and its critical role in supporting a just and equitable transition.

The **IMO Secretariat *(in MEPC 84/INF.10)*** provides a systematic comparison of the establishment, administration and governance of 10 funds with some comparability to the Net-Zero Fund. It acknowledges that several previous submissions to MEPC and ISWG-GHG regarding the Fund have made reference to the IMO's Council, as the Organisation's executive organ, and therefore also includes the IMO Council in the analysis. It compares the following features across the 10 funds: governing board (composition, election and term of membership; observers and publicity of meetings; chairmanship; decision-making process; quorum and number of meetings; eligibility, access modalities and implementing partners; financial instruments; and fund allocation.

OG analysis: The analysis by the Secretariat reveals a number of commonalities across the funds, and also significant divergences, which demonstrates that there is a high degree of regulatory flexibility in developing governing instruments for new funds.

Democratic Republic of Congo, Ghana and Togo *(in MEPC 84/7/44)* comment on document MEPC 84/INF.10 and provide proposals for the Net-Zero Fund revenue disbursement system. This submission reflects on the allocation models used by six of the ten funds compared by the Secretariat and posits that these may serve as a useful starting point for the design of the Net-Zero Fund's revenue disbursement and allocation framework. In particular, the co-sponsors emphasise that allocations should "reflect the differing circumstances, disproportionate negative impacts, capacities, and vulnerabilities of Member States, including developing countries, in particular SIDS and LDCs, while safeguarding against over-concentration and promoting balanced geographic distribution." They propose that three disbursement streams should be set up for the categories listed in draft regulation 41.1.1-3: ZNZ rewards, a just and equitable transition, and administrative and operational costs, stressing that ZNZ rewards should consider emissions avoided and be guided by a formula-based application system. Under the just and equitable transition stream, resources should be allocated according to a structured methodology which considers vulnerability, capacity constraints, disproportionate negative impacts, income levels, readiness, and potential transition benefits, as well as including minimum floors for SIDS and LDCs, safeguards against over-concentration, and periodic review for effectiveness. They propose that the Fund's governing provisions should define eligible recipients and access modalities, accredited implementing entities, and calls for proposals, and that the Governing Board should report annually to the Committee.

Mexico and the Solomon Islands *(in ISWG-GHG 21/2/4)* also reiterate the need for the NZF (through the Net Zero Fund) to facilitate a just and equitable transition of shipping, leaving no Member State or seafarer behind. They note that the Fund has similarities to other climate funds, but that it must consider the particularities of shipping, and must learn from previous multilateral debates and fora, and recommend adopting an industrial policy perspective. The co-sponsors point out that the NZF offers an opportunity to tie industrial development to the just and equitable transition in shipping, especially in SIDS and LDCs, reminding that many are still unable to access climate financing, despite the existence of climate funds for this purpose. Moreover, by funnelling funds through third parties, the multilateral development finance architecture fails to build capacity for countries to handle large projects themselves and propose that international financial architecture should be reformed to reflect the diversity and complexity of the world, while significantly scaling up climate finance.

The co-sponsors advocate for centring the 2023 IMO GHG Strategy's aim to "phase out [GHG emissions from international shipping] as soon as possible, while promoting a just and equitable transition" in the governing provisions of the Fund to reaffirm countries' commitment to removing all obstacles to sustainable development within shipping, and open up finance to SIDS and LDCs. They propose that revenues from the Fund be disbursed through comprehensive packages that combine concrete industrial projects, maritime energy transition adaptation and resilience measures for ports and coastal communities as key sites of maritime impact likely to face DNIs, and other associated national development priorities.

To facilitate the Fund's support of a just and equitable transition, **Kenya *(in ISWG-GHG 21/2/11)*** strengthen the definition of 'just and equitable transition' (JET) to one that:

1) "Enables all States, in particular developing States, least developed countries (LDCs) and small islands developing States (SIDS) to comply with and benefit from the regulations while minimizing any disproportionate negative impacts on their economies and societies;
2) Supports the creation of decent work, the protection and upskilling of seafarers and the maritime workforce;
3) Promotes fair access to finance, technology transfer and capacity-building; and
4) Addresses, through targeted support, the disproportionate negative impacts on developing countries, LDCs, and SIDS, including on trade, transport costs, and food security."

They also lay out a series of proposals to operationalize the governance, transparency, eligibility and disbursement modalities. Proposed guiding principles for the Fund to ensure its integrity and alignment with the 2023 IMO GHG Strategy are: environmental integrity; polluter pays; mitigation of disproportionate negative impacts (DNIs); reflecting varying national circumstances; integrity and transparency of governance; efficient and predictable disbursement channels and financing instruments. They suggest criteria to ensure a balanced and appropriate governing board, as well as allocation of funds by percentage and primary financial instrument across disbursement categories, suggesting an activity focus for each. They also propose which entities should be eligible, a simplified procedure for small grants, a rapid-response facility to address acute DNIs, and measures to support countries in accessing appropriate funding, including a prioritisation mechanism, without precluding support for other demonstrable DNIs. They note that that support for NZF will be strengthened by alignment with development priorities, and note key such priorities for the Africa region.

On the other hand, the **United Arab Emirates *(in MEPC 84/7/32)*** objects to MARPOL Annex VI hosting an economic element as it was originally established to deal with purely technical maritime matters, with commercial and economic matters in shipping under the jurisdiction of UNCTAD. The sponsors posit that this would entail the development of an independent convention including the establishment of a fund, rather than a simple amendment, and is inconsistent with the scope of IMO authority and practice as the NZF does not fall under one of the categories of funds listed under regulation 6.7 of the IMO Financial Regulations and Rules. They name the International Fund for Compensation for Oil Pollution Damage and the International Oil Pollution Compensation (IOPC) Funds as examples of funds established under a separate legal entity, and propose that the same approach should be taken for the NZF. They conclude that discussions on the NZF should therefore focus only on the technical measure, the GFI, which it suggests should be the only single global measure applicable to international shipping, should the Framework be adopted.

OG analysis: Opportunity Green's research[27] has confirmed that a separate legal instrument is not necessary to establish an economic measure at the IMO. The IOPC Funds do not set a precedent for the creation of a new convention as their structure was a function of a very different historical context, purpose, and legal environment. Today, Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL) provides a legally sound and operationally feasible framework for implementing economic measures that support the IMO's GHG reduction goals.

3.4 Zero- and Near-Zero Fuels (ZNZs)

Submissions on ZNZs relate to two key issues: the definition of what counts as a ZNZ, and how to calculate the value of the reward for their use. The key questions concern (1) the mechanism through which rewards will be granted, and (2) whether reward rates should differentiate between different fuel or technology pathways. A draft of the ZNZ guidelines is presented, resulting from intersessional work by an informal discussion group.

Kenya *(in ISWG-GHG 21/2/14)* proposes that the definitions of ZNZs, the guidelines and methodology for ZNZ rewards, and the governing provisions of the Fund's board should be brought forward in the timeline and prioritised. Kenya notes that the currently ambiguous definition of ZNZs limits Africa's uptake of capital for transition and therefore risks Africa being unable to meet compliance targets on time. The sponsor proposes that consideration and development of the guidelines for ZNZs be concluded by autumn 2026 and therefore argue that the conclusion of guidelines and methodology for reward should also be brought forward to MEPC 86, noting that developing the reward guidelines at MEPC 87 is later than expected and may lead to irregularity in the implementation and understanding of draft Regulation 40.

The governing provisions of the Fund board are currently due to be adopted by MEPC87 (subject to NZF adoption timelines). However, Kenya notes that the Fund's governing provisions should be in place before receipt of the first fees, and therefore suggests that these provisions should be developed by MEPC 85. They call on the Committee to encourage broad participation of Member States in this work, especially on disbursement.

3.4.1 Definitions

The definition of what fuels and technologies are classed as ZNZs is both a technical and political question. The definition of ZNZs determines which fuels and technologies will be eligible for rewards from the Net-Zero Fund under Regulation 41 of the draft Framework. The process and criteria for defining ZNZs is therefore the subject of dynamic debate, with implications for the effectiveness of the NZF in both reducing GHG emissions and supporting a just and equitable transition.

