

Frequently Asked Questions and best-practice guidance for preparing submissions to GESAMP-LCA Working Group

General questions

Q1 - What should be included in one submission of proposed default emission factor(s)?

Member States are invited to submit proposals for default emission factor(s), taking into account the *Methodology for submission, scientific review and recommendation of proposed default emission factors by GESAMP-LCA WG* (MEPC.1/Circ.916), for scientific review and recommendation to the Technical Secretary of the GESAMP-LCA WG:

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The following documentation is required to be submitted **simultaneously**:

1. the appropriate standard **template form(s)** (aligned with appendix 4 for well-to-tank (WtT) or appendix 5 for tank-to-wake (TtW) to the 2024 LCA Guidelines¹) (blank templates are available on the IMO website at [IMO framework on life cycle GHG intensity of marine fuels \(LCA\)](#));
2. the **Excel 'LCA calculation tool'**² for each proposal (latest version can be found on the IMO website at [IMO framework on life cycle GHG intensity of marine fuels \(LCA\)](#)); and

¹ 2024 Guidelines on life cycle GHG intensity of marine fuels (2024 LCA Guidelines) (resolution MEPC.391(81))

² Data completeness: every field in every tab should be completed to ensure compliance with the data-quality requirements stated in the 2024 LCA Guidelines. (report GESAMP-LCA WG 3/11, para 5.2.6)

Units: where units are specified for a column, those units should be used.

Scope of completion: if submitting only WtT default emission factors, it is sufficient to complete the tables related to WtT; and likewise for submissions containing only TtW proposed default emission factors.

Specific requirement: GESAMP-LCA WG requires 'WtT – Table 5 (fuel Id)' to be **fully completed**, and that the **lower calorific value (LCV) to be provided for all submissions**. (report GESAMP-LCA WG 3/11, para 5.2.6)

3. a **non-confidential dossier**³, summarizing the description of the proposal(s), and formatted as an MEPC⁴ document to be submitted to the next session of the Committee.

If any of the above mentioned documents are missing, the submission of proposed default emission factor(s) will not be forwarded to the GESAMP-LCA WG.

Additional information can be provided in the form of annexes. The submitted materials should be sufficient for GESAMP-LCA WG to conduct a full scientific review, including an assessment of data quality, relevance, and the methodology applied. GESAMP-LCA WG may also need to perform additional calculations using the submitted data. All supplementary information should be submitted as **complete electronic files** (PDF, Word, etc.) rather than hyperlink(s). All supporting documents and references need to be included directly in the submission package.

Provide a clear, detailed explanation of the entire **value chain**. This should include:

- a step-by-step description from feedstock sourcing up to final conversion to fuel;
- flowcharts showing mass and energy balances for each relevant stage; and
- detailed logistics information, including transport distances, return trip (i.e., distance and payload), transport modes for each feedstock, intermediary product and final fuel delivered to the ship.

Q2 - Could we have a face-to-face meeting or a call with GESAMP-LCA WG and explain our data?

GESAMP-LCA WG cannot hold face-to-face meetings or calls with the submitting Member State(s) to ensure complete transparency and a fair and impartial treatment of all the submissions.

Q3 - For emerging fuels such as e-ammonia, the available data — particularly related to combustion emissions — may evolve significantly over the coming years. Could you clarify whether the default emission factor(s) submitted at this stage are expected to be treated as ‘final’, or whether there is scope for iterative updates as more validation data becomes available?

GESAMP-LCA WG will review the proposed default emission factor(s) and may recommend some for approval by MEPC, including how they should be incorporated into the 2024 LCA Guidelines. GESAMP-LCA WG may also issue provisional recommendations on default emission factors.

Section 13 of the 2024 LCA Guidelines (Part V, Review) specifically state that default emission factors are subject to continuous review to ensure that new supply chain, technological advances and scientific knowledge are taken into account.

³ GESAMP-LCA WG agreed (MEPC 83/7/1) that the non-confidential information to be included, and provided to MEPC, should include, at a minimum, the following:

1. fuel pathway description and code;
2. proposed WtT default emission factor(s), as appropriate;
3. proposed TtW default emission factor(s), as appropriate; and
4. underlying analysis/studies performed.

