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Guidance Document

The EU ETS and MRV Maritime
General guidance for shipping companies

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Disclaimer

This document is part of a series of documents provided by the Commission services for supporting the implementation of the EU ETS (the European Union Emission Trading System).

The guidance represents the views of the Commission services at the time of publication. It is not legally binding.

Version History

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1 INTRODUCTION

1.1 About this document

This document has been written to support the implementation of the MRV Maritime Regulation and the EU ETS Directive, by explaining their requirements in a non-legislative language. For some more specific technical issues, further guidance documents may be made available in the future. On the Commission's website there are further guidance documents which were developed to support earlier versions of the MRV Maritime Regulation (before 2023). Those will be withdrawn as soon as the content has been taken up and/or further developed by new guidance documents. However, it should always be remembered that only the legislation (EU ETS Directive, MRV Maritime Regulation, and implementing and delegated acts thereunder) is legally binding.

This document interprets the legislation regarding requirements for shipping companies. It takes into account older guidance material, as well as the valuable input from the CCEG (Climate Change Expert Group) Maritime formation, and the MRV and ETS Implementation subgroup of the ESSF (European Sustainable Shipping Forum). This guidance document was endorsed by Member States in the Meeting of the Maritime Formation of the CCEG (Expert Group on Climate Change) in its meeting on 3 July 2024.

1.2 Where should I start reading?

It is advised to read the document from the beginning to the end in order to get a full overview of the relevant monitoring and reporting rules for the maritime shipping sector. However, readers already familiar with the MRV Regulation in its form before the inclusion of shipping in the EU ETS (the EU greenhouse gas Emission Trading System) may consult section 1.3 in order to quickly jump to the information on most important changes made to the legislation in 2023.

The linear reading order is as follows:

- Chapter 2 presents the basic principles needed to understand the requirements of the MRV Maritime Regulation and the EU ETS Directive:
  - Section 2.1 gives a general overview of requirements of the two main legislative acts, and how they interact.
  - Section 2.2 describes in detail the scope of activities falling under the MRV Maritime Regulation (in terms of GHGs, ships, activities / voyages);
  - Thereafter, section 2.3 provides similar guidance on the scope of the EU ETS for shipping.
  - Section 2.4 explains what the administering authority is, and section 2.5 gives guidance on the identification of the 'shipping company', as the regulated entity assuming responsibility in respect of ships.
  - Section 2.6 presents the underlying principles of MRV (monitoring, reporting and verification) system.
- Chapter 3 explains the roles and responsibilities as well as the relevant deadlines of the so-called "compliance cycle".
- Chapter 4 presents the monitoring rules for ships. It gives insight into which parameters need to be monitored on a per-voyage basis, and under what circumstances a derogation can be granted.
  - From section 4.3 onwards, the applicable monitoring methods (A, B, C and D) are described.

- Section 4.6 deals with the selection and use of emission factors, both default and actual ones, i.e. diverging from those contained in Annex I of the MRV Maritime Regulation.
- Section 4.9 explains the possible combination of approaches, and section 4.10 introduces the topic of uncertainty assessment.

- Chapter 5 is dedicated to the reporting of further information beyond fuel consumption and GHG emissions, like cargo carried, energy efficiency, etc.
- Section 5.2 lists all requirements, necessary for the calculations and exemptions for reporting under the EU ETS.
- In Chapter 6 guidance is given on all requirements for the monitoring plan, including its control system for data flow activities.
- The first Annex (chapter 7) presents detailed step-by-step guidance for filling the monitoring plan template as implemented in THETIS-MRV, including numerous examples.
- Annex II (Chapter 8) provides guidance on further specific topics relevant to the monitoring and determination and reporting of the parameters required by the MRV Maritime Regulation.
- Annex III (Chapter 9) gives a short introduction to the requirements for "zero-rating" of CO_2 emissions from biofuels for the purpose of the EU ETS.
- Annex IV (Chapter 10) finally contains a list of acronyms used throughout this document and provides a list of the relevant legal acts.

1.3 What is new for shipping companies?

This document was written to support the implementation of the MRV Maritime Regulation and the EU ETS Directive after the legislative updates made in 2023 within the European Green Deal. The original MRV Maritime Regulation has already been applied since 2018. Readers who are familiar with the original MRV Regulation will find the following points to be new since 2023 and are therefore recommended to pay particular attention to the following points:

- From 2024, the MRV Maritime Regulation covers not only emissions of CO_2, but also methane (CH_4) and nitrous oxide (N_2O) emissions.
- The scope of the MRV Maritime Regulation has been extended with regard to the ships covered (see section 2.2).
- The introduction of maritime activities in the EU ETS brings a set of new requirements for shipping companies:
  - Guidance on the scope of activities falling under the EU ETS is given in section 2.3. The EU ETS currently covers only CO_2, and from 2026 also the other greenhouse gases covered by the MRV Maritime Regulation (i.e. CH_4 and N_2O).
  - Each shipping company is assigned to one Member State and exactly one administrating authority (see section 2.4).
  - For ships which carry out activities falling under the EU ETS Directive, the shipping company has to submit the monitoring plan to the administering authority for approval (following the assessment of monitoring plans by the verifier).
  - In addition to the annual submission of verified emissions reports per ship (ER), the shipping company must submit a verified company-level emission Report (CER) to the administering authority. The data contained therein is discussed in section 5.2).

- For fulfilling the EU ETS obligations, the shipping company must surrender one allowance (EUA) for each tonne of CO_2 equivalent emitted. For this purpose, the shipping company must have opened an account[1] and purchased the relevant amount of EUAs. These topics are outside the scope of this guidance document.

1.4 Where to find further information

- All information on MRV Maritime and EU ETS legislation can be found on the Commission's website: **https://climate.ec.europa.eu/eu-action/transport/reducing-emissions-shipping-sector_en**
  - Legislation is found there in the sub-section "EU Action", as well as via the links given in the Annex of this document (section 10.2);
  - Guidance documents are found under "Documentation" Sub-section "Guidance / best practice documents";
  - Answers to frequently asked questions are found in the section "FAQ".
- Guidance on the use of the reporting tool THETIS-MRV is given in the form of videos on the THETIS-MRV website: **https://emsa.europa.eu/thetis-mrv/thetis-mrv-videos/**.
- There is an extensive set of guidance documents on monitoring and reporting, and on verification and accreditation, in the EU ETS for stationary installations and aircraft operators. That guidance material is partly also interesting for shipping companies. The respective documents are indicated where relevant directly in this document. However, should those documents be updated, it may happen that the given links do not work anymore. In such case, please look up the respective document on the Commissions MRVA website:
  https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en#documentation

[1] MOHA, Maritime Operator Holding Account.

2 CONCEPTS AND DEFINITIONS

Note: Throughout this document, "**Member States**" are to be understood to include the 27 EU Member States as well as the EFTA states covered in the **EEA** (European Economic Area), i.e. Norway, Iceland and Liechtenstein, which fully participate in the EU ETS and apply the MRV Maritime Regulation. Therefore, "EU ports" and "EEA ports" are used interchangeably.

For details on the geographical scope, see section 2.2.4.

2.1 Overview: MRV Maritime and EU ETS

MRV Maritime Regulation

Since 1 January 2018, the maritime transport sector has been obliged to monitor and report emissions in accordance with the MRV Maritime Regulation[2]. Under this regulation, shipping companies have to provide monitoring plans, emissions reports and verification reports, **for each of the ships** under their responsibility. Shipping companies have to monitor, for each of their ships, greenhouse gas emissions, fuel consumption and other parameters, such as distance travelled, time at sea and cargo carried on a per voyage basis, so as to gather annual data into an emissions report verified by an accredited MRV Maritime verifier. Shipping companies must, through THETIS-MRV, submit to their responsible administering authority, the Commission and to the authorities of their flag State (in case ships are flying the flag of a Member State) a satisfactorily verified Emissions Report (ER) for each ship that has performed maritime transport activities in the European Economic Area in the previous reporting period (calendar year).

EU ETS from 2024 onwards

From 2024, they also need to provide data **on a per company basis**, with additional data reported for the EU Emission Trading System (EU ETS[3]), providing an aggregated report of all their ships' emissions derived from the data monitored under the MRV Maritime Regulation. For this purpose, only one single process of monitoring and reporting is required, although the data to be reported within the EU ETS may deviate, to a certain extent, from those to be reported under the MRV Maritime Regulation, e.g. regarding the scope (GHG gases, coverage of voyages), and the different applicable derogations as established by the EU ETS Directive.

Compliance

Under the MRV Maritime Regulation, shipping companies are in compliance if they fulfil the obligation to submit a verified emissions report in time and if the relevant ships which carried out activities within scope of the Regulation have a valid document of compliance on board. Under the EU ETS, however, shipping companies have to purchase and surrender (use) EU ETS emission allowances for each tonne of reported CO_2 (or CO_2 equivalent for the activities after 1 January 2026) as emitted under the scope of the EU ETS. Emissions from maritime transport are included in the overall ETS cap, which defines the maximum amount of greenhouse gases that can be emitted under the system. The cap is reduced

[2] Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of greenhouse gas emissions from maritime transport, and amending Directive 2009/16/EC (Text with EEA relevance); Consolidated version: http://data.europa.eu/eli/reg/2015/757/2024-01-01

[3] Established by the "EU ETS Directive": Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. Consolidated version: http://data.europa.eu/eli/dir/2003/87/2024-03-01

over time to ensure that all ETS sectors cumulatively contribute to the EU's climate objectives. In addition, it creates a carbon price signal to incentivise energy efficiency, low-carbon solutions, and reduce the price difference between alternative fuels and traditional marine fuels.