IMLA *(in MEPC 84/7/2)* proposes an 'easily understandable marine fuel classification approach' that can be used to account for all potential clean marine fuels. The proposal responds to inconsistent terminology ("alternative," "sustainable," "ZNZ") and the technical complexity of the LCA Guidelines, arguing that industry needs a clearer, more intuitive system. The approach

[27] Opportunity Green, 2025, Establishing an economic measure at the IMO, available at: https://opportunitygreen.org/shipping/briefings/is-there-a-need-to-create-a-separate-legal-instrument-to-adopt-an-economic-measure-at-the-imo/

outlined should include all marine fuels and account for their carbon footprint of feedstock, conversion, distribution, and end use. It should also define clean marine fuels as sustainable fuels instead of alternative fuels, excluding conventional fossil materials and high-carbon-intensity biomass from feedstock catalogue.

Brazil *(in ISWG-GHG 21/2/12)* makes a case for a definition of ZNZs that is agnostic to technology type and feedstock. The submission raises the concern that differentiation between ZNZ types go beyond the requirements of the 2024 LCA Guidelines and may "risk excluding sustainable [ZNZs]" and "undermine the targets set out in the 2023 IMO GHG Strategy". Brazil reiterates the Committee's recognition that the maritime energy transition should be possible for all IMO Member States and create opportunities for developing countries, LDCs and SIDS to participate in the ZNZ value chain, and note that "capital-intensive solutions tend to concentrate economic benefits in developed regions", potentially limiting such participation.

Referring to **MEPC 83/7/12 (Brazil and China)**, the document argues that the definition of ZNZs should be agnostic, "prioritising the sustainability of production pathways and the effective reduction of GHG emissions", and should support innovation and investment and enhance the scalability and flexibility of biofuels. Moreover, it notes that the definition should be fully consistent with the 2024 LCA Guidelines and the 2023 IMO GHG Strategy and suggests the following wording, based on the aforementioned MEPC 83 submission: "Zero or near-zero GHG emission technologies, fuels, and/or energy sources are those feedstock- and technology-agnostic solutions, focusing on sustainability themes and aspects, and life cycle GHG emission reductions, in accordance with the LCA Guidelines, meeting the eligibility thresholds for ZNZ, assessed on a well-to-wake (WtW) basis, as established in Regulation 39."

3.4.2 Rewards

Norway and the United Kingdom *(in ISWG-GHG 21/2)* present a draft of the guidelines on ZNZ rewards to provide a basis for ISWG to begin its work on the guidelines. This draft is the consolidation of many proposals to ISWG-GHG 20 on ZNZ rewards, completed by a group of countries working intersessionally. In some places, the draft includes several possible options in square brackets. The co-sponsors note that they do not necessarily endorse any of the options included in the consolidated draft guidelines.

The draft proposes that the ZNZ guidelines apply to all ships subject to Chapter 5 of MARPOL Annex VI, and to all ZNZs used on board, including as a component in blended fuels, and that WtW GHG emission factors should be calculated according to the 2024 LCA Guidelines. Two options for the reward mechanism are presented, both with extensive precedent in policy frameworks around the world. The co-sponsors note that these options are not mutually exclusive and could run simultaneously or sequentially:

1) An IMO-determined reward, with levels and qualifying criteria agreed by IMO and published in advance. However, this rate may be discounted if the sum of eligible applications exceeds the total amount available.
2) A reverse-auction mechanism, whereby shipowners submit bids to the IMO for the ZNZ reward rate they would need to transition their ships to ZNZs.

ZNZ Reward Methodology

There are two models under consideration for how ZNZ fuel use is rewarded, as laid out in the draft ZNZ Guidelines by Norway and the UK: an IMO-defined reward and/or a reverse auction. Each of these options is a standalone mechanism and MEPC could opt for either individually or both in parallel.

IMO-defined Reward

What is it? The IMO sets a rate of ZNZ rewards in USD per tonne of CO_2eq avoided and publishes this rate in advance of the year to which it applies. A limit for the total value of funds available for this purpose will also be set. The draft Guidelines contain options for reward rates differentiated by fuel type and/or region and an option for one flat rate across all eligible ZNZs with no differentiation. All ships that meet the eligibility criteria are guaranteed to receive a reward.

Pros: This model offers a degree of fairness, as all eligible applications are guaranteed to receive some reward.

Cons: Due to the discount mechanism, this model offers no certainty about the rate of reward. As the mechanism also functions retroactively, shipowners have no guarantee that the reward they receive will compensate them for the extra costs incurred by transitioning to or using ZNZs. This may disincentivise early movers and fail to unlock the necessary investment to catalyse a transition.

Reverse Auction

What is it? The IMO opens specific windows during which shipowners submit bids for the exact reward rate that they would require in order to transition to/operate on ZNZs. The total value of funds available for this purpose will be set in advance of each window. Once each window closes, all eligible bids are ranked in order of cost, starting with the lowest, until the value cap is reached. All lowest-cost bids up to the limit will be successful, and successful bids will be guaranteed rewards at the agreed rate annually for up to 10 years based on GHG avoided.

Under this model, shipowners would know the value of their reward before investing in ZNZs. However, unlike the IMO-defined reward, not all eligible applicants are guaranteed to be granted rewards, and unsuccessful applicants receive no funds. Unsuccessful applicants may resubmit to subsequent windows.

Pros: Certainty for investors on the received reward value based on actual GHG emissions avoided offers a strong incentive both for investment in transition and for real emissions reductions, leading to stronger transition outcomes and ZNZ availability.

Cons: There is no certainty of receiving any reward. Ships that make unsuccessful bids are unlikely to invest in transitioning to ZNZs. The methodology of selecting bids based only on price may disadvantage bids for currently more expensive, newer, but truly sustainable ZNZs.

For both options, the paper proposes that the reward a given ship is eligible to receive is based on the emissions avoided by using ZNZs. The submission proposes a methodology for calculating the avoided emissions based on the difference between the WtW emissions factor for a given ZNZ and the GFI reference value for 2008 of 93.3gCO_2eq/MJ. The method also proposes that final calculations should consider wider factors, such as whether the ZNZ energy

replaces the use of fuel oil, or a combination of fuel oil and shore power. The total reward is then calculated by multiplying the avoided emissions by the reward rate, which varies between the two design options.

Importantly, basing rewards solely on avoided emissions doesn't account for impacts not quantified under fuel lifecycle assessments (e.g. impacts of Indirect Land Use Change associated with some biofuels, which can result in substantial emissions and wider environmental and social impacts). Therefore, the submission includes options for differentiation, which would mean not all ZNZ types would be eligible to receive rewards.

Differentiation of ZNZ rewards

There are two main forms of differentiation under consideration:

1) **By fuel type** (rewarding different types of ZNZ differently): This would incentivize investment in and use of truly zero-emission energy types, e.g. WPS, green hydrogen, over energy sources that either still have significant GHG emissions, e.g. LNG, and/or might have other significant impacts for the environment or a just and equitable transition, e.g. many biofuels.
2) **By region** (accounting for cost variations of ZNZ production and supply): This aims to support a just and equitable transition, acknowledging that the availability and costs of technology and materials needed to derive ZNZs vary significantly between regions. Setting a higher reward rate in regions where ZNZs have a higher cost can help offset this, enabling all regions to participate equitably in the shipping energy transition.

Non-differentiation is described as technology 'neutral' or 'agnostic'. Several submissions question the veracity of such terms, noting that any incentive mechanism naturally creates different risks, opportunities and biases for different options, and that therefore no policy mechanism designed to incentivize or change a behaviour can be neutral.

Palau and Vanuatu *(in ISWG-GHG 21/2/15)*

The co-sponsors participated in the intersessional work led by Norway and the UK to consolidate proposed ZNZ guidelines and endorse the draft guidelines in docs **ISWG-GHG 21/2** and **ISWG-GHG 21/2/1** as the basis for the Group's further work. They note that in practice, ZNZ rewards will compete for funds with the disbursement categories in draft regulation 41.1.2 which support a just and equitable transition (JET) and that it is therefore important to carefully define ZNZ guidelines so they do not absorb the majority of Fund revenues and undermine the NZF's ability to drive a just and equitable transition, or fail to promote energy transition and ensure fuel availability. They therefore propose 'ringfencing' the majority of revenues for the disbursement categories which support a just and equitable transition, listed in draft Regulation 41.1.2.