⁴ Marine Environment Protection Committee (MEPC)

Q4 - Can confidential data be included in a submission?

Yes. GESAMP-LCA WG recognizes that some data may be confidential.

All submissions are treated as confidential, and submitters will have the opportunity to review any materials for confidentiality prior to being shared publicly by GESAMP-LCA WG as part of its report to MEPC.

Q5 - The 2024 LCA Guidelines specify that data should be “accessible”. Our submission relies on primary data provided by industry partners, and we are currently finalizing the terms under which the life cycle inventory (LCI) data can be disclosed. One potential outcome is that we will only be allowed to provide anonymized and aggregated data. Should we include a separate Word document describing the anonymization process itself as part of our submission?

Data should be accessible to GESAMP-LCA WG for the purposes of their review. All GESAMP-LCA WG members are bound by confidentiality and non-disclosure obligations.

Q6 - Does GESAMP-LCA WG prefer aggregated or disaggregated data?

GESAMP-LCA WG prefers **disaggregated data**, as it enables a more robust and scientifically sound review of the submissions.

If multiple datasets or sources are combined (e.g., averaged), the individual underlying datasets should also be provided. Only combine datasets when it is appropriate to do so, and include a clear justification for the combination.

GESAMP-LCA WG acknowledges that disaggregated data may be confidential. Nevertheless, providing such data is strongly encouraged. All submissions are treated as confidential, and submitters will have the opportunity to review any materials for confidentiality prior to being shared publicly by GESAMP-LCA WG as part of its report to MEPC.

Questions related to the Excel 'LCA calculation tool'

Q7 - The Excel 'LCA calculation tool' includes both a "Region" field and a dedicated tab for regional electricity data. Should submitters derive region-specific default values based on the actual production location OR are default values expected to be global or region-neutral, with the "Region" field used only for contextual information?

Submitters may provide either **global** or **regional** data. However, the data should be presented with enough clarity and specificity for GESAMP-LCA WG to assess it (ideally with results traceable to a specific country). For its review, GESAMP-LCA WG requires that the underlying data for each parameter (e.g., e_{fecu} , e_p and e_{td}) be provided directly. In the **Region field**, specify the region to which the data apply, i.e., global for global values, or indicate the relevant country or region when the data are specific to that location.

At its second meeting, GESAMP-LCA WG agreed in principle that, to ensure geographical representativeness, global default values should be based on **at least three cases, each from a different country**.

However, where the national production of a specific pathway representing at least ~80% or more of global volumes for that given fuel pathway can be demonstrated, then **three cases from that country alone** may be sufficient to determine a geographically representative global default value. In this context, the three cases could be prepared using three different LCA models or three different scenarios within the same LCA model, provided they reflect realistic production and transportation conditions.

Q8 - The Excel 'LCA calculation tool' includes a tab for "Regional Electricity" GHG-intensity values, but these values do not appear to be linked to the main calculation tabs. What is the intended purpose of the "WtT – Table 3 (region elect)" tab?

The purpose of this tab is to provide the carbon intensity of the electricity used in the fuel pathway. Submitters are encouraged, though not required, to link the data for all processes that have electricity as input.

Emission data related to electricity generation may be entered directly into the *WtT – Table 2 (e_p)* tab, using the electricity-unit format provided by the submitter's chosen calculator. Submitters may then manually link the electricity inputs in the *WtT – Table 2 (e_p)* tab (and other tabs, as appropriate) to the associated electricity-generation emissions in the *WtT – Table 3 (region elect)* tab.

While optional, it is recommended that submitters link the data for all processes that have electricity as input by completing both of the following steps:

- **Step 1: Enter the carbon intensity of the electricity mix** in column D of the *WtT – Table 3 (region elect)* tab.

In the example below, the cradle-to-gate emissions per MJ electricity for CO₂, CH₄, and N₂O values are entered in cells D27, D28, and D29, respectively.