Other relevant legislation

Closely linked to MRV Maritime and the EU ETS, a third piece of legislation requires monitoring and reporting activities by shipping companies. This is the "FuelEU Maritime Regulation"[4], under which shipping companies have to monitor, calculate and report the average annual GHG intensity of the energy used on board each of their ships. This Regulation requires from January 2025 the reporting of life cycle emissions rather than direct emissions ("Well-to-Wake", WtW emissions), while the MRV Maritime and EU ETS require the reporting of direct emissions, or "Tank-to-Wake" (TtW) emissions. FuelEU Maritime has its own compliance system, but there are many synergies which shipping companies may make use of so that the monitoring of emissions data takes place only once.

2.2 Scope of the MRV Maritime Regulation

2.2.1 Greenhouse gas emissions covered by the MRV Maritime Regulation

The greenhouse gases (GHG) covered by MRV Maritime Regulation from 2024 are: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) released during a voyage or a port of call covered by the Regulation.

2.2.2 Ships covered by the MRV Maritime Regulation

The MRV Maritime Regulation applies to ships of 5 000 gross tonnage (GT) and above in respect of the greenhouse gas emissions released during their voyages from or/and to and between ports in the European Economic Area (EEA) for transporting for commercial purposes cargo or passengers, as well as within EEA ports.

Starting with 1 January 2025, the MRV Maritime Regulation will also apply to offshore ships of and above 5 000 GT, as well as offshore ships and general cargo ships between 400 and 5 000 GT.

Ships are subject to the MRV Maritime Regulation regardless of their flag or class. This means that if a ship changes class or flag, this has no effect on the MRV reporting.

Article 2 of the MRV Maritime Regulation lists ships which are exempted from its scope, namely:

- Warships;
- Naval auxiliaries;
- Fish-catching or fish-processing ships;
- Ships not propelled by mechanical means;
- Government ships used for non-commercial purposes.

Note on ships operated in stationary mode:

Emissions of a ship while within a port of call under the jurisdiction of an EEA country are included in the emissions to be reported under the MRV Maritime Regulation and the EU ETS for maritime transport. However, there are cases of ships that fall under the scope of the EU ETS for stationary installations,

[4] Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC, http://data.europa.eu/eli/reg/2023/1805/oj

as long as they are stationary. For this purpose, the Commission's guidance document on the scope of the EU ETS for stationary installations (GD0)[5] clarifies:

> "W*here LNG terminals or other offshore installations such as oil rigs are installed on a ship, the emissions from the ship's engine would be covered by the EU ETS for maritime transport while it is mobile. However, if the ship's engine is used during stationary mode (e.g. for the production of electricity or heating), its emissions are to be included in the GHG permit which it requires for being stationary*."

Operators of such ships therefore have to contact the competent authority of the jurisdiction of where the ship is operated in stationary mode in order to obtain a greenhouse gas emissions permit[6] in accordance with Article 4 of the EU ETS Directive and submit a monitoring plan for approval accordingly. Note that such monitoring plans are not included in THETIS-MRV and that such ships will not be subject to other obligations as set in the MRV Maritime Regulation, such as reporting emissions within a port of call, as long as they remain stationary. For more information, see the Commission's website on guidance for stationary installations[7].

2.2.3 Activities covered by MRV Maritime Regulation

The MRV Maritime Regulation applies to greenhouse gas emissions released by ships during their voyages as discussed below, as well as within ports of call under the jurisdiction of a Member State. Emissions released within a port of call include emissions while the ship is at berth and emission released within ports when the ship is not at berth, but instead moving within a port of call between two voyages.

The notion of '**port of call**' is used to delineate the **start and the end of a voyage**. It means the port where a ship stops to load or unload cargo or to embark or disembark passengers, or the port where an offshore ship stops to relieve the crew.

Some exclusion cases are foreseen by the Regulation, by which certain stops do not qualify as a 'port of call', namely:

- Stops for the sole purposes[8] of refuelling; obtaining supplies (including fodder for vessels transporting animals as cargo); relieving the crew of a ship other than an offshore ship; going into dry-dock or making repairs to the ship and/or its equipment;
- Stops in port because the ship is in need of assistance or in distress;
- Ship to ship transfers carried out outside ports;
- Stops for the sole purpose of taking shelter from adverse weather or rendered necessary by search and rescue activities;
- Stops of containerships in a neighbouring container transhipment port identified in Implementing Regulation (EU) 2023/2297[9].

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[5] https://climate.ec.europa.eu/document/download/edc93136-82a0-482c-bf47-39ecaf13b318_en?filename=GD0%20-%20Annex%20I%20to%20EU-ETS%20Directive.2024.pdf

[6] The ship may require its own permit or, upon acceptance of the relevant competent authority, be covered under the permit of the stationary installation in respect of which it is considered to represent a directly associated activity.

[7] EU ETS MRVA Website: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en#documentation
The following information sources are most important: Quick Guide for operators; GD1 (General guidance for installations) and the Monitoring Plan template.

[8] A ship may combine different activities covered by different port of call exclusion cases within the same port of call (for instance refuelling and relieving the crew) without determining a port of call within the MRV Regulation as long as the ship does not load or unload cargo or embark or disembark passengers for commercial purposes during that stop.

[9] http://data.europa.eu/eli/reg_impl/2023/2297/oj

The fact that the above stops are excluded from the definition of 'port of call' does not mean that relevant emissions are always out of scope, because whether emissions will fall within scope will ultimately depend on the previous and the next stop and more specifically on whether one of these two stops is a port of call within the MRV Regulation[10].

As an example for such types of stops which are not considered port calls, Figure 1 explains the case of a stop carried out by a ship for the sole purpose of refuelling. The emissions falling within the MRV scope, marked by the green arrow, are those taking place during the voyage between the previous port of call and the next port of call, including emissions released during the stop for refuelling purposes.

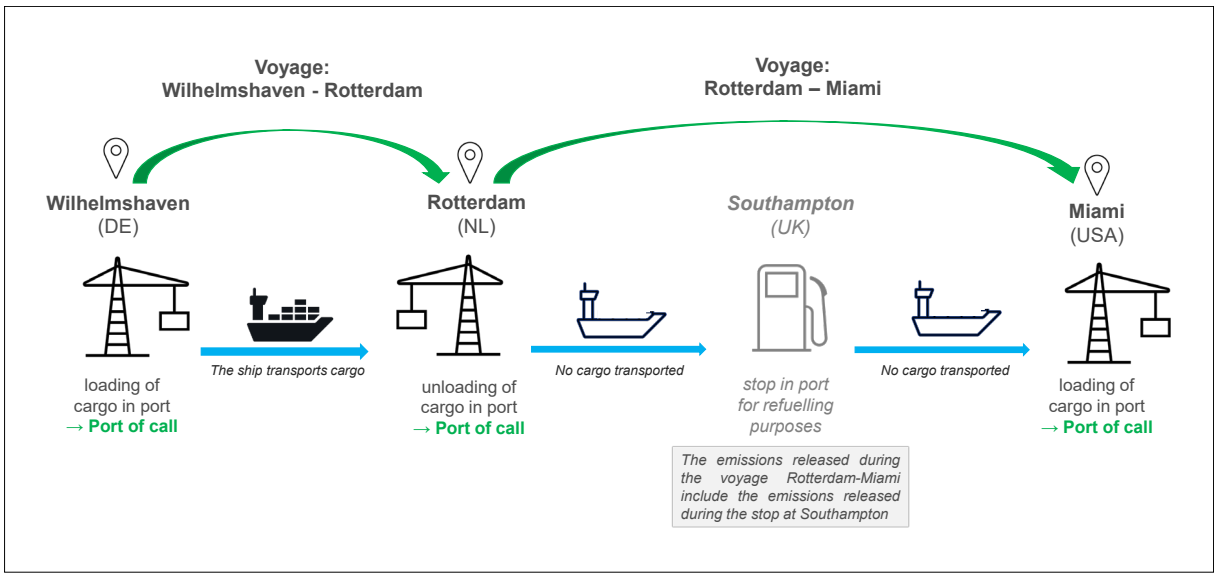

Figure 1: Example for port of call exclusion cases (in this figure for refuelling purposes), and the related emissions covered by the MRV Maritime Regulation.

Table 1 provides an overview of significant cases specifying whether the relevant activities or voyages in their context fall within MRV scope. All emissions released during an MRV voyage should be monitored. It is not allowed to exclude parts of the voyage, for instance by deducting from a voyage the emissions caused by deviations from the scheduled passage due to force majeure, safety events, or assistance needs of the ship.

[10] The same applies where multiple stops excluded from the definition of 'port of call' are carried out one after the other.

Table 1: Stops and activities and their impact on whether they impact the voyage covered by the MRV Maritime Regulation, specific cases.