The submission argues that differentiation is required to upscale ZNZs in the longer term and that a ZNZ-agnostic approach either only supports current least-cost ZNZs or supports all but over-compensates lower-cost ZNZs and that a ZNZ-agnostic approach is "not 'neutral' but

heavily favours incumbent industries". The co-sponsors reiterate scientific evidence presented in ISWG-GHG 20/2/14 on the least cost pathway to decarbonise shipping and propose using that to set appropriate specifications of the ZNZs that are "scalable" and support the differentiation option as laid out in the draft Guidelines. They support the reverse auction option over the IMO-defined reward, as the auction offers more certainty due to the discount mechanism of the IMO-defined reward, and will therefore be better able to support investment, supporting a more effective transition and fuel availability.

The co-sponsors note that there is currently no explicit link to sustainability criteria in the ZNZ guidelines. They note the importance of such criteria to avoid incentivising deforestation, and threatening food and water security, including through direct and indirect land-use change (DLUC, ILUC). They note the inclusion of sustainability criteria in the 2024 LCA Guidelines and imply that these should be explicitly integrated into the ZNZ guidelines.

The submission highlights the need to redress the imbalance of access to and cost of capital and institutional support between high- and low-income countries that might lock low-income countries out of accessing the ZNZ reward mechanisms, which would signify a failure to ensure a globally just, equitable and inclusive transition. The co-sponsors suggest that this can be done by 'ringfencing' a portion of total available funding for recipients who meet "'JET-eligible' criteria" which should be defined in an appendix to the guidelines. They note that this option is included in the draft guidelines and should be developed further.

Palau and Vanuatu emphasise their support for Wind-Assisted Propulsion Systems (WAPS), which are demonstrating emissions reductions of up to 80% with little or no wider sustainability implications. However, they note that calculating and accounting for the GHG emissions reductions of WAPS is complicated, and underline the importance of including WAPS-specific GFI calculations in the draft ZNZ guidelines to support this technology, particularly for its further use in low-income countries.

Lastly, the co-sponsors advocate for the removal of the ZNZ multiplier option from the draft GFI guidelines (***ISWG-GHG 21/2/1*** **(Norway and United Kingdom)**) and argue that, because it distorts the 1:1 link between surplus units and GHG emissions, it undermines the environmental integrity of the NZF and will "either reduce the GHG emissions reductions it achieves or reduce the revenues it collects and disburses". Lastly, it is noted that such a multiplier is not aligned with draft Regulations 39 and 41 of the NZF.

Brazil ***(in MEPC 84/7/35)*** comments on the three different approaches to calculate ZNZ rewards that have been considered by MEPC: 1) cost/price gaps between ZNZ and conventional fossil fuel; 2) rewards anchored to abatement/CO_2eq avoided; 3) a multiplier approach linking rewards to energy use. They emphasise that option 2, linking rewards to CO_2eq avoided, is the most appropriate option, as it: ties rewards directly to emissions avoided, correlating to marginal social damage; maintains internal coherence with the carbon pricing logic of the NZF; and provides stability in reward value, which helps to create enabling conditions for investment in transitioning the global fleet. They note that options 1 and 3 would both generate volatile implicit carbon prices, which can lead to overcompensating low-abatement options, privileging fuels which are currently closer to commercial parity and under-incentivising deep

decarbonisation options, requiring assumptions about future fuel pathways and uncertainties. The sponsor contends that these options tie incentives to the wrong key issues: by linking rewards to fossil fuel prices, it would account for private costs to businesses rather than social damage caused by fossil fuels. A multiplier links rewards to the energy used by a ship rather than the emissions avoided, and would inflate the compliance value of ZNZ energy, distorting the number of surplus or remedial units issued to ships.

Lastly, Brazil asserts that ZNZ reward pricing should be fuel-agnostic, stating that differentiated rewards can encourage shipowners to wait longer before starting to transition their fleets in the hopes of higher rewards in the future; they can complicate governance and information processes; and that they go against principles of cost-effectiveness. Brazil suggests that fuel differentiation is also unnecessary, as the NZF already includes WtW accounting and certification for ZNZs, and therefore superior technologies are automatically rewarded through greater GHG emissions reductions.

The Institute of Marine Engineering, Science and Technology (IMarEST) (in *ISWG-GHG 21/2/13)* considers the cost-effectiveness of the options under consideration for the ZNZ reward methodology: IMO-defined vs reverse auction, and differentiation vs no differentiation. The sponsor also reiterates the cost of delaying the start of the transition at USD 100bn for each year of delay between 2025 and 2030 (research presented in MEPC 79/INF.29 (UK)), and notes the negative implications of such a delay for fuel availability. IMarEST invites the Committee to consider the 1-year delay in adopting the NZF in this context.

As well as the transition cost, the submission notes that fuel pathways will also be impacted by the methodology chosen, recalling that the Comprehensive Impact Assessment (MEPC 82/INF.8/Add.1) found that policy design creates large variations in cost-effectiveness and incentivisation, and that scenarios which combine a reward to e-fuels and a flexibility (surplus unit) mechanism have among the lowest abatement costs to 2050. Both the models laid out in ISWG-GHG 21/2 (Norway & UK) have elements of certainty and uncertainty. The options therefore pose different investment risks and opportunities for the ZNZ value chain and different effects on the competitiveness and likely availability of certain technology/fuel options, citing evidence from both high- and low-income countries that auctions are the most cost-effective way of allocating a fixed amount of funds to a set of target technologies.

On differentiation, IMarEST states that differentiation by ZNZ type would support the development of more long-term scalable ZNZs that currently have high abatement costs, while non-differentiation would privilege ZNZs with current lower marginal abatement costs but risk locking out options which would be more scalable in the long term. IMarEST therefore questions the term “technology neutral” and point out that all policy design features that affect incentivisation introduce different risks for different technology/energy/fuel options, and therefore a bias/preference for certain options.

The submission argues that the mechanism which would offer the best support for longer-run scalable ZNZ, alongside support for current least cost ZNZ is a reverse-auction mechanism with differentiation.

China *(in ISWG-GHG 21/2/10)* emphasises providing incentives for the adoption of ZNZ technologies, fuels, and GHG removal solutions, aiming to promote uptake, ensure investment predictability, and maintain technology neutrality. Key principles include predictability, verifiability, simplicity, and fairness, while eligibility should consider different ZNZ pathways and sustainability criteria aligned with the 2024 LCA Guidelines. The proposed reward mechanism relies on a unified accounting structure using verified GHG emissions avoided and a fixed reward rate, integrated with the GFI compliance framework. Implementation includes netting of rewards against GHG pricing contributions, proportional disbursement in case of insufficient fund budget, and banking of unpaid balances.

Section 4: The Life-Cycle Assessment (LCA) Framework

4.1 Certification, Traceability, and Verification Frameworks

4.1.1 Chain of Custody Models

To strengthen the credibility and implementation of the NZF a structured approach to fuel supply chain traceability is proposed, through robust chain of custody (CoC) systems.

Austria et al *(in ISWG-GHG 21/3/1)* suggest organising an expert group meeting/workshop ahead of ISWG-GHG 22 to advance understanding of fuel traceability requirements, using existing ISO standards (ISO 22095) as a starting point for consistent terminology and definitions. The sponsors also set out a list of parameters for assessing CoC systems (e.g. mass balance, book and claim), including systems boundaries, temporal characteristics, and applicability across supply chain segments, while emphasising the need for robust, transparent, and internationally aligned systems. Importantly, it underlines that CoC models must be assessed for their interaction, links, and potential leakages to prevent double counting and ensure credible certification of fuel GHG intensity and sustainability attributes.