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Data for emissions associated with electricity generation can be reported in the table(s) below.			
• Use table A for data reported in g/MJ.		• Use table B for data reported in g/kWh.	
(The conversion factor is 1 MJ = 3.6 kWh)			
▼			
• Table A: Summary of cradle-to-gate emissions per MJ electricity			
(If the emissions data can only be provided as g CO ₂ eq/MJ electricity, enter the data in the first row and provide an explanation in the Data source / model used column)			
	Unit		Data source / model used
Cradle-to-gate CO ₂ emissions	g CO ₂ /MJ electricity	32,8390582	REET
Cradle-to-gate CH ₄ emissions	g CH ₄ /MJ electricity	0,063080074	REET
Cradle-to-gate N ₂ O emissions	g N ₂ O/MJ electricity	0,00366326	REET
Carbon intensity (using IPCC AR5 GWP100)	g CO ₂ eq/MJ	35,57606413	
Carbon intensity (using IPCC AR5 GWP20)	g CO ₂ eq/MJ	39,10488502	
• Table B: Summary of cradle-to-gate emissions per kWh electricity			
(If the emissions data can only be provided as g CO ₂ eq/kWh electricity, enter the data in the first row and provide an explanation in the Data source / model used column)			
	Unit		Data source / model used
Cradle-to-gate CO ₂ emissions	g CO ₂ /kWh electricity	118,2206095	REET
Cradle-to-gate CH ₄ emissions	g CH ₄ /kWh electricity	0,227088267	REET
Cradle-to-gate N ₂ O emissions	g N ₂ O/kWh electricity	0,013187735	REET
Carbon intensity (using IPCC AR5 GWP100)	g CO ₂ eq/kWh	128,0738309	
Carbon intensity (using IPCC AR5 GWP20)	g CO ₂ eq/kWh	140,7775861	

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Instructions
Glossary
Summary
WtT - Table 1 (efecu)
WtT - Table 2 (ep)
WtT - Table 3 (region elect)
WtT - Table 4 (etd)
WtT Table 5 (f)

- **Step 2: Manually link the electricity input in column D of the *WtT – Table 3 (region elect)* tab to the corresponding emission factors in the *WtT – Table 2 (ep)* tab. This link will populate the CO₂, CH₄ and N₂O emissions results in columns F, G and H respectively of *WtT – Table 2 (ep)* tab.**

In the example below:

$$F15 = D15 * 'WtT - Table 3 (region elect)!'D27$$

$$G15 = D15 * 'WtT - Table 3 (region elect)!'D28$$

$$H15 = D15 * 'WtT - Table 3 (region elect)!'D29$$



Enter all inputs, outputs and emissions during fuel production in Table 2 below. All

- Column B enter the types of inputs and outputs.
- Column C enter a more detailed description of the flow.
- Column D enter the quantity of each input/output for 1 MJ_{LCV} of fuel delivered to the ship.
- Column E enter the unit.
- Columns F, G and H enter direct emissions or cradle-to-gate GHG emissions respectively. If the emissions data can only be provided as a CO₂eq, enter the value in column F.
- Columns I and J the sum should be equal to e_p for GWP100 and GWP20, respectively.
- Column K enter the data source/model used for each input/output.
- Column L enter any additional observations or comments, if any. If any allocations are allocated to each product.

Table 2: Full inventory of all inputs, outputs and emissions during fuel production for 1 MJ_{LCV} of fuel delivered to the ship, including all necessary steps to pre-treat the feedstock for conversion into fuel, via the selected process

Inputs / Output types (if there are direct GHG emissions during fuel production, they are listed as emissions in this column and reported in columns F, G and H)	Flow description	Value (amount needed for 1 MJ _{LCV} of fuel delivered to the ship)	Unit	CO ₂ emissions	CH ₄ emissions	N ₂ O emissions	Total CO ₂ eq emissions	Total CO ₂ eq emissions	
				g MJ _{LCV} of fuel delivered to the ship	g MJ _{LCV} of fuel delivered to the ship	g MJ _{LCV} of fuel delivered to the ship	GWP100	GWP20	
Electricity	Input	3	MJ electricity/MJ(LCV) fuel delivered to ship	98.5171746	0.189240222	0.01098978	106.7281925	117.3146552	
				0	0	0	0	0	
				0	0	0	0	0	
				0	0	0	0	0	

Q9 - We noted that the Excel ‘LCA calculation tool’ does not contain a dedicated tab or section for reporting data quality or uncertainty. As part of our submission, we would like to include qualitative and/or quantitative information on data quality and uncertainty to help contextualize the robustness of the emission factor values we have derived. Would it be acceptable to provide this information in a separate Word document as part of our submission, or is there a preferred format or specific guidance on how such information should be submitted and considered during the review process?