Stops/Activities	Defines a port call/voyage under MRV Maritime Regulation?	Additional information
Partial loading or discharge operation	Yes	There is no minimum quantity of cargo loaded or unloaded in order to be recognized as a port of call within the MRV Maritime Regulation.
Loading and unloading of cargo for technical reasons (e.g. loading of LNG to cool down cargo tanks)	Yes	Any loading/unloading of cargo operation, since associated to the activity of transporting cargo for commercial purposes by the ship, determines a port of call. Note that there are some exclusions listed in the definition of port of call in the MRV Maritime Regulation Article 3 (b).
Passengers leaving and returning on board the ship within the same day (leisure stops)	Yes	Leisure stops (e.g. for sightseeing) are to be considered as port of call within the MRV Maritime Regulation.
Ballast voyages	Yes (if starting and/or ending in an EEA port of call)	Ballast voyages, from the last port of call where the ships have discharged cargo or disembarked passengers to the next port of call where cargo is loaded or passengers embark, also serve the purpose of transporting cargo or passenger.
Ship to ship transfer carried out outside ports	No, such transfer does not establish a port of call.	When ship to ship transfer occurs outside the limits of a port, as part of an MRV voyage, variations of cargo arising from the 'ship to ship' transfer should be taken into account. In those cases, an average for cargo carried, weighted by distance travelled, should be calculated and applied to the entire voyage. Example: Ship to ship transfer outside of a port (e.g. vessel leaves an EEA port, arrives in Houston and performs ship to ship operation outside the Houston port limits and then goes to South Korea for a cargo operation within port limits). The whole emissions released during the whole voyage from the EEA port of call until the port of call in South Korea fall within MRV Maritime scope. If the ship to ship transfer were carried out within Houston port limits, that operation would constitute a port of call. The voyage covered by the MRV Maritime Regulation would then be EEA port of call – Houston port of call.
Stops of ships for repairs/dry-docking	Stops for the sole purpose of going into dry-dock or making repairs to the ship and/or its equipment are not considered as 'ports of call' within the meaning of the MRV Maritime Regulation.	Emissions falling within the MRV Maritime scope are those taking place during the voyage between the previous port of call and the next port of call, provided that at least one of these two ports of call is a port of call under the jurisdiction of a Member State. Emissions released during that voyage include emissions released during the stop for repairs/dry-docking.

Stops/Activities	Defines a port call/voyage under MRV Maritime Regulation?	Additional information
Stop to relieve the crew	Stops for the sole purpose of relieving the crew are not considered ports of call within the meaning of the MRV Maritime Regulation, except for offshore ships.	Emissions falling within the MRV Maritime scope are those taking place during the voyage between the previous port of call and the next port of call, provided that at least one of these two ports of call is a port of call under the jurisdiction of a Member State. Emissions released during that voyage include emissions released during the stop for relieving the crew. The situation is different for offshore ships as a stop for relieving the crew is considered as a port of call for these ships.
Stops for refuelling purposes	Stops for the sole purpose of refuelling are not considered ports of call within the meaning of the MRV Maritime Regulation.	Emissions falling within the MRV Maritime scope are those taking place during the voyage between the previous port of call and the next port of call, provided that at least one of these two ports of call is a port of call under the jurisdiction of a Member State. Emissions released during that voyage include emissions released during the stop for refuelling purposes.
Stops in neighbouring container transhipment ports, as identified in Implementing Regulation (EU) 2023/2297	Stops by containerships at neighbouring container transhipment ports identified in the legislation as presenting a high risk of evasion are not considered ports of call within the meaning of the MRV Maritime Regulation. Hence, they do not count to determine the start or the end of a voyage.	Emissions released during the voyage include emissions released during the stop at the neighbouring container transhipment port. In those cases, an average for cargo carried, weighted by distance travelled, should be calculated and applied to the entire voyage.
First voyage from a new built ship from its shipyard to its first stop to load cargo or embark passengers	No, if neither cargo nor passenger are transported for commercial purposes during that voyage.	Provided that no cargo nor passengers are transported for commercial purposes during that voyage, the maiden voyage of a ship from its shipyards to its first port of call under the jurisdiction of a Member State is not covered by the MRV. By contrast, If the ship transports cargo or passenger for commercial purposes during its maiden voyage, the voyage is covered by the MRV Maritime Regulation scope, provided that this maiden voyage starts and/or ends with a port of call under the jurisdiction of a Member State.
Voyage of an empty ship to the decommissioning facility	No	The last voyage of an empty ship to the decommissioning facility is not covered by the MRV Maritime obligations.

2.2.4 Geographical scope covered by the MRV Maritime Regulation

The expression 'ports of call under the jurisdiction of a Member State' refers to ports of call located in European Union territory (in other words, where EU law fully applies). Not all ports belonging to a Member State are EU territories (see list below). For a voyage to be covered by the MRV Maritime Regulation, at least one of the ports of call must be located in an EU territory.

Ports of call in the nine EU outermost regions are ports of call under the jurisdiction of a Member State:

Member State	Outermost Regions (included)
Spain	• Canary Islands
France	• Guadeloupe • French Guyana • Martinique • Mayotte • Saint Martin • Reunion
Portugal	• Madeira • Azores

Ports of call in Norway (except those on Svalbard) and Iceland also qualify as ports of call under the jurisdiction of a Member State, since the MRV Maritime Regulation and the EU ETS Directive are incorporated into the EEA Agreement.

Ports in **Overseas Countries and Territories ('OCT') of the European Union do not qualify as ports of call** under the jurisdiction of a Member State. These are:

Member State	Overseas Countries and Territories (excluded)
Denmark	• Greenland
France	• French Polynesia • French Southern and Antarctic Territories • New Caledonia • Saint Barthélémy • Saint Pierre and Miquelon • Wallis and Futuna
Netherlands	• Aruba • Bonaire • Saba • Sint Eustatius • Curaçao • Sint Maarten

Further regions *excluded* are:

- Faroe Islands (Denmark);
- Svalbard (Norway).

In practical terms, this implies that:

- Voyages between a port of call located in the excluded territories listed above and a port of call under the jurisdiction of an EEA State constitute "incoming"/ "outgoing" voyages and are to be monitored and reported;
- Voyages between two ports of call located in the excluded territories listed above do not fall under the MRV Maritime Regulation;
- Emissions within ports of call located in the excluded territories listed above do no fall under the MRV Maritime Regulation.

2.3 The EU ETS scope

The scope of emissions covered by the EU ETS is based on the scope of the MRV Regulation. Therefore, the shipping company has to perform the monitoring of all emissions in principle only once. However, it is important for the shipping company to implement a procedure[11] to identify for each individual voyage whether it falls under one or both systems. This section explains the similarities and differences between the scope of the EU ETS and the MRV Maritime Regulation.

2.3.1 Greenhouse gas emissions covered by the EU ETS Directive

The greenhouse gases covered by the EU ETS Directive are: CO_2, and from 1 January 2026 onwards CH_4 and N_2O.

The EU ETS Directive covers emissions as follows:

- 100% of emissions from ships performing voyages departing from a port under the jurisdiction of a Member State and arriving at a port under the jurisdiction of a Member State (e.g. Hamburg to Marseille and Marseille to Hamburg);
- 100% of emissions from ships within a port under the jurisdiction of a Member State (e.g. in the port of Antwerp), i.e. emissions released at berth and during movements within such a port;
- 50% of emissions from ships performing voyages departing from a port under the jurisdiction of a Member State and arriving at a port outside the jurisdiction of a Member State (e.g. Rotterdam to Shanghai);
- 50% of the emissions from ships performing voyages departing from a port outside the jurisdiction of a Member State and arriving at a port under the jurisdiction of a Member State (e.g. Shanghai to Rotterdam)

Phase-in of obligation under EU ETS

Shipping companies must surrender EU ETS allowances equal to the amount of verified aggregated emissions data at company level[12] by 30 September every year following the reporting year, i.e. the first time by 30 September 2025 for emissions reported for the year 2024.

The share of emissions that must be covered by the surrendering of allowances gradually increases each year:

- 2025: 40% of emissions reported for 2024 must be covered by emission allowances;
- 2026: 70% of emissions reported for 2025;
- 2027 and beyond: 100% of reported emissions.

[11] Such a procedure should be described in the monitoring plan, under Table C.3.

[12] As calculated in accordance with point 1.7, Part C of Annex II to the MRV Maritime Regulation.

Note that the total emissions have to be reported in the annual emissions report as well as the mentioned percentages.

2.3.2 Ships covered by the EU ETS Directive

The EU ETS has been extended to include maritime transport emissions from 2024. Cargo and passenger ships of or above 5 000 gross tonnage (GT) are included in the EU ETS. From 2027 onwards, offshore ships of or above 5 000 GT will be included.

2.3.3 Exemptions under the EU ETS for maritime transport

According to the ETS Directive, the emissions of the following voyages shall be monitored and reported, but no allowances have to be surrendered in respect of these voyages taking place until 31 December 2030:

- Voyages performed by passenger ships, other than cruise passenger ships, and by ro-pax ships, between a port of an island listed in the implementing act[13] under Article 12(3-d) of the EU ETS Directive, and a port under the jurisdiction of that same Member State.[14]
- Voyages performed by passenger or ro-pax ships in the framework of a transnational public service contract or a transnational public service obligation, listed in the implementing act[13] pursuant to Article 12(3-c) of the EU ETS Directive.
- Voyages between a port located in an outermost region of a Member State and a port located in the same Member State, including voyages between ports within an outermost region and voyages between ports in the outermost regions of the same Member State (Article 12(3-b) of the EU ETS Directive). For a list of outermost regions please see section 2.2.4.