Pacific Environment *(in MEPC 84/7/48)* comments on the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) LCA Working Group's (GESAMP-LCA WG) work on CoC models, outlining that whilst a mass balance CoC system can enable scalable deployment of sustainable fuels, its environmental integrity depends heavily on how key design parameters are defined. The submission emphasises the need to prioritise balance period stringency and traceability requirements, noting that weak rules could enable temporal arbitrage, over-claiming, and fraud, particularly in complex global fuel supply chains. The sponsor recommends short balance periods (e.g., 3 months), robust traceability and verification, and stronger safeguards such as identity preservation or 'hard mass balance' for high-risk feedstocks, to ensure that sustainability claims reflect verifiable physical flows. It concludes that early specification of these parameters is critical to maintaining credibility and ensuring effective implementation of the system.

The **Environmental Defense Fund *(in ISWG-GHG 21/INF.3)*** compares three models (physical segregation, mass balance, and book-and-claim) detailing traceability methods, advantages, and challenges. It outlines that physical segregation guarantees that certified final outputs have desired attributes, but requires infrastructure throughout the value chain that may not be

feasible; mass balance introduces traceability in systems and supports scale-up of sustainable fuels, yet does not guarantee that certified final outputs have the desired attributes and requires robust documentation and verification to prevent double counting; lastly, book-and-claim supports scale-up of sustainable fuels by rewarding production of material with desired attributes and supports small, medium, and early-stage producers globally, however it completely separates desired attributes from physical materials and requires a central registry systems and robust verification to prevent double counting.

4.1.2 Sustainable Fuel Certification Schemes (SFCS)

Where CoC models focus on how fuel attributes are tracked through the supply chain, SFCS is the system that verifies and certifies those attributes.

China ***(in ISWG-GHG 21/2/8)*** comments on the development of SFCS guidelines and emphasises that Member States/contracting parties are the responsible entities for implementing the MARPOL Convention and should therefore be fully involved in the SFCS recognition process, rather than allowing scheme owners to apply directly to IMO. The submission proposes that application for SFCS recognition should either be submitted or supported by a Member State, in line with IMO practice, to ensure accountability, quality, and proper implementation of the NZF. China also highlights the need to protect commercially sensitive information of economic operators, recommending that data shared through SFCS be aggregated, non-identifiable, and compliant with national legal and policy requirements, particularly regarding data management and cross-border data transfer.

Brazil, Singapore, United Kingdom, et al ***(in ISWG-GHG 21/2/5)*** present an updated draft guidelines to establish a governance framework for recognising SFCS and reporting certification data to the IMO. The aim is to ensure credible, consistent certification of marine fuels' lifecycle emissions (especially WtT) and strengthen trust in reported GHG intensity values. It covers system roles and responsibilities, core principles, recognition requirements, application, review procedures, and reporting obligations. Progress has been made, particularly on governance structure, audit requirements, and initial traceability approaches (with a focus on mass balance CoC), but key elements remain unresolved. Major outstanding issues include finalising traceability rules and CoC models, agreeing how SFCS applications should be submitted (e.g., with or without Member State involvement), completing the terms of reference for the SFCS Assessment Group, and defining what data certified schemes must report and how it will be used. The co-sponsors also highlight the need for systems to enable cross-checking between fuel certification data and ship-level emissions reporting. The Working Group is invited to continue refining the guidelines with a view to adoption (potentially as interim guidance) while resolving these governance and technical gaps.

4.2 Default Emission Factors

The submissions in this section propose new or revised default GHG emission factors under the LCA Guidelines. These default values are used to calculate the GHG intensity of marine fuels on a well-to-tank (WtT), tank-to-wake (TtW), and overall well-to-wake (WtW) basis.

All submissions request scientific review by the GESAMP-LCA Working Group before inclusion in the LCA Guidelines. Whilst the proposals do not change the GHG Fuel Intensity (GFI) standard itself, they impact how fuels are assessed for compliance in practice.

4.2.1 Definitions and methodologies

A number of submissions focus on the method of calculating default emission factors, particularly for fossil fuel supply chains.

INTERTANKO et al *(in ISWG-GHG 21/3/2)* propose refinements and clarifications to the understanding and assessment of 'representativeness' and 'conservativeness' [28] in the selection of default emission factors. The submission recommends assessing the former across geographical, technological, and temporal criteria, and applying the latter within a 'convergent range' rather than defaulting to the highest values, i.e. conservativeness applied within the bounds of demonstrated representativeness [29], in order to ensure that the conservativeness applied to the default value remains anchored in representative pathway configurations.

Brazil *(in ISWG-GHG 21/3/6)* supports the GESAMP-LCA Working Group's proposed definitions of 'representativeness' and 'conservativeness' for well-to-tank (WtT) default emission factors for renewable fuels to address remaining definitional ambiguities, including those related to regional and technological differences, while ensuring compliance with the requirements of the 2024 LCA Guidelines.

Norway, Republic of Korea, and SGMF *(in ISWG-GHG 21/3/7)* provide comments on the current approach to establishing WtT default emission factors under discussion within the GESAMP-LCA WG. In this context, the co-sponsors propose that GESAMP-LCA WG undertakes further technical consideration of statistical approaches, such as weighted averages or measures of central tendency, when determining default emission factors. For purely fossil fuel pathways, the co-sponsors consider it particularly important that default emission factors be established on the basis of recent, high-quality data consistent with representativeness criteria, noting that the application of "actual values" is not permitted for these fuel pathways.

Other submissions below cover a broader range of methodological issues:

Norway et al *(in ISWG-GHG 21/3/5)* outline that ships using part of their cargo as fuel are not addressed in the 2024 LCA Guidelines and invite the Working Group to acknowledge that such ships exhibit distinct WtT emissions characteristics that require differentiated accounting. The co-sponsors suggest inviting GESAMP-LCA WG to quantify the avoided WtT emissions for ships using cargo as fuel when developing new default emission factors and propose that two

[28] 'Conservativeness' means erring on the side of caution when uncertainty exists, ensuring emissions are not underestimated. Conservative values act as a safety margin by adding a risk adjustment to the fuel's typical emissions intensity. This approach safeguards environmental integrity and maintains stakeholder trust. More on this can be found at: Countdown: How statistical benchmarking for default emission factors supports an effective NZF.

[29] In practice, 'representativeness' means reflecting the actual emissions typically produced by a fuel or technology, using credible and up-to-date data. More on this can be found at: Countdown: How statistical benchmarking for default emission factors supports an effective NZF.

separate emission factors are determined to reflect different operational boundaries and supply-chain configurations, namely (1) a last-mile distribution emission factor (2) a large-scale transport and/or distribution emission factor.

Kuwait and Saudi Arabia *(in ISWG-GHG 21/3/13)* review and assess sustainability theme/aspect 2 (carbon source) under the 2024 LCA Guidelines and propose its removal or clarification to prevent what they present as ambiguity, misapplication in certification, and unintended impacts on life cycle GHG assessment. They argue that life cycle GHG performance is already determined through quantitative LCA methodology, including system boundaries, energy inputs, and verified carbon rate, and that carbon source classification does not determine climate impact, but instead introduces a qualitative indicator that risks duplicating or obscuring existing accounting rules. The submission suggests that the current formulation may undermine fuel and technology neutrality, create regulatory inconsistency, and lead to misinterpretation or discriminatory treatment of fuels with equivalent life cycle performance, particularly in certification schemes. It therefore invites the Working Group to recognise these inconsistencies and agree to remove sustainability theme/aspect 2 (carbon source) from the FLL framework or otherwise clarify it to ensure alignment with an outcome-based, transparent, and consistent LCA framework.

OG analysis: Carbon source remains an important aspect of assessing a fuel's overall sustainability and the interactions between emissions in shipping and other sectors. It provides critical information on whether carbon is newly introduced into the atmosphere, recycled, or drawn from renewable (short-cycle) sources, that quantitative accounting may not fully capture. Removing the carbon source distinction risks incentivising pathways that shift, rather than reduce, emissions across sectors, potentially undermining long-term decarbonisation goals and creating hidden systemic risks. This distinction ensures that fuels that can deliver absolute emissions reductions are rewarded.

