INTERNATIONAL MARITIME ORGANIZATION

E

MARINE ENVIRONMENT PROTECTION COMMITTEE
84th session
Agenda item 7

MEPC 84/7/43
6 March 2026
Original: ENGLISH
Pre-session public release: ☒

REDUCTION OF GHG EMISSIONS FROM SHIPS

Comments on the report of the third meeting of GESAMP-LCA Working Group

Submitted by Pacific Environment and CSC

SUMMARY

Executive summary:	This document comments on the report of the third meeting of GESAMP-LCA WG, regarding the development of a default well-to-tank (WtT) emission factor for fossil LNG. It highlights systematic underestimation of upstream emissions in life cycle assessments, cautions against adoption of non-representative or supplier-specific factors, and calls for a conservative, globally representative default value consistent with established benchmarks. It also provides alternative emission factors.
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 16
Related documents:	MEPC 84/7/3, MEPC 84/7/11, MEPC 84/7/12, MEPC 84/7/13, MEPC 84/7/16; MEPC 83/7/28; MEPC 75/INF.25; ISWG-GHG 20/3/9; ISWG-GHG 17/3 and resolution MEPC.67(37)

Introduction

1 This document is submitted in accordance with the provisions of paragraph 6.12.5 of the *Organization and method of work of the Maritime Safety Committee and Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.6), and comments on document MEPC 84/7/16, containing the report of the third meeting of GESAMP-LCA WG (hereafter "the Report"), in particular section 5.3 and annex 4.

2 The co-sponsors welcome the continued work of GESAMP-LCA WG to develop default well-to-tank (WtT) emission factors under the 2024 LCA Guidelines (resolution MEPC.391(81)). Given the central role of default emission factors in assessing the environmental impact of marine fuels, this document provides comments and evidence relevant to the selection of a default WtT emission factor for fossil LNG.

Studies show globally underestimated WtT emission factors

3 Following the proposed way forward in para. 5.3.5.3 of the report, the co-sponsors wish to provide GESAMP-LCA WG with the following peer-reviewed studies, which

demonstrate systematic underestimation of upstream emissions from LNG extraction and production. This body of evidence indicates that reliance on inventory-based or lower-bound emission factors risks embedding underestimation into default WtT values.

4 In the United States, the integration of nearly 1 million aerial site measurements across major producing regions estimated upstream methane emissions to average 2.95% of production, approximately three times higher than national inventory estimates and materially higher than emission factors reviewed in the report.[1] In Canada, aircraft-based measurements over the Athabasca region found facility-wide carbon emissions exceeding reported values by factors of 19 to 64.[2] Additionally, satellite-based analyses of major gas-producing basins have estimated methane emissions to be approximately 7.4 times higher than inventory values.[3] Document ISWG-GHG 20/3/9 presents analysis of satellite observations indicating that WtT fossil LNG emissions may be underreported by approximately 54% in Canada and 30% in the United States.

5 Measurement campaigns show that "super-emitters" may contribute the majority of regional emissions, with a few sites responsible for 50 to 79% of total methane released in some basins.[4] In certain cases, emissions from a small number of high-emitting facilities can match or exceed inventory-based estimates for the sector within a region or country.[5] Such heavy-tailed emission distributions cannot be captured by average-based emission factors.

6 Peer-reviewed reassessments of national inventories reach similar conclusions. A reassessment of the United Kingdom's upstream oil and gas methane inventory estimated emissions five times higher than reported.[6] A literature review of United States LNG emission factors likewise concludes that inventory-based LCAs tend to underestimate methane compared with measurement-based datasets, in some cases by up to +316%.[7] A peer-reviewed LCA of United States LNG exports underscores that upstream and midstream methane emissions constitute a dominant share of the overall GHG footprint when empirical methane data is included.[8]

Default WtT emissions factors must be conservative, globally representative, and aligned with established regulatory findings

7 The co-sponsors wish to reiterate GESAMP-LCA WG's conclusion in para. 5.3.4 of the report, that selecting a conservative and representative value is critical. Following the findings of paragraphs 3 to 6, the adoption of a precautionary (resolution MEPC.67(37)) and demonstrably conservative default value is necessary to avoid the risk of structural underestimation admitting higher-emitting supply chains.

---

1 Sherwin et al. (2024), *US oil and gas system emissions from nearly one million aerial site measurements*. https://www.nature.com/articles/s41586-024-07117-5

2 He et al. (2024), *Total organic carbon measurements reveal major gaps in petrochemical emissions reporting*. https://www.science.org/doi/10.1126/science.adj6233

3 Dubey et al. (2023), *Comparing satellite methane measurements to inventory estimates: A Canadian case study.* https://doi.org/10.1016/j.aeaoa.2022.100198

4 Sherwin et al. (2024).

5 He et al. (2024).

6 Riddick & Mauzerall (2022), *Likely substantial underestimation of reported methane emissions from United Kingdom upstream oil and gas activities*. http://doi.org/10.1039/D2EE03072A

7 Srikanth (2026), *Democratizing life cycle assessment by developing a streamlined model of GHG emissions from US natural gas supply chains*. https://doi.org/10.1016/j.crsus.2025.100554

8 *Howarth (2024). The greenhouse gas footprint of liquefied natural gas (LNG) exported from the United States.* https://doi.org/10.1002/ese3.1934

8 A conservative default emission factor that reflects the latest peer-reviewed evidence better reflects any fuel's emission profile than underestimated emission factors. As accurate measurement-based emissions quantification becomes available, a methodology should be established to update the WtT default values of LNG to better account for observed impacts.