The emissions occurring within port associated to such derogation cases, including the ones from the previous/next port of call, are also covered by the derogation[15].

In addition to these derogations, shipping companies may surrender 5 % fewer allowances than their verified emissions released until 31 December 2030 from ice-class ships[16], provided that such ships have the ice class IA or IA Super or an equivalent ice class[17], established based on HELCOM Recommendation 25/7.

[13] This act (Commission Implementing Decision (EU) 2023/2895) covers both the list of islands relevant under Article 12(3-d) and the routes of public service obligations required by Article 12(3-c). http://data.europa.eu/eli/dec_impl/2023/2895/oj.

[14] Please note that this includes voyages between a port of an island listed in the implementing act and a port of another island of that same Member State (whether or not listed in the implementing act).

[15] All the emissions associated to a voyage benefitting from one of the derogations mentioned in this section 2.3.3 will benefit from the derogation to surrender allowances, even those taking place within port. As an example, for a voyage Lisbon/Funchal (where Madeira is the Outermost Region of the same Member State – Portugal)/Porto, both the emissions from the leg Lisbon/Funchal and Funchal/Porto will benefit from the derogation, as well as the emissions taking place within the port of call in Funchal. The same applies to cases of derogations granted under Article 12(3-d) and 12(3-c) of the EU ETS Directive.

[16] As calculated in accordance with point 1.6, Part C of Annex II to the MRV Maritime Regulation.

[17] This includes ships with higher ice operating capability (e.g. Polar Classes PC1 – PC5) .

2.4 The administering authority

For a smooth and effective operation of the EU ETS, each shipping company is assigned to exactly one administering authority in one Member State. This is the Member State to which the shipping company submits the monitoring plan for approval, to which it submits the verified annual emissions report (ER) and company emission report (CER), and which administers the shipping company with regard to its Registry account.

Each shipping company is assigned to its administering Member State by applying the following rules (Article 3gf(1) of the EU ETS Directive):

- In case of a shipping company registered in an EU Member State, it is the EU Member State where the shipping company is registered;
- In case of a shipping company not registered in an EU Member State, it is the EU Member State with the greatest estimated number of port calls from voyages performed by that shipping company over the last four monitoring years and falling within the scope of the EU ETS Directive;
- In case of a shipping company that is not registered in an EU Member State and that did not carry out any voyage covered by the EU ETS Directive in the preceding four monitoring years, the administering authority is the EU Member State where a ship of the shipping company has arrived or has started its first voyage falling within the scope of the EU ETS Directive.

For providing legal certainty, the Commission regularly publishes a **list of all shipping companies and their respective administering authorities**[18]. To ensure stability, a shipping company remains assigned to the Member State indicated in the list regardless of subsequent changes in the shipping company's activities or changes in registration, until those variations are reflected in a new version of the list. The list will be updated every two years for companies registered in an EEA state, and only every four years for non-EEA companies attributed to a Member State based on their ports of call in the last four monitoring years.

Shipping companies not yet found on that list can identify their administering authority via the THETIS-MRV[19] system. If one of the company's ships has performed an activity falling under the EU ETS, then the company has to fulfil all relevant requirements of the EU ETS, irrespective of whether the company is found on the list or not.

Note: For the establishment of the list, the European Maritime Safety Agency developed an algorithm to be used to attribute each shipping company to a Member State, in accordance with the rules laid down in Article 3gf(1) and (3) of Directive 2003/87/EC and Articles 4 and 5 of Implementing Regulation (EU) 2023/2599. The country considered by the algorithm for the purpose of the attribution is the country provided in the address of the shipping company, as recorded in the company's page in THETIS-MRV (usually the address of establishment).

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[18] Commission Implementing Decision (EU) 2024/411 of 30 January 2024 on the list of shipping companies specifying the administering authority in respect of a shipping company in accordance with Directive 2003/87/EC of the European Parliament and of the Council, http://data.europa.eu/eli/dec_impl/2024/411/oj

[19] https://mrv.emsa.europa.eu/#public/eumrv. You should perform the following steps:

Create a user account in the THETIS-MRV system (if not already existing);

Add the new company to the user account;

If established in an EEA country, according to the information recorded in THETIS-MRV, the company may already send a request to the THETIS-MRV Helpdesk to be assigned to the administering authority of that EEA country.

If established in a non-EEA country, first, ensure that all the ships under the company's responsibility falling within EU ETS scope are assigned to the company account in THETIS-MRV, and thereafter, send a request to the THETIS-MRV Helpdesk to be assigned to the administering authority of the EU Member State where the first port of call took place.

The helpdesk can be contacted under thetis@emsa.europa.eu.

2.5 The shipping company

Every ship performing activities falling within the scope of the EU ETS or MRV Maritime Regulation must be under the responsibility of a single shipping company. The shipping company is the entity that is responsible for:

- Establishing the ship's monitoring plan in THETIS-MRV;
- Ensuring assessment of the monitoring plan by an accredited verifier;
- Submitting through THETIS-MRV the previously assessed ship's monitoring plan to the administering authority for approval, if the ship performs activities falling under the EU ETS;
- Monitoring the ship's emissions and keeps the monitoring plan up-to-date;
- Compiling the ship's annual emissions report in THETIS-MRV;
- Contracting an accredited verifier for verification of the annual emissions report;
- Submitting through THETIS-MRV[20] the verified annual emissions report to the administering authority, the Flag State (in case the ship is flying the flag of a Member State) and to the Commission;
- For EU ETS activities, the shipping company is also responsible for:
  - Compiling an aggregated emissions report at company level, get it verified and submit it through THETIS-MRV to the administering authority;
  - Acquiring and surrendering in the Union Registry the quantity of allowances equal to the aggregated emissions at company level[21];
- In addition, the shipping company is also responsible for all other aspects of compliance with the MRV Maritime Regulation and EU ETS, such as ensuring that the ships carry the relevant Documents of Compliance, paying potential penalties, etc.

The **shipping company is defined** as '*the shipowner or any other organisation or person, such as the manager or the bareboat charterer, that has assumed the responsibility for the operation of the ship from the shipowner and that, on assuming such responsibility, has agreed to take over all the duties and responsibilities imposed by the International Management Code for the Safe Operation of Ships and for Pollution Prevention, set out in Annex I to Regulation (EC) No 336/2006 of the European Parliament and of the Council*.'

In the context of EU ETS and MRV, this means that the entity responsible for compliance in respect of the emissions of a given ship can be either the shipowner (i.e., the registered owner) or the ISM Company[22] of that ship, if different from the shipowner. The registered owner and the ISM Company have to decide who is the most appropriate entity to take on responsibilities for complying with the EU ETS and MRV obligations. In the absence of an explicit decision by the registered owner and the ISM Company, **the registered owner[23] will be considered, by default**, responsible for compliance with ETS and MRV obligations.

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[20] The submission through THETIS-MRV is implemented through the command 'Submit to Commission' for ER and 'Submit to AA' for CER. Once the shipping company executes the command, the relevant reports will show the updated status of 'submitted' and the workflow will be finalised, with all relevant actors (European Commission, Flag State, administering authority, companies) gaining access to those, as relevant and in accordance with the MRV Maritime Regulation. Companies may further share any additional relevant document by uploading those in the ship page in THETIS-MRV in the Doc tab as PDF documents.

[21] As calculated in accordance with point 1.7, Part C of Annex II to the MRV Maritime Regulation.

[22] ISM: International Safety Management Code. The ISM Company is the company which manages the ship's affairs under the ISM.

[23] A bareboat charterer cannot be considered as the shipowner within the meaning of the EU ETS Directive. This consideration also applies in the case where the ship is subject to a 'parallel registration' in the registry of two administrations. However, a bareboat charterer can be responsible for compliance with EU ETS and MRV in respect of a given ship if that bareboat charterer has accepted to assume ISM Code responsibilities in respect of that ship, and the conditions for ISM ´Companies' responsibility for EU ETS and MRV are fulfilled.

Pursuant to Implementing Regulation (EU) 2023/2599[24], shipping companies (either ISM Companies or registered owners) must share information on the ships for which they assume EU ETS and MRV responsibility with their administering authority. Indeed, if the **registered owner** decides to assume responsibility for EU ETS and MRV obligations, the registered owner must provide the administering authority with a document listing the ships for which the registered owner assumes responsibility.

If the ISM Company agrees to assume responsibility for EU ETS and MRV obligations in respect of one or several ships, the ISM Company **must provide a document to the administering authority** that demonstrates the existence of an agreement according to which the ISM Company is mandated by the registered owner to comply with ETS and MRV obligations in respect of one or several ships. In the absence of such a document, the registered owner is considered the entity responsible for compliance with ETS and MRV obligations, by default.