Data quality information can be described in Appendix 4⁵ for well-to-tank (WtT) default emission factor submission or Appendix 5⁶ for tank-to-wake (TtW) default emission factor submission. Submitters should also be prepared to provide any additional details to GESAMP-LCA WG upon request.

⁵ Appendix 4 to the 2024 LCA Guidelines (resolution MEPC.391(81))

⁶ Appendix 5 to the 2024 LCA Guidelines (resolution MEPC.391(81))

Questions related to well-to-tank (WtT) and Appendix 4⁷

Q10 - What information needs to be included in Appendix 4 when submitting a well-to-tank (WtT) default emission factor?

To complete the standard **template form** (as outlined in appendix 4 to the 2024 LCA Guidelines), the submission should clearly define what the proposed default emission factor represents. This includes specifying the region, feedstock, technology, time horizon, and any other parameters that are considered part of the goal and scope of the life cycle assessment. Provision of this context is essential for reviewing and assessing default emission factors.

Flowcharts illustrating energy and mass flows and balances should be included. These diagrams help GESAMP-LCA WG to understand the system boundaries, underlying assumptions, and methodological choices. Including relevant quantitative information directly on the flowchart is encouraged.

It is also recommended to provide a block-wise mass and energy balance for each process step, as exemplified in figure 1. Input materials x, y may include the feedstock or fuel stream, as well as any other additives, etc. Output material z may include the products of the process step (feedstock or fuel), other co-products or by-products, any direct leakages or losses, etc.

Energy inputs to the process include electricity and heat required for the step, while energy outputs from the process include electricity and heat leaving the system (NOT the energy content of the material leaving the process). When materials have an energy content, provide their lower calorific value (LCV) so that the overall energy balance of the process can be verified.

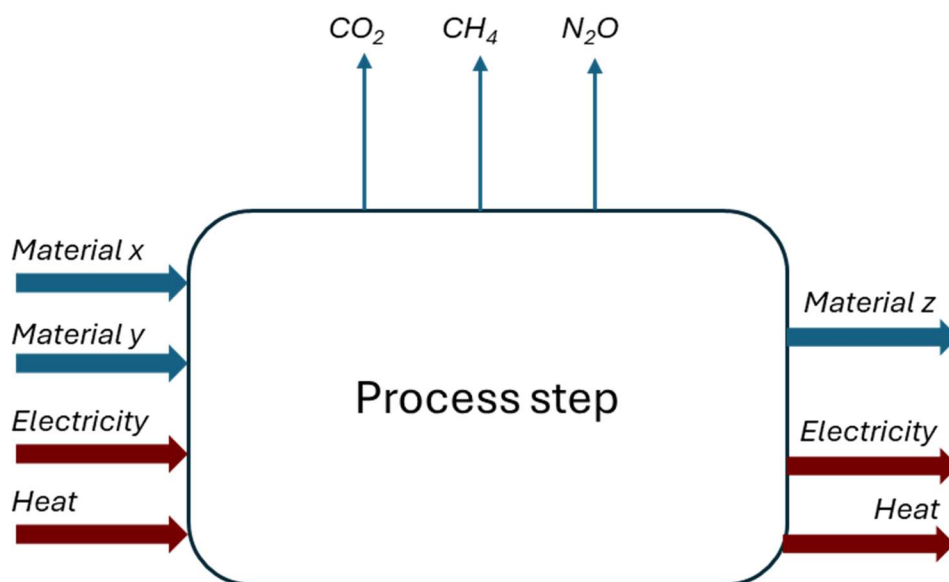


Figure 1 Example of a block-wise mass and energy balance for a process step.