9 A default WtT emission factor for fossil LNG must reflect the full diversity of global LNG production and trade flows, rather than a selective subset of regional imports or supplier-specific case studies. As highlighted in document MEPC 83/7/28 (Pacific Environment et al.), there are significant regional differences in GHG intensities across LNG exporting countries. A value derived from a limited geographic scope or a single supply chain risks embedding structural bias, underscoring the need to take a conservative approach until further review.

10 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. Any deviation from such established benchmarks should be supported by robust, transparent, and measurement-based evidence demonstrating that a lower factor is representative across diverse supply chains.

Suggestions on the Working Group's proposed way forward

11 Given the potential for extreme emissions as identified in paragraph 5, as well as higher-emitting export regions, the approach set out in paragraph 5.3.5.2.1 of the report, to identify a conservative global default value, is appropriate to ensure that all material impacts are captured. A conservative global value provides a safeguard against structural underestimation and reduces the risk that high-emitting production pathways are inadvertently advantaged, as explained in document MEPC 84/7/42 (Pacific Environment et al.).

12 In light of the structural underestimation of emissions documented in paragraphs 3 to 6, the co-sponsors caution against the proposed way forward in paragraphs 5.3.5.2.3 and 5.3.5.2.4 of the report to establish a range of values or regionally differentiated factors. Such an approach risks enabling the use of cherry-picked, lower-bound, or narrowly scoped upstream datasets to minimize reported emissions for particular supply pathways.

Limitations of WtT fossil LNG emissions factors submitted to GESAMP-LCA WG

13 The co-sponsors provide the following comments on selected emission factors submitted to GESAMP-LCA WG, as assessed in the report:

MEPC 84/7/13 (Japan)	Proposed factor of 14.8 gCO_2eq/MJ cites a study that compiles supplier-specific data to model LNG from Cheniere Energy's Sabine Pass plant delivered to China. The authors report GHG intensities 30-43% lower than national average emission profiles. Accordingly, the proposed factor should be taken as a route- and supplier-specific case study, rather than a basis for globally representative default values.
MEPC 84/7/3 (France)	Proposed factor of 17.5 g/MJ is for LNG delivered to Europe, whereas a default value should reflect the diversity of global LNG supply chains. ISWG-GHG 17/3 (CSC) presents a literature review-based assessment of EU LNG that reports a substantially higher WtT GHG intensity of 22.39 g/MJ and even critiques FuelEU Maritime's 18.5 g/MJ as understating real-world emissions. The co-sponsors also support the understanding in annex 4 to the report, that the submission undercounts fugitive methane emissions due to the incorrect assumptions that flaring efficiency is 100% and that no methane is leaked during extraction.[9]

[9] See, for example, Clean Air Task Force (2024), *Flaring accountability: Global gas flaring by major oil and gas companies and their partners*. https://www.catf.us/resource/flaring-accountability/

MEPC 84/7/11 (Norway and the Republic of Korea)	Proposed factor of 14.0 g/MJ is based on a claimed methane emissions intensity of 0.34%, which is substantially below ranges reported in peer-reviewed and measurement-based studies outlined in paragraphs 3-6. Additionally, the granular methodology underpinning the Rystad Energy analysis is not publicly available. GESAMP-LCA WG is therefore invited to critically evaluate the methodological basis and representativeness before considering its suitability for default application.

Proposed emissions factors

14 In accordance with the proposed way forward set out in paragraph 5.3.5.3 of the report, the co-sponsors wish to provide GESAMP-LCA WG with alternative emission factors for its consideration. While these values may not be presented in the precise format requested by the Group, the co-sponsors respectfully submit that the robustness, magnitude, and consistency of the underlying findings warrant careful consideration and cannot reasonably be disregarded.

MEPC 83/7/28	The proposed factor of 33 g/MJ explicitly accounts for upstream methane slip using estimates from in widely cited peer-reviewed literature.
MEPC 83/7/28	The factor of 23.8 g/MJ is a recent, globally representative estimate by aggregating data from over 130 references in line with the 2024 LCA Guidelines.
MEPC 75/INF.25	The factor of 21.5 g/MJ applies transparent boundaries and incorporates updated methane leakage and slip data, resulting in an upstream value that is representative of LNG supply chains. In light of the evidence of structural underestimation in paragraphs 3-6, this factor is a precautionary and literature-grounded benchmark for the Group's consideration.

Conclusions and recommendations

15 The body of peer-reviewed literature and measurement-based studies summarized in paragraphs 3 to 6 demonstrates a consistent pattern: upstream emissions associated with fossil LNG are structurally underestimated, undermining the objective of establishing emissions factors that are representative and conservative and perpetuating the risks highlighted in para. 5.3.4 of the Report. The co-sponsors recommend that the Committee forward the following to GESAMP-LCA WG:

.1 the body of evidence showing systematic undercounting of emissions from inventory-based assessments (paragraphs 3 to 6);

.2 an emphasis on the need to find conservative and representative emissions factors (paragraphs 7 to 10);

.3 the limitations of the proposed emissions factors (paragraph 13); and

.4 suggestions on the proposed ways forward (paragraphs 11 and 12) and suggested sources for benchmark emissions factors (paragraph 14).

Action requested of the Committee

16 The Committee is invited to consider the information in this document in relation to the GESAMP-LCA WG's development of default emissions factors for the pathway code LNG_f_SLP_gm, consider the recommendations in paragraph 15 and forward them to GESAMP-LCA WG for their consideration, and take action as appropriate.