Furthermore, shipping companies (either ISM Companies or registered owners) must **inform their administering authority** without delay in case of any change to the ships for which they assume responsibility[25]. Shipping companies should contact their administering authority in order to learn more about any potential administrative procedures and/or applicable deadlines for providing such information. Please note that the information could be provided as an attachment in the ship page in THETIS-MRV, but Member States may have different or additional procedures in place.

The ISM Company that assumes EU ETS and MRV responsibilities in respect of a given ship must also provide to its verifier the document demonstrating the mandate between the registered owner and the ISM Company, as part of the documents accompanying the monitoring plan of the ship[26].

NOTE: Pursuant to Commission Delegated Regulation (EU) 2019/1122[27] (i.e. related to obligations concerning Maritime Operator Holding Accounts in the ETS Union Registry), the shipping company shall also provide information on the ship(s) for which it assumes EU ETS responsibility to the relevant national administrator (in charge of the Union Registry). Such information has to be provided as part of the request to open a maritime operator holding account in the Union Registry, i.e. within 40 working days of the publication of the list referred to in Article 3gf(2), point (a), of the EU ETS Directive, or, for shipping companies not included in that list, within 65 working days of the first voyage falling within the EU ETS scope.

Furthermore, in case of changes to the list of ship(s) for which the shipping company assumes EU ETS responsibility, there are specific deadlines for the shipping company to inform the relevant national administrator:

- for ISM companies: within 10 working days from the change[28];
- for registered owners: within 20 working days from the change.[29]

[24] Commission Implementing Regulation (EU) 2023/2599 of 22 November 2023 laying down rules for the application of Directive 2003/87/EC of the European Parliament and of the Council as regards the administration of shipping companies by administering authorities in respect of a shipping company; http://data.europa.eu/eli/reg_impl/2023/2599/oj

[25] Pursuant to Article 1(3)f and Article 2(2) of Commission Implementing Regulation (EU) 2023/2599.

[26] Those can be provided as attachments to the monitoring plan in THETIS-MRV.

[27] Commission Delegated Regulation (EU) 2019/1122 supplementing Directive 2003/87/EC of the European Parliament and of the Council as regards the functioning of the Union Registry, OJ L 177 2.7.2019, p. 3 ; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019R1122-20231230

[28] Pursuant to Article 22, paragraph 1, of Implementing Regulation (EU) 2019/1122.

[29] Pursuant to Annex VIIa, point 5, second sub-paragraph, to Implementing Regulation (EU) 2019/1122.

The shipping company assuming compliance responsibility might still decide to delegate some **operational tasks** (e.g., data collection and monitoring) to another entity, for instance a ship manager[30]. It has to be noted that despite this delegation of tasks Member States will consider the shipping company as the sole entity responsible for compliance with EU ETS and MRV obligations.

Where a change of shipping companies[31] occurs, the new shipping company should implement the necessary modifications to the monitoring plan and, without undue delay, notify or submit for assessment to the verifier, as appropriate[32], and then send the modified MP for approval to the administering authority.

Furthermore, if the change of company occurs **during a reporting period** (i.e. at any date other than 1 January), the following rules apply:

- With regard to **MRV Maritime emissions reporting**, the shipping company which is responsible for the ship at the end of the year must report the ship's emissions released during the **whole reporting period** (i.e. calendar year);
- In order to provide the relevant information to the new shipping company, the shipping company holding responsibility over the ship in the period of the same reporting year before the change of company occurs must provide a verified "**partial emissions report**" in accordance with Article 11(2) of the MRV Maritime Regulation no later than three months after completion of the change[33]. This report has the same content as the annual emissions report but covers only the time period between start of the year and end of the company's responsibility for the ship. As this report is sent (amongst other recipients) to the shipping company through THETIS-MRV, the latter can compile the whole calendar year's emission report.
- With regard to **surrendering of allowances** for the ship's emissions under the EU ETS, each shipping company is responsible for the emissions of each of its ships **for the period during which it was responsible** for the ship.[34]

Example

Company A (administered by Portugal) sells a container ship ("*The Example of the Seas*") to Company B (administered by Greece) effective from 24 May 2024. She flies the flag of Spain. Since Company B becomes the shipping company in respect of *The Example of the Seas* starting from that day, the following needs to happen:

- No later than by 24 August 2024, Company A provides the verified partial emissions report covering the period 1 January to 23 May 2024 to its responsible administering authority (Portugal), and to Company B.

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[30] Accordingly, such a third party could, as a THETIS-MRV user, operate in the IT system, enter and submit data on behalf of the shipping company which will still remain the ultimately responsible entity for the entered data. To facilitate contacts with the verifier and the Administering Authority, it is recommended to indicate the relevant contact details of such third party in the 'Additional information' section under the 'Further info' tab within the Monitoring Plan page of THETIS-MRV.

[31] A change of shipping company occurs anytime a change of the company assuming responsibility for MRV and EU ETS obligations in respect of a given ship takes place. Such a change may be due to a change of ownership (i.e. sale and purchase of a ship) or to a change in the ISM Company being mandated to assume responsibility in accordance with Implementing Regulation (EU) 2023/2599.

[32] In accordance with the conditions specified in Article 7 of the MRV Regulation.

[33] Article 11(2): "*Where there is a change of company, the previous company shall submit to the administering authority responsible, to the authorities of the flag States concerned for ships flying the flag of a Member State, to the new company and to the Commission, as close as practicable to the day of the completion of the change and no later than three months thereafter, a verified report covering the same elements as the emissions report referred to in paragraph 1, but limited to the period corresponding to the activities carried out under its responsibility.*"

[34] On the basis of the emissions levels reported in the company emissions report which will only consider the emissions within EU ETS scope of the relevant ships in respect of the period during which those were under the company's responsibility.

- By 31 March 2025[35], Company B provides the annual emissions report under the MRV Maritime Regulation for "*The Example of the Seas*" to its administering authority (Greece), and to the ship's Flag State (Spain), as the latter is an EU Member State[36].
- By 31 March 2025[35], Company A submits to its administering authority (Portugal) the verified aggregated emissions report for its company-level emissions for the purpose of the EU ETS. It includes the emissions of "The Example of the Seas" from 1 January to 23 May 2024. For this quantity, Company A surrenders allowances.
- By 31 March 2025[35], Company B submits to its administering authority (Greece) the verified aggregated emissions report for its company-level emissions for the purpose of the EU ETS. It includes the emissions of "The Example of the Seas" from 24 May to 31 December 2024. For this quantity, Company B surrenders allowances.

2.6 Underlying principles for MRV

Articles 5 to 9 of Regulation 2018/2066 (the **MRR**[37] or Monitoring and Reporting Regulation for the EU ETS with regard to installations, aircraft operators and the "ETS2") outline guiding principles which operators of stationary installations under the EU ETS have to follow when fulfilling their obligations. These guiding principles, also covered in Article 4 of the MRV Maritime Regulation, should also be considered as best practice for shipping companies:

1. **Completeness:** The completeness of emission sources (i.e. fuel-consuming equipment, not limited to engines) and source streams (i.e. fuels) is at the very core of the MRV Maritime and EU ETS monitoring principles. That means in practice that all fuel consumption taking place onboard the ship from all emissions sources shall be monitored and reported. It also includes that there are no exceptions to emissions except for what was discussed regarding voyages in sections 2.2.3 and 2.3.3. Also emissions happening due to unforeseen situations (e.g. accidents) have to be included, as no deduction within a voyage falling within scope is admissible.
2. **Consistency and comparability**: Time series of data need to be consistent throughout the years. Arbitrary changes of monitoring methodologies are prohibited. This is why monitoring activities have to follow a monitoring plan, which has to be assessed by an independent verifier and approved by the administering authority.
3. **Transparency**: All data collection, compilation and calculation must be made in a transparent way. This means that the data itself, the methods for obtaining and using them (in other words: the whole data flow) have to be documented transparently, and all relevant information has to be securely stored and retained allowing for sufficient access by authorised third parties[38]. In particular, the verifier and the administering authority must be allowed access to this information.
   It is worth mentioning that transparency is in the own interest of the shipping company: It facilitates transfer of responsibilities between existing and new staff and reduces the likelihood of errors and

[35] According to national legislation, this deadline may be earlier, but not before 28 February. It is recommended that shipping companies check the relevant national legislation on this respect. The same applies for the aggregated emissions report for company-level emissions for the purpose of the EU ETS.

[36] Article 11 of the MRV Maritime Regulation does not require the submission of the annual emissions report to non-EEA flag states.

[37] Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012, consolidated version: http://data.europa.eu/eli/reg_impl/2018/2066/2024-01-01

[38] The MRV Maritime Regulation does not specify a specific period for storage. In alignment with what required under the MRR rules for the EU ETS, it is recommended to store relevant data for 10 years.

omissions. In turn this reduces the risk of over-surrendering, or under-surrendering of EU allowances, and penalties. Without transparency, the verification activities are more onerous and time-consuming.