China *(in ISWG-GHG 21/3/11)* comments on the sustainability themes/aspects in the 2024 LCA Guidelines and proposes that refinement should facilitate the implementation of the NZF, rather than create barriers or exclude certain fuel pathways. It argues that while some themes (e.g., GHG carbon source, energy source, and land use change) can follow a uniform approach, others (such as water, air, soil, waste, chemicals, and conservation) should be assessed in a more practical, implementable, and qualitative way, avoiding overly prescriptive and quantitative metrics and instead relying on compliance with local, national, and regional regulations, as assessed by Member States. The submission suggests that social and economic sustainability themes be addressed qualitatively, at a later stage, remain high-level, respecting each country's background, priorities, and development context.

OG analysis: While the draft guidelines do not disaggregate by fuel types, it is worth noting that fossil fuels and biofuels from feedstock have higher social and environmental impacts in terms of extraction, land use change (DLUC or ILUC), water usage and chemical pollution. While water, air, soil, waste and chemicals, and conservation do indeed fall under national jurisdiction, regulating the permissible impact of marine fuels on these themes/aspects at the IMO level is

important to prevent the displacement or concentration of negative impacts from the production of marine fuels in countries with weaker national regulation.

Conversely, **Pacific Environment, CSC and EDF *(in ISWG-GHG 21/3/18)*** propose the re-establishment of the correspondence group on "other social and economic sustainability themes/aspects of marine fuels" at MEPC 84 and suggest terms of reference that request the group to: further develop the five social and economic sustainability themes/aspects listed in document MEPC 83/7/9; further refine possible metrics/indicators for these, with a focus on qualitative assessment, and to harmonise as far as possible the metrics/indicators that existing environmental sustainability themes/aspects set out in the 2024 LCA Guidelines.

Cruise Lines International Association (CLIA) et al *(in ISWG-GHG 21/3/8)* propose a definition and methodological approach for 'avoided emissions' under the 2024 LCA Guidelines, suggesting these be accounted for within the existing *efecu* parameter (feedstock emissions), including reductions from waste management and methane recovery (e.g. manure pathways). It defines the avoided emissions as the difference between baseline and lower-carbon alternatives and proposes that fuel pathways achieving greater reductions than total emissions be recognised as net-negative.

Oil Companies International Marine Forum (OCIMF) et al *(in ISWG-GHG 21/3/9)* propose amending the 2024 LCA Guidelines to clarify how actual emission factors should be calculated by explicitly referencing existing ISO standards (14040/14067). They argue that the Guidelines only provide detailed rules, but lack methodological clarity for actual values, which are critical for fuel producers to demonstrate improved GHG performance and make investment decisions under the NZF. The co-sponsors suggest that ISO standards be used as the methodological basis for calculating actual WtW emissions, including guidance on system boundaries, data sources, allocation, methods, and transparency requirements.

Royal Institution of Naval Architects (RINA) *(in ISWG-GHG 21/3/19)* highlights that progress on the development of default emissions factors is limited, with values submitted at present only covering 10 out of 128 pathways listed in appendix 1 of the LCA Guidelines. At the current rate of progress, considering the minimum permissible submissions for each value, definition of default emissions factors for all pathways in the Guidelines would take 18 years and cost USD 3.5 million, unless the capacity of GESAMP-LCA WG is increased by adding more members, increasing the frequency of meetings, or outsourcing some work. They therefore emphasise that prioritisation of workstreams, e.g. sustainability themes and ILUC, will be required, and call on MEPC to provide guidance on which pathways are urgently required, and note that if increased granularity is required, the number of pathways, time and cost will also increase. They therefore propose that the methodology for selection of default emissions factors as described in the LCA Guidelines may require modification. They call for clarifications in the LCA methodology to avoid double counting of emissions in both the WtT and TtW phases, and suggest that disaggregating default values, as done under ICAO CORSIA and FuelEU Maritime, could help to expedite work by allowing a mix of default and actual values to be used. In order to ease the workload of GESAMP-LCA WG, RINA questions if actual emissions values for fossil fuels could be permitted in some cases, at least in the interim, and identifies gaps and uncertainties regarding the

calculation of actual emissions values, which need to be resolved and could be eased by aligning with existing international standards.

Canada ***(in ISWG-GHG 21/2/16)*** raises issues for consideration across a number of the implementation guidelines for the NZF. The submission discourages the inclusion of a ZNZ multiplier in the draft GFI guidelines, noting that draft regulations 39 to 41.1.1 already serve to incentivise the uptake of ZNZs and a multiplier could therefore be duplicative. The sponsor suggests that chain of custody models for fuels should be addressed through the LCA and/or SFCS guidelines, and therefore belong under agenda item 3. Conversely, they argue that discussions on a book-and-claim system for fuel consumption fall outside of the scope of the LCA and should be considered under agenda item 2, separately from chain of custody matters. Moreover, a book-and-claim system would imply notable trade-offs that should be considered further before a decision is reached. Canada notes that administration costs for the GFI registry are likely to be low enough (approx. USD 200 per ship) not to warrant a graduated scale and therefore all ships over 5,000 GT should pay the same rate, and that this should be paid directly by the shipowner to the IMO GFI registry to avoid undue administrative burdens especially on small states. On SUs, Canada recommends that the GFI Registry Guidelines make "no reference to the legal nature or property aspects of SUs", however that the Registry may be a constitutive record of holdings and transactions of SUs. Moreover, the submission recommends that, while the IMO may encourage the voluntary cancellation of SUs, they should not make statements about the environmental attributes of cancelled SUs or endorse their use for GHG accounting purposes outside the IMO.

4.2.2 Liquified Natural Gas (LNG)

OG analysis: Emissions from LNG can vary substantially depending on the supply chain, the engine technology used onboard ships, and efforts to control methane leakage in the supply chain and slippage at the point of combustion. Because methane is a powerful GHG, even small variations in leakage can drastically impact the climate profile of a fuel. Overall, the climate benefits of LNG use are negligible at best and, in some cases, it can be worse than the use of traditional fuel types.

For the WtT phase, only default emission factors are permitted to be used for calculating the emissions of fossil LNG, while for the TtW phase, actual values can be used. In both cases, it is critical that default emission factors reflect the conservative (i.e. high) range of available estimates to minimise the risk of under-reporting. For the TtW phase, conservative default values also serve to incentivise improved performance, which can be demonstrated using actual emission factor values.

Recognising this, the **Solomon Islands** ***(in MEPC 84/7/23)*** propose a revision to the default TtW methane slip emission factor for LNG Otto engines, increasing the value from 3.5% to 6% of total fuel mass, based on real-world observations which reveal that 77% of vessels exceeded the current default[30].

[30] The International Council on Clean Transportation, 2024, Fugitive and unburned methane emissions from ships (FUMES): characterizing methane emissions from LNG-fuelled ships using drones, helicopters, and on-board measurements, available

Considering the WtT phase, a number of submissions suggest default emission factors which vary widely. This emphasises the importance of developing a robust methodology to calculate a conservative, global, default emission factor, with relevance to previously discussed submissions including ***ISWG-GHG 21/3/2, ISWG-GHG 21/3/6*** *and* ***ISWG-GHG 21/3/7***.

In this regard, **Pacific Environment and Clean Shipping Coalition *(in MEPC 84/7/43)*** comment on the GESAMP-LCA WG's development of a default WtT emission factor for fossil LNG, highlighting evidence of systematic underestimation of upstream emissions, particularly methane. The sponsors suggest that a default WtT emission factor for fossil LNG should not be materially lower than benchmarks already adopted in other major regulatory frameworks, such as the 18.5 g/MJ value applied under FuelEU Maritime, and caution against using supplier-specific, regionally-limited, or lower-bound data, as well as approaches based on ranges or differentiated values, which risk underestimation. **Pacific Environment and CSC go on *(in MEPC 84/7/47)*** to emphasise that LNG systems leak methane across the supply chain, and that even small releases can affect lifecycle GHG intensity. The submission therefore recommends that the IMO agree on a single, conservative, global default emission factor, such as 75% of global LNG supply GHG intensities, which is estimated at approximately 27.95 gCO_2eq/MJ; consistent with the 2024 LCA Guidelines.