⁷ Appendix 4 to the 2024 LCA Guidelines (resolution MEPC.391(81))

Q11 - Under which parameter should GHG emissions from hydrogen production via electrolysis be reported: under e_p or under $e_{f_{\text{ecu}}}$?

The most important aspect is that all steps in the life cycle are included and calculated in accordance with the 2024 LCA Guidelines.

GESAMP-LCA WG acknowledges that there may exist different ways to categorize a **feedstock**. GESAMP-LCA WG recommends using 'Feedstock Type' in appendix 1 to the 2024 LCA Guidelines as guidance to determine what should be classified as feedstock and reported under $e_{f_{\text{ecu}}}$.

For fuels produced using hydrogen as **input** (e.g., e-ammonia), GESAMP-LCA WG recommends reporting hydrogen production under $e_{f_{\text{ecu}}}$, while the subsequent **fuel synthesis** process (e.g., Haber-Bosch process) should be reported under e_p .

If hydrogen production and fuel synthesis are integrated into a single process, GESAMP-LCA WG recommends reporting the combined process under e_p .

Questions related to tank-to-wake (TtW) and Appendix 5⁸

Q12 - What type of data is preferred?

Primary TtW emissions data for each energy converter under consideration, and in line with the classification in the 2024 LCA Guidelines, is to be reported. The data will allow GESAMP-LCA WG to: replicate the calculations and properly contextualize the proposed emission factors and the data are indeed representative of real-world practices. When primary data is available from multiple energy converter cases, provide it in disaggregated form, in addition to any aggregated data submitted.

GESAMP-LCA WG deemed the following primary data sources appropriate for TtW default emission factor submission, listed from most to least relevance, suitability and transparency:

- .1 publicly accessible, peer-reviewed datasets from production engines using appropriate measurement protocols;
- .2 verified lab tests or factory acceptance tests (e.g., Engine International Air Pollution Prevention (EIAPP) certificates) that include the relevant parameters of interest;
- .3 non-verified or non-peer-reviewed lab tests, factory acceptance tests, or other comparable datasets; and
- .4 estimates based on calculations, simulations, development targets, or other approximations.

Q13 - What information should be provided when describing the primary data?

A description of the **measurement procedures** used to obtain the primary data should be included. Acceptable standards include, for example: ISO 8178-1; ISO 8178-2; the NO_x Technical Code; or the *Guidelines for test-bed and onboard measurements of methane (CH₄) and/or nitrous oxide (N₂O) emissions from marine diesel engines* (resolution MEPC.402(83)).

Other methodologies are acceptable, provided they are clearly documented and include the following:

- .1 a justification for any deviation from the standards listed above;
- .2 a summary of the applied methodology, including instrumentation for gas-phase measurement and engine operation, fuel properties, measurement protocol, and any relevant data analysis techniques; and
- .3 a summary of the results obtained, in particular the values required to calculate the submitted TtW values.

⁸ Appendix 5 to the 2024 LCA Guidelines (resolution MEPC.391(81))

Q14 - Should measurement uncertainty be reported?

Yes. An assessment of measurement uncertainty and testing conditions (e.g., in accordance with ISO 5725) should be provided.

Submitters should also be prepared to provide any additional details to GESAMP-LCA WG upon request.

Q15 - Should the fuel composition data be specified?

Yes. The fuel composition data such as carbon content, sulfur content, etc. should be clearly specified, especially if C_{slip} parameter is used to assess methane emission conversion factor (C_{fCH_4}).

Q16 - In cases where empirical data availability is limited, such as for emerging fuels like ammonia, is there guidance on how should inputs be handled based on theoretical or literature-derived values?

For example, ammonia combustion (TtW) will require assumptions on N_2O emissions that are not yet validated through large-scale marine engine testing. In such cases, is it acceptable to use theoretical, industry-based, or peer-reviewed estimates, as long as all the assumptions and data sources are transparently documented in the Word submission?

As per paragraph 3.3 of the GESAMP-LCA WG's Methodology (MEPC.1/Circ.916), alongside a filled template, additional details and relevant information (e.g., LCA model/tool and respective data, peer-reviewed literature, primary data, official statistics or scientific/engineering simulation used for establishment of proposed default emission factors) should be provided. (See also question Q3).