4. **Accuracy:** Shipping companies have to take care that data is accurate, i.e. neither systematically nor knowingly inaccurate. Due diligence is required by shipping companies, striving for the highest achievable accuracy.
5. **Integrity of the methodology and of the emissions report:** This principle is at the very heart of any MRV system. The following is considered best practice:
   - The monitoring methodology and the data management must allow the verifier to achieve "reasonable assurance" on the emissions report, i.e. the monitoring must be able to endure intensive testing;
   - Data shall be free from material misstatements and avoid bias (i.e. over- or under-estimating emissions, knowingly or unknowingly);
   - The data shall provide a credible and balanced account of a ship's emissions.
6. **Continuous improvement:** Shipping companies shall endeavour to take account of the recommendations included in the verification reports as well as comments by the administering authority. Shipping companies must check regularly, on their own initiative, whether the monitoring methodology can be improved.

3 THE MRV AND EU ETS COMPLIANCE CYCLE

3.1 Importance of MRV in the EU ETS

Monitoring, reporting and verification (MRV) of emissions play a key role in the credibility of any system for the control of emissions, and in particular for an emission trading system. Without MRV, compliance would lack transparency and be much more difficult to track, and enforcement compromised. This holds true also for the European Union Emission Trading System (EU ETS). It is the complete, consistent, accurate and transparent monitoring, reporting and verification system that creates trust in emissions trading. Only in this way can it be ensured that operators, aircraft operators and shipping companies meet their obligation to surrender sufficient allowances. MRV is furthermore considered the first essential step in any roadmap to a climate policy. In context of maritime transport, a mandatory MRV system was therefore established already years before the sector's inclusion in the EU ETS.

Furthermore, the importance of MRV is based on the twofold nature of the EU ETS: On the one hand it is an instrument for achieving an environmental benefit. But in contrast to other environmental legislation, the goal is not to be achieved by individuals, but the whole group of EU ETS participants having to achieve the goal jointly. On the other hand, it is a market-based instrument. It has allowed a significant market to evolve, in which market participants want to know the monetary value of the allowances they purchase, they trade and they have to surrender. As it is an instrument for achieving an environmental benefit, it requires a considerable level of fairness between participants, ensured by a solid MRV system. The competent authorities' oversight activities contribute significantly to ensuring that the goal set by the cap is reached, meaning that the anticipated emission reductions are delivered in practice, and emissions data accurate. It is therefore the responsibility of the competent authorities together with the accreditation bodies to protect the integrity of the EU ETS by supervising the well-functioning of the MRV system.

Both, carbon market participants and competent authorities want to have assurance that one tonne CO_2 equivalent emitted finds its equivalent of one tonne reported (for the purpose of one allowance to be surrendered). This principle has become known already from the early days of the EU ETS as the proverbial postulation: **"A tonne must be a tonne!"**

In order to ensure that this is achieved in a robust, transparent, verifiable and yet cost-effective way, the EU ETS Directive provides a solid basis for a good monitoring, reporting and verification system. For installations, aircraft operators and the sectors in the "ETS2" this is achieved by the Monitoring and Reporting Regulation" (MRR) and the Accreditation and Verification Regulation (AVR), for maritime transport the earlier established "MRV Maritime Regulation" was updated in 2023[39] to also cover the requirements of the EU ETS for shipping companies.

However, a complex and technical legislation such as the MRV Maritime Regulation needs to be supported by further guidance, in order to ensure harmonised implementation throughout all Member States, and for paving the way to smooth compliance through pragmatic approaches wherever possible.

[39] Through Regulation (EU) 2023/957 of 10 May 2023.

3.2 Overview of the compliance cycle

The annual process of monitoring, reporting, verification of emissions, surrender of allowances, and the administering authority's procedure for checking emission reports are often referred to as the "compliance cycle". Figure 2 shows the main elements of this cycle.

On the right side of the picture there is the "main cycle": The shipping company monitors the emissions throughout the year (Y). After the end of the calendar year they must prepare the emissions report at company level (CER), seek verification and submit the verified report to the administering authority (AA) by 31 March of year (Y+1)[40]. The verified emissions must correlate with the surrendering of allowances in the Union Registry[41]. Here the principle "a tonne must be a tonne" translates into "a tonne must be an allowance", i.e. at this point the market value of the allowance is correlated with the costs of meeting the environmental goal of the EU ETS. Thereafter the monitoring goes on, as shown in the picture. More precisely, the monitoring continues without any stop at the end of the year Y for the following year (Y+1) while reporting and surrendering in respect of emissions occurred in the previous year take place in Y+1.

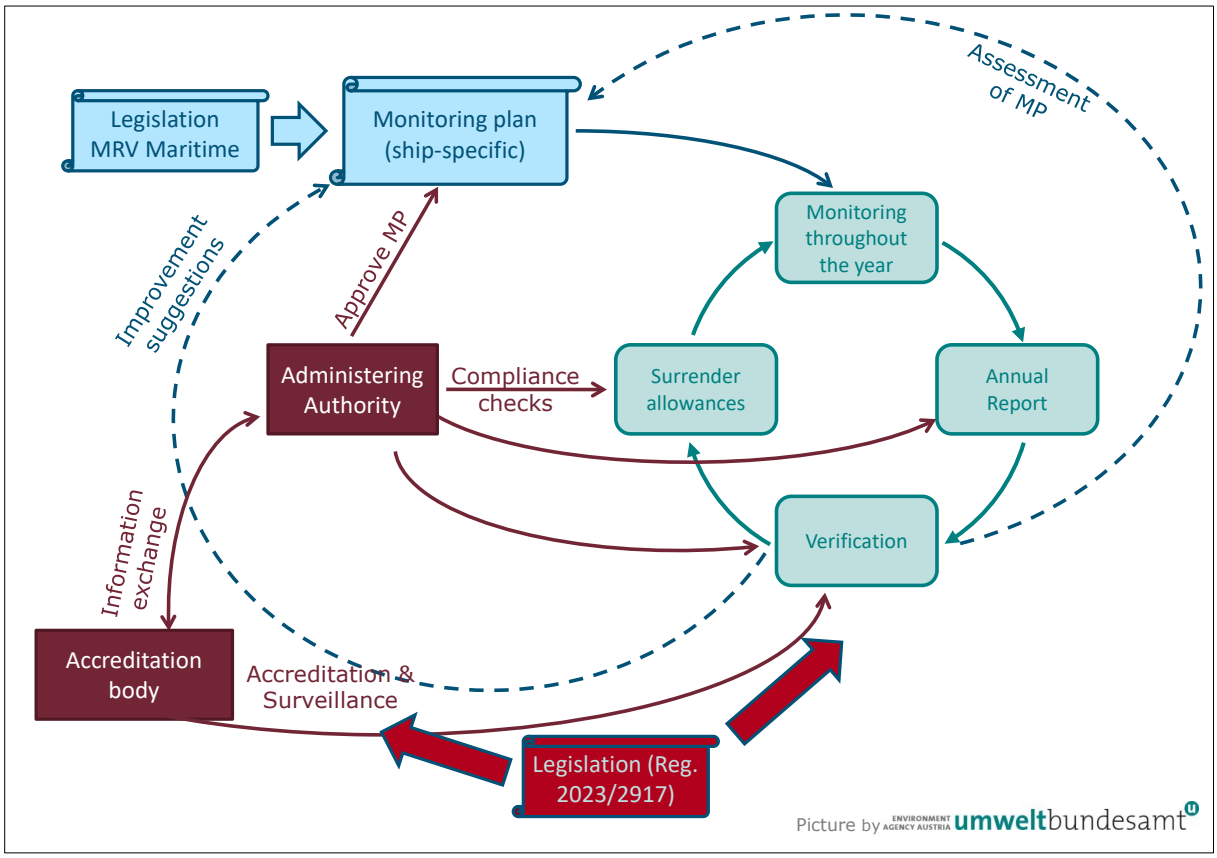

Figure 2: Principle of the EU ETS compliance cycle

[40] According to national legislation, this deadline may be earlier, but not before 28 February of the year following the reporting period (Y+1). Note that before the introduction into the EU ETS, this deadline was 30 April under the MRV Maritime Regulation. The first year in which the new deadline applies is 2025, i.e. covering the emissions released in 2024.

[41] For the purpose of simplification, the surrender of allowances has not been included in the picture. Similarly, the picture also ignores the processes of purchasing and trading of allowances.

The monitoring process needs a firm basis. Resulting data must be sufficiently robust for creating trust in the reliability of the EU ETS, including the fairness of the surrender obligation, and it must be consistent throughout the years. Therefore, the shipping company must ensure that the monitoring methodology is documented in writing and cannot be changed arbitrarily. In the case of the MRV Maritime Regulation and the EU ETS, this written methodology is called the Monitoring Plan (MP) of the ship (see Figure 2).

The figure also shows that the monitoring plan, although very specific for an individual ship, must follow the requirements of the EU-wide applicable legislation, in particular the MRV Maritime Regulation. As a result, the MRV system of the EU ETS is able to square the circle between strict EU-wide rules providing reliability and preventing arbitrary and undue simplifications, and allowing for sufficient flexibility for the circumstances of individual ship and shipping company.

Figure 2 also shows some key responsibilities of the administering authority. It has to supervise the compliance of shipping companies. As the first step, the AA has to approve every monitoring plan (MP). The MRV Maritime Regulation requires that the MP is assessed by the verifier before it is submitted to the AA for approval[42]. This means that the monitoring plans developed by the shipping companies are checked for compliance with the MRV Maritime's requirements. Where the shipping company wants to deviate from the general approach of the MRV Maritime Regulation, e.g. by applying actual emission factors rather than the default ones, this must be justified by the shipping company.