OG analysis: The range of suggested WtT emission factors varies significantly across submissions, from 33gCO_2eq/MJ (**Denmark *in MEPC 84/7/12***) to 14.8gCO_2eq/MJ (**Japan in *MEPC 84/7/13***), reflecting different accounting approaches, and assumptions, which are summarised below. Crucially however, emissions from fossil LNG in shipping are dominated by the TtW phase. Even under the most optimistic WtT assumptions – which are inappropriate for use in default emission factors – fossil LNG still delivers less than 20% emissions reductions compared with conventional shipping fuels (as shown by **Norway, ICS, CLIA and SGMF *(in MEPC 84/7/1)***), while it also results in significantly increased methane emissions (a highly potent GHG, 80 times more potent that carbon dioxide over a 20 year period) through supply chain leakage and engine slippage***;*** offering no substantive benefit to shipping decarbonisation. The evidence indicates that LNG is not a credible low-emission pathway and risks locking in high-emitting infrastructure and delaying the transition to genuinely ZNZ fuels and technologies.

	Submission	gCO_2eq/MJ	OG analysis
Conservative (high) values[31]	**Denmark (in MEPC 84/7/12)**	**33.04 (WtT fossil LNG)**	This value is based on evidence of methane leakage rates across the LNG supply chain.
Mid-range values	**France (in MEPC 84/7/12)**	**17.5 (WtT fossil LNG)**	**-**
	Norway et al (in MEPC 84/7/1)	**17.4 (WtT fossil LNG)**	The proposal also shows that most LNG emissions occur during the TtW phase due to methane slip from engines, with suggested TtW default values varying from 57 to 70 gCO_2e/MJ. Therefore, overall WtW results (ranging from 74

at: https://theicct.org/publication/fumes-characterizing-methane-emissions-from-lng-fueled-ships-using-drones-helicopters-and-on-board-measurements-jan24/

[31] These are set at the upper end of plausible emissions ranges to minimise risk of underestimating lifecycle emissions and incentivise operators to demonstrate lower, actual values where possible.

			to 87 gCO_2e/MJ) show that LNG would be unable to deliver necessary emission reductions[32].Crucially, this submission relies on data from steady-state, test-bed engine operation, rather than real-world observations in which engine load varies. Real-world data confirm that operational levels of methane slip can be higher than those assumed here[33].
Low values	**Japan (in MEPC 84/7/13)**	**14.79 (WtT fossil LNG)**	It is important to note that this submission uses values calculated for a specific supply chain in the United States, rather than a national or regional average.
	Norway and the Republic of Korea (in MEPC 84/7/11)	**14.01 (WtT fossil LNG)**	The proposed WtT factors do little to improve LNG's overall decarbonisation profile, especially since TtW methane emissions dominate WtW performance, reinforcing that fossil LNG remains a high-emitting fuel.
	Turkey *(in MEPC 84/7/17 and MEPC 84/INF.15)*	New fuel pathway for onboard 'blue hydrogen' production from LNG with carbon capture: -3.73 (TtW) -17.7-36.8 (WtW)	The submission assumes high CO_2 capture rates (94.5%) in the TtW phase, yet WtW emissions remain substantial and highly dependent on upstream emissions in the LNG supply chain, including leakage. This approach locks in continued reliance on fossil LNG and carbon capture, both of which face well-documented limitations and uncertainties. Further, the methodology excludes emissions from CO_2 transport and permanent storage, which risks underestimating lifecycle impacts.

4.2.3 Ammonia

The **United Kingdom's submission *(in MEPC 84/7/4)*** provides WtT values for three ammonia marine fuel pathways, including: renewable ammonia (also known as green ammonia) produced using renewable electricity for both nitrogen separation and hydrogen production (10.33 gCO_2eq/MJ), SMR-CCS ammonia (also known as blue ammonia) produced via steam methane reforming with carbon capture and storage (68.40–70.17 gCO_2eq/MJ depending on GWP metric), and ATR-CCS ammonia (blue ammonia), a newly proposed pathway using autothermal reforming with CCS (48.96–54.85 gCO_2eq/MJ). For all pathways, the submission provides a TtW value of 2.20 gCO_2eq/MJ.

OG analysis: The UK's proposed emission factors demonstrate varying degrees of alignment with the IMO's enhanced climate ambition. While renewable ammonia clearly fits within a zero- or near-zero emissions trajectory compatible with the IMO Net-Zero Framework[34], both SMR-CCS and ATR-CCS ammonia pathways exhibit significantly higher lifecycle intensities, which

[32] Sphera, 2021, 2nd Life Cycle GHG Emission Study on the Use of LNG as Marine Fuel, available at: 2nd Life Cycle GHG Emission Study on the Use of LNG as Marine Fuel - Report Thank You | Sphera

[33] ICCT, 2024, FUGITIVE AND UNBURNED METHANE EMISSIONS FROM SHIPS (FUMES), available at: ID-64-–-FUMES-ships-Report-A4-60037-FV.pdf

[34] Opportunity Green, 2025, Ammonia as shipping fuel: benefits, risks and policy solutions, available at: https://opportunitygreen.org/alternative-fuels/briefings/policy-briefing-ammonia-shipping-fuel/

place them well above any plausible 2030 and 2040 decarbonisation benchmarks. The CCS-based routes demonstrate partial emissions mitigation but remain heavily dependent on fossil feedstocks and electricity from grid-mix sources, resulting in GHG intensities too high to qualify as transitional or near-zero fuels under emerging IMO policy criteria. The inclusion of an ATR-CCS pathway reflects technological optimism and a desire to expand eligible fuel pathways, but its emissions profile underscores the critical need for stringent lifecycle thresholds to avoid lock-in of high-GHG fuels. Overall, only renewable electricity-based ammonia production is capable of delivery long-term climate goals.

Similar trends emerge in the submission from **Norway *(in MEPC 84/7/1*)**, which provides WtT values for ammonia produced by 6 separate pathways. Again, renewable ammonia delivers the lowest emissions (20 gCO_2eq/MJ) while fossil fuel-based production methods give far higher values which, for some pathways, far exceed the emissions from conventional shipping fuels. Use of carbon capture and storage again reduces emissions somewhat but still results in significant WtT emissions totalling 46 gCO_2eq/MJ.

Denmark *(in MEPC 84/7/12*) also provides both WtT and TtW emission factors for e-ammonia (i.e., green or renewable ammonia), confirming its use can deliver substantial emissions reductions. The WtT value, 11.69 gCO_2eq/MJ, agrees closely with the United Kingdom's submission, while the TtW value (0.71 gCO_2eq/MJ) is slightly lower.

4.2.4 Biodiesel

A number of submissions propose emission factors for biofuels.

Brazil *(in MEPC 84/7,* MEPC 84/7/6, MEPC 84/7/7, MEPC 84/7/8, MEPC 84/7/9, *MEPC 84/7/10)* submits the following values in gCO_2eq/MJ:

- Ethanol produced from intermediate-crop corn - 19.48 WtT
- Brazilian sugarcane ethanol - 19.01-21.27 WtW
- Soybean biodiesel (using ethanol) - 30.36 WtW
- Tallow biodiesel (using ethanol) - 9.89 WtW
- Soybean biodiesel (using methanol) - 35.09 WtW
- Tallow biodiesel (using methanol) - 16.28 WtW

OG analysis: These default emission factors are generally at the lower end of the ranges reported for comparable biofuel pathways, particularly for tallow biodiesel and sugarcane ethanol. As such, these values do not reflect conservative assumptions and thus increase the risk of underestimating emissions. This is particularly relevant given that biofuels are associated with significant and well-evidenced risks, including ILUC, land-use pressure, and competition with food production, which can drive substantial additional emissions and adverse environmental and social outcomes that are not fully reflected in lifecycle accounting.

Default values are intended to be broadly applicable and conservative, providing a standardised baseline across diverse supply chains. Pathways that are relevant in a large number of domestic contexts must be prioritised to avoid fragmentation of the framework and create uneven starting conditions between producers in different regions, potentially undermining the consistency and environmental integrity of the GHG intensity approach.

In relation to Brazil's submissions, the **GESAMP-LCA Working Group *(in MEPC 84/7/15)*** provisionally recommended the inclusion of a new ethanol fuel pathway code for intermediate crop corn-based ethanol, with an initial factor of 20.08 gCO_2eq/MJ.

OG analysis: However, this is not a conservative value and the final recommendation remains pending further agreement on the definition of 'representativeness' and 'conservativeness'.

Finland's submission *(in MEPC 84/7/5)* provides a WtT value of 13.95 gCO_2eq/MJ for renewable diesel (HVO) produced from waste and residue feedstocks.

OG analysis: It is notable that the scalability of waste- and residue-based HVO is inherently constrained by limited feedstock availability, and there are persistent challenges in verifying that inputs are genuinely waste-derived. These factors raise concerns about the suitability of such fuels as a durable, long-term decarbonisation solution within the maritime sector[35].

Indonesia (*in MEPC 84/7/20*) outline a WtW value of 48.63 gCO_2eq/MJ for fatty acid methyl ester (FAME) from palm oil production

OG analysis: Indonesia's submission excludes potential land use change impacts, the impacts of which are more broadly detailed below.

4.3 Indirect Land Use Change

OG analysis: Although direct land use change (DLUC) is considered under the LCA Guidelines, indirect land-use change (ILUC) is not unaccounted for, as it is difficult to quantify. However, there is consensus that if ILUC emissions were captured, the carbon intensity of biofuels would be significantly impacted[36]. Whilst biofuels can currently be used to comply with the NZF, first generation biofuels, including virgin palm oil, are associated with high ILUC emissions that could lead to a net increase in emissions comparable to fossil fuels[37]. This underscores the need for robust guardrails to exclude high-ILUC-risk feedstocks, ensuring that compliance does not incentivise fuels that compromise achieving 1.5°C as well as a just and equitable transition.

Importantly, ILUC cannot be directly measured and is therefore challenging to quantify. Because of this, ILUC cannot be adequately addressed by project- or regional-specific accounting, because the impacts of ILUC can occur far from the site of a biofuels project. Instead, a global, risk-based approach should be preferred.

Pacific Environment, Environmental Defense Fund, and Clean Shipping Coalition *(in MEPC 84/7/42)* highlight the need for a robust, regular, and evidence-based assessment of global ILUC risk for crop feedstocks used in maritime biofuels. The submissions argues that the current approach adopted by the GESAMP-LCA Working Group focuses too narrowly on DLUC and does not adequately address indirect, market-mediated effects, such as the expansion of agricultural land and displacement of existing land uses. As such, the paper calls for a global quantitative

[35] Transport and Environment, 2025, 'Renewable diesel' sold by oil majors most likely contains fraudulent palm oil, available at: https://www.transportenvironment.org/articles/renewable-diesel-likely-contains-fraudulent-palm-oil-study
[36] U.S. Environmental Protection Agency, 2023, Model Comparison Exercise: Technical Document (EPA 420-R-23-017), available at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017P9B.pdf.
[37] The International Council on Clean Transportation, 2026, Climate and Revenue Considerations for the International Maritime Organization Net-Zero Framework, available at: https://theicct.org/publication/climate-and-revenue-considerations-for-the-international-maritime-organization-net-zero-framework-mar26/

methodology, drawing on existing frameworks including the EU Renewable Energy Directive (RED) and the International Civil Aviation Organization (ICAO)'s Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), both of which include threshold-based criteria, default emissions factors, and strict sustainability requirements. In addition, the same sponsors ***(in MEPC 84/7/46)*** build on this and call for the IMO to apply such a framework in practice, by developing a global ILUC-risk classification of feedstocks (high, medium, low) and reporting back to MEPC85.

Saudi Arabia ***(in ISWG-GHG 21/3/14)*** suggest that the 2024 LCA Guidelines create methodological asymmetries across fuel pathways, particularly through the qualitative treatment of ILUC, the temporary exclusion of DLUC and soil carbon parameters (set to zero), and the uneven application of default versus actual WtT emission factors. It outlines that these provisions undermine lifecycle comparability, environmental integrity, and technology neutrality, while sustainability criteria and geographic considerations may unintentionally favour certain pathways. The submission calls for targeted technical work to quantify ILUC, operationalise land-use parameters, and ensure a symmetric, non-discriminatory application of emission factors within the existing framework.

OG analysis: This proposal risks weakening climate ambition by framing stronger land-use safeguards as methodological bias. Currently, there is an underestimation of biofuels' emissions due to an absence of ILUC assessment. Emphasising technology neutrality, without robust, precautionary ILUC accounting risks locking in high-risk biofuel pathways and shifting environmental and climate burdens onto other sectors.

The **United States** ***(in ISWG-GHG 21/3/21)*** outlines concerns with how the 2024 LCA Guidelines assess land use change risk for crop-based marine fuels, arguing that current project-level, risk-based approaches fail to capture ILUC, which occurs outside project boundaries. It emphasises that land use change risks vary widely across regions and that fuels sourced from areas with high deforestation or carbon-dense vegetation should not be considered low-risk, as biofuel production can incentivise land clearing beyond project boundaries through market and price effects. The submission proposes that the IMO adopt a regional-based approach to ILUC risk assessment, incorporating land use change occurring in the vicinity of production areas, to better reflect real-world impacts and avoid misclassifying high-risk feedstocks as sustainable.

OG analysis: This U.S submission contrasts with Brazil's (summarised above in section 4.2.1), but both contain similar shortcomings. The US submission advocates for a regional approach, likely favouring producers in 'lower-risk' regions (e.g., the U.S and EU) where there has already been extensive land use change. Meanwhile, Brazil similarly pushes for sustainability to be assessed through methodologies incorporating regional differences, to avoid being penalised for regional deforestation dynamics beyond the project-level. Both submissions fail to account for the fundamentally unobservable, and international, nature of ILUC risk.

4.4 Onboard Carbon Capture and Storage (OCCS)

The submissions in this section largely relate to the treatment of OCCS in the LCA Guidelines. As it stands, the high degree of uncertainty around OCCS and CCS technology means that any

potential GHG savings they contribute would not be accounted for. Several submissions urge developing detail needed to operationalise OCCS in the LCA Guidelines, offer methodological suggestions to do so, and propose amendments to the definition of OCCS under the NZF.

It is important to note that, OCCS technologies are still speculative and not yet operational. Furthermore, they require significant additional energy to run, weakening their contribution to GHG emissions reduction. Most critically, they extend the life of fossil fuels and are capital-intensive and therefore do not contribute to a just and equitable energy transition. Investing in costly OCCS technology and retrofits will lock fleets into fossil fuel dependency for years to come, hampering shipping's decarbonisation. Redirecting investment to long-term, scalable and truly low emission fuels, energy sources and technologies is more aligned with the IMO's goal of achieving a just and equitable decarbonisation of the shipping industry.

Saudi Arabia ***(in ISWG-GHG 21/3/16)*** notes that the 2024 LCA Guidelines include WtT and TtW terms for OCCS, however they do not yet contain sufficient detail to encourage early investment and deployment of these technologies. Saudi Arabia therefore proposes tasking GESAMP-LCA WG to develop a technologically-neutral methodological module on CCS/OCCS to be included in the LCA Guidelines to operationalise CCS and OCCS in a transparent, robust and verifiable manner. The module should cover: CCS in WtT, OCCS in TtW, clarify that only long-term stored CO_2 may be reflected, specify a consistent boundary system for the full CCS/OCCS chain, establish minimum quantification rules for credited storage and minimum measurement points suitable for verification, operationalise permanence through a conservative treatment of leakage, and contain provisions to avoid double counting.

China ***(in MEPC 84/7/40)*** calls for greater flexibility in the application of the LCA Guidelines, particularly in relation to emerging fuel pathways such as onboard carbon capture and storage (OCCS) and e-fuels. The submission raises concerns about the lack of clear methodologies for CCS/OCCS, argues against excluding these pathways from default emissions values, and cautions against imposing strict lifecycle boundaries given technological uncertainty. In ***ISWG-GHG 21/2/9,*** **China** notes that, as the 2024 LCA Guidelines were developed before the NZF, the parameter e_{occs} was included in the calculation of WtW emissions factors as an interim solution to be able to reflect the emissions reduction contribution of OCCS technology. However, the sponsor argues that the methodology of calculating these contributions should now be amended and suggests that calculating OCCS emissions reductions as part of the ship-level GFI is more appropriate and propose amendments to the relevant guidelines to this end.