It is furthermore the responsibility of the administering authority to carry out checks on the annual emission reports, as appropriate. This includes checks on the already verified reports, but also cross-checks with figures entered in the verified emissions table of the registry system, and checking that sufficient allowances have been surrendered.

However, the compliance cycle has a wider perspective. As Figure 2 shows, there is a second cycle. This is the regular review of the monitoring plan[43], for which the verification report may provide valuable input. Besides, the shipping company is required to continuously strive for further improving the monitoring methodology.

3.3 Roles and responsibilities

The simplified picture given in the previous section is further filled with detail in Figure 3. It shows the distribution of tasks between the different actors as well as their sequence. In the leftmost column, the tasks of the shipping company are further split between the ship-level requirements of the MRV Maritime Regulation (left) and the EU ETS (company-level, right).

[42] The assessment of the MP corresponds to the activities carried out by an accredited verifier with a view to conclude on the conformity (or not) of the monitoring plan with the requirements laid down in the MRV Maritime Regulation and related implementing and delegated acts. The approval of the MP is a decision made independently by the administering authority responsible, taking due account of the verifier's conclusions on the assessment of the MP, with a view to ensure that shipping companies under its responsibility are compliant with the MRV Maritime Regulation.

[43] The review of the monitoring plan is to be meant as a continuous process, which can take place at any time during the monitoring period. The shipping company can revise the monitoring plan at any time by its own initiative. Further, once per year, the shipping company is required to validate in THETIS-MRV whether the existing monitoring plan remains valid or whether changes are needed.

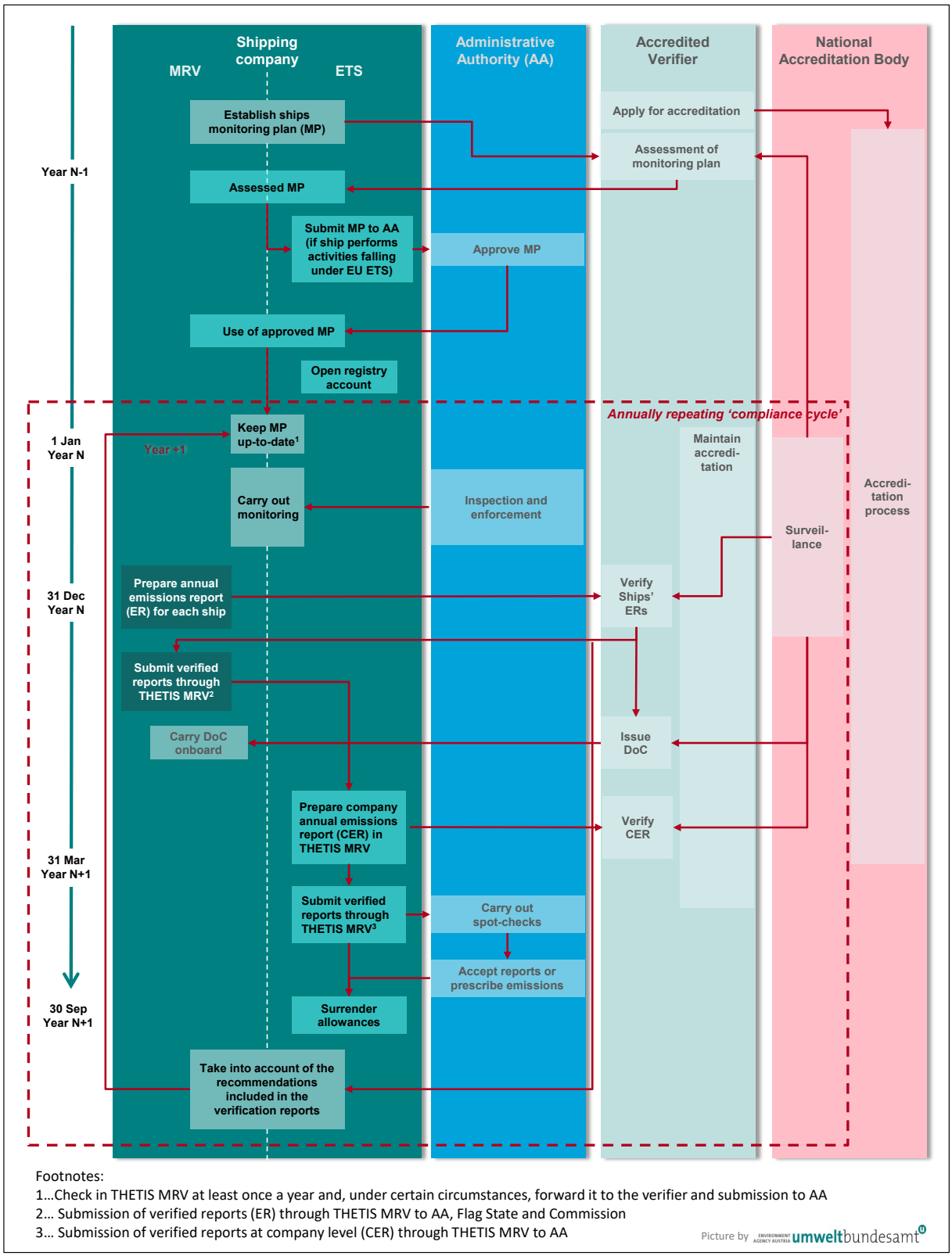

Figure 3: Detailed overview of the combined compliance cycle of the MRV Maritime Regulation and the EU ETS for shipping companies.

The process starts in the year Y-1 (the year before actual monitoring is to start) with the development of the first version of the monitoring plan (MP) for each ship by the shipping company[44]. After the assessment of the MP by the accredited verifier, the shipping company has to send the MP for approval to the Administering Authority (AA), if the MP refers to a ship carrying out activities falling under the EU ETS. Also for the annual emission report, the picture differentiates between the ship-level emission reports (ER) and the company-level aggregated data reports (CER). From a logical viewpoint, the latter comes *after* the verification of individual ship reports. However, provided the same verifier has been contracted by the shipping company for both tasks, the verification can theoretically also take place in parallel. The relevant Administering Authority will then receive the verified emissions reports through THETIS-MRV and, within its responsibility in ensuring compliance by shipping companies[45], may take any appropriate action including by carrying out checks on those in respect of the obligations set in the EU ETS Directive and the MRV Maritime Regulation.[46]

For each ship, the verifier also issues a "Document of Compliance" (DoC), if the relevant emissions report has been verified as satisfactory. That DoC is to be carried onboard the ship for the purpose of compliance with MRV obligations, to be checked by port authorities.

On top of what was already said in section 3.2, the verifier has to obtain the relevant accreditation by a National Accreditation Body (NAB, shown in the rightmost column) in one of the EEA countries. In terms of timing, please note that accreditation will not be finished in year Y-1, but will continue into the first year during which the verifier actually performs verification activities, as "witness audits" are a common element of accreditation. Note that furthermore the NAB is responsible for surveillance activities, which will cover all activities of the verifier, i.e. in case of the maritime sector not only verification but also the assessment of monitoring plans and issuance of the DoCs. As this surveillance may require improvement tasks by the verifier, there is a box "maintain accreditation" as part of the annual work of the verifiers. For simplification, the figure omits the fact that accreditation is usually valid only for a limited time (usually 4 or 5 years), after which period the verifier has to apply for re-accreditation.

3.4 The importance of the monitoring plan

From the previous section it becomes apparent, that the approved monitoring plan is the most important document for every shipping company participating in the EU ETS and each ship's crew for complying with the MRV Maritime Regulation. Like a recipe for a cook and like the management handbook for a certified quality management system, it serves as manual for the shipping company's tasks. Therefore, it should be written in a way that allows all, particularly new staff, to immediately follow the instructions. It must also allow the verifier and the AA to quickly understand the shipping company's monitoring activities. Finally, the MP is *the* guide for the verifier against which the ship's and shipping company's emission reports are to be judged.

Typical elements of a monitoring plan include the following activities of the shipping company (applicability depends on the specific circumstances):

[44] The development of the first version of the monitoring plan is expected to take place before the start of the actual first reporting period, so that the monitoring plan can be swiftly submitted to the verifier (for assessment) and to the administering authority (for approval) within the timeline foreseen under Article 6 of the MRV Maritime Regulation (i.e. by 1 April 2024 or, for ships falling within the scope of this Regulation for the first time after 1 January 2024, no later than three months after the ship's first call in an EEA port).

[45] Under the EU ETS Directive, the administering authority is responsible for ensuring that shipping companies comply with the whole Directive, see Article 12(3), Article 3gd, and Article 3ge of Directive 2003/87/EC.

[46] Pursuant to Article 2 of Delegated Regulation (EU) 2023/2849, the Administering Authority should make a conservative estimate of the aggregated emissions data in specific situations.

- Data collection (metering data, bunker delivery notes (BDN) and invoices, log books, etc.);
- Description of calculations and formulae to be used;
- Control activities (e.g. four eyes principle for data collection);
- Data archiving (including protection against manipulation);
- Regular identification of improvement possibilities.