The submission supports the methodologies and conversion factors for shore power and zero-emission energy sources proposed by Norway and the United Kingdom in document ISWG-GHG21/2/1, noting that without such conversion factors, the emission reduction contribution of such energy sources may not be adequately reflected. China also highlights the distinction between this conversion factor as a technical adjustment, and any potential ZNZ multiplier as a policy incentive tool. Moreover, the sponsor discourages the introduction of a ZNZ multiplier, noting that it may reduce the transparency, interpretability and comparability of GFI results. However, if any multiplier is eventually introduced, China argues that this should be uniformly eligible to all ZNZs and should not differentiate across technologies and fuel pathways.

China *(in MEPC 84/7/18)* proposes that the mineralisation of onboard captured carbon, e.g. into calcium carbonate, should be considered a long-term storage solution under the OCCS regulatory framework (to be developed). China carried out a demonstration of the full closed-loop process of OCCS "capture-transportation-storage-mineralization". The largest area of increased or leaked CO_2 recorded was the energy required to run the OCCS system, at over 25%. Leakage of CO_2 during transportation and mineralization was minimal. In ***MEPC 84/INF.8,*** **China** details the process of transferring liquid captured CO_2 from the originating ship to the transport ship), and once mineralized there is no further leakage as mineralized CO_2 is turned into cement and other building materials. Proposes to include mineralization of CO2 as an acceptable permanent storage solution and considered in the development of LCA guidelines and regulatory framework of OCCS, and beyond.

The **International Bunker Industry Association (IBIA)** ***(in ISWG-GHG 21/3/4)*** also notes that the current description of OCCS is limited to technologies that produce liquid CO_2 for geological injection and invites consideration of OCCS technologies that permanently mineralise CO_2 as part of future deliberations.

Norway *(in ISWG-GHG 21/3/17)* gives a detailed overview of the whole CCS/OCCS value chain and suggests allocations of emissions from each activity to the various phases of the equation given in the 2024 LCA Guidelines to calculate emissions from OCCS and whether they should be verified by the Administration or the SFCS. In particular, which shore-based activities should be included in the FLL or other guidelines.

RINA *(in MEPC 84/INF.25)* provides an update to the OCCS case study they submitted to MEPC 80 (MEPC80/7), recalculating the energy requirements of the OCCS system by using recovered waste heat from the main engine instead of additional fuel, which significantly reduces the system's CO_2 emissions. This update is based on theoretical calculations, not real-world data, and no WtW life cycle analysis has yet been conducted on this technology.

OG analysis: It is worth noting that implementation of OCCS in complex marine environments still faces numerous challenges, including high energy requirements, which can reduce overall energy efficiency and increase fuel consumption[38].

4.5 Wider considerations in the LCA Framework

Several submissions highlight new or under-explored elements which could be represented in the LCA Framework.

Pacific Environment and EDF *(in ISWG-GHG 21/3/20*) summarise the evidence regarding the indirect climate impacts of emissions of hydrogen and reactive nitrogen species, including nitrogen oxides (NO_x) and ammonia (NH_3). The submission gives examples of how these emissions currently arise from conventional fossil fuel use, and may result from future use of alternative fuels, including biofuels and ammonia. The submission also highlights that while these emissions already contribute to shipping's climate impacts, they are not currently targeted by IMO climate measures. The co-sponsors propose updates to the terms of reference

[38] Kan, A., 2026, Advancements and challenges of Onboard Carbon Capture, Utilization and Storage technologies for marine industry: A state-of-the-art- review, available at: https://www.sciencedirect.com/science/article/abs/pii/S0025326X25013244

for the Fifth IMO GHG Study to detail these emissions, or to undertake considering how these emissions could be addressed within the LCA Framework.

The **International Petroleum Industry Environmental Conservation Association (IPIECA) et al *(in ISWG-GHG 21/3/10)*** propose expanding the 2024 LCA Guidelines to allow fuel producers to use PPAs and spot electricity purchases supported by credible energy attributes certificate, to account for the carbon intensity of electricity used across the WtW lifecycle of marine fuels and energy carriers. The submission calls for consistent eligibility criteria and guidance for all contractual mechanisms to ensure transparency, credibility, and environmental integrity.

Brazil *(in ISWG-GHG 21/3)* recalls the progress made on sustainability themes/aspects in the LCA Guidelines by GESAMP-LCA WG and the Correspondence Group established at MEPC81, including the proposition of five additional social and economic sustainability themes/aspects related to marine fuels, nonetheless noting that additional clarification and further development of these themes/aspects remain necessary.

Section 5: Air Pollution Prevention

Canada *(in MEPC 84/INF.38)* present a study on the use of waste incinerators onboard ships in Canadian waters, highlighting that while incineration is a convenient method for managing ship-generated waste, it can emit hazardous and toxic substances depending on the materials burned. The study indicates that the international regulatory framework is primarily set by MARPOL Annex and VI, however, only limited pollutants (e.g., carbon monoxide) are regulated, and most emissions are not continuously monitored in practice. The study finds that shipboard incinerators vary in type and typically lack after-treatment systems. Critically, there is very limited data on emission factors, with estimates often based on land-based incinerators without after-treatment, which suggests potentially high emissions of pollutants such as nitrous oxides, heavy metals and dioxins.

Turkey *(in MEPC 84/5)* proposes updating how nitrogen oxide (NOx) emissions are regulated for ships using new electricity-based propulsion systems to ensure air quality protection is consistent with current standards. The submission recommends measuring total NOx emissions relative to the total electricity produced, maintaining the current strict Tier III limits, and applying the standard across the main operating range of the ship's power system.

Section 6: 5th IMO GHG Study

The IMO commissions GHG Studies to estimate emissions from the sector and project possible developments. The 5th IMO GHG Study, scheduled for final approval at MEPC87 in spring 2028, will be used to guide future IMO decisions on shipping decarbonisation.

The **Republic of Korea *(in ISWG 21/4)*** provides comments on the draft terms of reference for the 5th IMO GHG Study, emphasising the need to ensure data reliability, methodological clarity, and consistency with previous studies. It proposes setting 2025 as the data year to balance timeliness and data completeness, clarifying that ammonia and hydrogen emissions should be treated within existing emission categories (e.g., fugitive or operational emissions) rather than as primary GHGs, and excluding embedded carbon of equipment and infrastructure from core inventory calculations, suggesting it be presented separately if needed. The sponsor

recommends that the definition of ZNZs avoids policy pre-determination and propose that the steering committee develop a framework for regularising future IMO GHG Studies and an annual update mechanism to ensure continuity and support evidence-based decision-making.

Pacific Environment and EDF *(in ISWG-GHG 21/3/20*) summarise the evidence regarding the indirect climate impacts of emissions of hydrogen and reactive nitrogen species, including nitrogen oxides (NO_x) and ammonia (NH_3). The cosponsors propose updates to the terms of reference for the Fifth IMO GHG Study to provide information on these emissions.

The April 2026 IMO meetings will cover several crucial topics central to advancing the decarbonisation of international shipping.

Key discussions at ISWG21 will focus on the development and implementation of the Net-Zero Fund, definitions and reward guidelines for ZNZ fuels, and the LCA Framework, including default emission factors, methodological choices, certification systems, and sustainability considerations. A central point of discussion will be ensuring that they support a just and equitable transition, particularly for climate vulnerable developing countries, while providing transparency, predictability, and clear investment signals for industry.

At MEPC 84, decisions on the NZF, including its economic element and acceptance procedure, will be critical for maintaining momentum in fuel transition, safeguarding compliance with GHG targets, and providing a strong foundation for effective implementation.

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Legal disclaimer

This paper was written by Opportunity Green staff: Sapphire Ross, Maudie Fraser, and Em Fenton. Any omissions or errors are the fault of the authors alone.

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