Monitoring plans must be drafted carefully (see chapter 6), so that administrative burden is minimised. Since the MP is to be assessed by the verifier, it goes without saying that any changes to the MP also need such assessment.[47] In case of ships performing activities covered by the EU ETS, the MP is to be approved by the administering authority after the verifier's assessment.

Because of the importance of the monitoring plan, the Commission is also providing templates for monitoring plans. These are implemented in the IT system THETIS-MRV.

3.5 Milestones and deadlines

Shipping companies need to submit for assessment a monitoring plan for each of the ships under their responsibility and falling under the EU MRV scope to an independent accredited verifier. For ships whose emissions are falling within the scope of the EU ETS Directive, the monitoring plan must also be submitted to the administering authority responsible for approval after it has been positively assessed by the verifier.

For each of their ships carrying out voyages to and/or from ports under the jurisdiction of a Member State after 1 January 2024, shipping companies must fulfil the following monitoring and reporting obligations, as shown in Table 2. That table focusses on ships already falling under the MRV Regulation before 1 January 2024, i.e. it starts from the assumption that the ship already has a monitoring plan which requires updating. However, it also shows the timetable for ships which do not have a monitoring plan yet (because they didn't fall within the scope of the MRV Regulation). In that case, the shipping company shall submit a monitoring plan to the verifier without undue delay and no later than two months after the ship's first port call in a port under the jurisdiction of an EEA State, and to the administering authority not later than three months after that port call.

[47] Any changes to the MP are to be assessed by the verifier, including those explicitly mentioned in Article 7(2), points (b) to (d), of the MRV Maritime Regulation. Please note that in case the modification of the MP only consists in a company change without any further modifications to the MP, and provided that the verifier remains the same as before the company change, a simple notification to the verifier (instead of a full assessment by the verifier) may be deemed sufficient. The modified MP should however in all cases be sent to the AA for approval, after the notification to and/or assessment by the verifier.

Table 2: Monitoring and reporting obligations and overall timeline for shipping companies for compliance with the MRV Maritime Regulation and EU ETS Directive.

When?	What?
Without undue delay	Revise the monitoring plan (MP) of each of their ships to be in conformity with the requirements of the revised MRV Maritime Regulation, i.e. inclusion of new GHGs and monitoring for EU ETS purposes, if applicable. Submit the updated MP to the verifier for assessment.
As from 1 January 2024	Start of monitoring period: CO_2, CH_4 and N_2O
By 1 April 2024 (or no later than three months after the ship's first call in an EEA port)	Submission of a positively assessed monitoring plan to the administering authority
31 December Y (for the first time 2024)	End of monitoring period; prepare annual emission report for each ship and send to verifier as soon as possible
By 31 March of each year (Y+1), from 2025[48]	Submit verified annual emissions report for each ship[49] to: ● the administering authority responsible; ● the authorities of the flag States concerned for ships flying the flag of a Member State; and ● the European Commission.
By 31 March of each year (Y+1), from 2025[48]	Submit verified aggregated emissions data at company level[50] to the administering authority responsible.
By 30 September of each year (Y+1), from 2025	Surrender EU ETS allowances (amount corresponding to verified annual emissions determined in accordance to Part C of Annex II to the MRV Maritime Regulation)
In case of a change of shipping company within 3 months[51]	Submit a verified "partial emission report" to the new shipping company, the administering authority and the authorities of the Flag State concerned for ships flying the flag of a Member State

[48] The Member State of the administering authority may require earlier submission, but not earlier than 28 February of Y+1.

[49] Through the submission of ship-specific emissions report compliant with Annex II to Implementing Regulation (EU) 2023/2449.

[50] Through the submission of a company level emissions report compliant with Annex IV to Implementing Regulation (EU) 2023/2449, thus including relevant emissions for all ships under the company's responsibility.

[51] Article 11(2) of the MRV Maritime Regulation: "*Where there is a change of company, the previous company shall submit to the administering authority responsible, to the authorities of the flag States concerned for ships flying the flag of a Member State, to the new company and to the Commission, as close as practicable to the day of the completion of the change and no later than three months thereafter, a verified report covering the same elements as the emissions report referred to in paragraph 1, but limited to the period corresponding to the activities carried out under its responsibility.*"

4 MONITORING AND REPORTING OF EMISSIONS

4.1 What must be monitored?

The MRV Maritime Regulation requires shipping companies to perform comprehensive data determination and collection ("monitoring") on emissions and further parameters that help to put the emissions into context. In principle, monitoring has to be done on a "**per-voyage**" basis, this means that the data has to be separately recorded and reported for each voyage and separately for the time spent within ports. What a voyage is and which voyages are covered by the MRV Maritime Regulation has been outlined in section 2.2, and for the EU ETS in section 2.3. There is, however, the possibility to deviate from the per-voyage reporting. The conditions for this exemption are explained in section 4.2.

The information to be monitored includes (Articles 8 to 10 of the MRV Maritime Regulation):

- The consumption of each fuel (see section 4.5);
- The greenhouse gas emissions. For this purpose, the Regulation allows the use of four methods (see section 4.3). The "calculation-based approaches" (Methods A to C) require the determination of emission factors (see section 4.6), the "measurement-based approach" (Method D) requires continuous measurement of GHG concentration in the flue gas and of the gas flow (section 4.8).
- Information regarding the voyage (see also section 5.1.1):
  - port of departure and port of arrival including the date and hour of departure and arrival;
  - distance travelled;
  - time spent at sea;
  - cargo carried;
  - transport work;
  - (voluntarily / if applicable): information relating to the ship's ice class and to navigation through ice.

In addition to the above per-voyage information, the shipping company must determine the annual totals of these data (see section 5.1.2). For ships falling under the scope of the EU ETS, these data are used to determine the relevant aggregated emissions data at company level (see section 5.2). Where the company intends to make use of derogations under the EU ETS, some additional data need to be collected, such as proofs of sustainability for biofuels (see section 5.2.2 and **Annex III**). The aggregation of annual data for reporting purposes is discussed in section 5.2.1.

For monitoring and reporting of data not directly related to emissions (like the distance travelled, cargo, passengers and efficiency of the engines), please consult chapter 5.1.

4.1.1 Consideration of voyages and ports of call for the monitoring of relevant parameters

A voyage is considered from the last berth or ship-to-ship transfer within a port of call[52] to the first berth or ship-to-ship transfer in the following port of call.

For the parameters to be monitored[53], the following scope applies (Table 3).

[52] To recall that the MRV Maritime Regulation defines 'port of call' as the port where a ship stops to load or unload cargo or to embark or disembark passengers, or the port where an offshore ship stops to relieve the crew.

[53] By measurement, calculation or estimation in accordance with the relevant provisions of the MRV Maritime Regulation.

Table 3: Monitored parameters and required coverage

Parameter	During voyage	Within EEA ports while at berth	Within EEA ports while not at berth[54]
Fuel consumption	Yes	Yes	Yes
GHG emissions	Yes	Yes	Yes
Distance travelled	Yes	No	No
Time spent at sea	Yes	No	No
Cargo carried	Yes	No	No

The emissions within MRV scope which are not attributed to a voyage shall be accounted as emissions within a port of call. For that purpose, a port has to be understood as 'port of call' within the meaning of the MRV Maritime Regulation and the EU ETS Directive. This is not impacted by port limits since the mere fact of entering or leaving port limits does not mark the end or beginning of a voyage.

Emissions within port result from the sum of emissions at berth and emissions from movements in port. The template for the emissions report requires the indication of both emissions at berth and emissions within port (see points 6 and 7, Part D).

A ship is to be considered at berth when 'securely moored or anchored in a port falling under the jurisdiction of a Member State while it is loading, unloading or hoteling, including the time spent when not engaged in cargo operations'[55].

Emissions from movements in port cover the emissions taking place within port limits when not occurring at berth or during a voyage. The emissions taking place between arrival at first berth and departure from last berth not taking place when the ship is at berth[56] should be reported as emissions from movements in port[57].

For the purpose of the MRV Maritime Regulation, specific situations and activities are considered as follows:

- Ship-to-ship transfer of cargo or passengers:
  - To be considered as part of the voyage if carried out outside the port limits of the port of call[58] (cargo carried needs to consider the amount of cargo before and after ship-to-ship transfer by calculating the weighted average for the entire voyage);
  - If carried out within a port of call, ship-to-ship transfers are treated as cargo operations at berth: a ship-to-ship transfer within a port (prior to arrival at the first berth, if applicable) would be considered as the endpoint of the incoming voyage (and ship-to-ship transfer within a port after the last berth considered as start point of next voyage).
- Anchoring:
  - Considered as part of voyage if happening prior to arrival at port of call (arrival at 1st berth or 1st ship-to-ship transfer) or after departure from port of call (departure from last berth or last ship-to-ship transfer);

[54] Movements within the port of call.

[55] Article 3 of Regulation (EU) 2015/757.

[56] In the case where the ship carries out movements within the port of call for purposes other than cargo operations (e.g. refuelling, positioning, etc), the emissions associated to the movement itself should be reported as emissions from movements within port, but the emissions associated to cargo operations in other locations within the port (for instance at a third quay, different from the one of arrival and departure) should be reported as emissions at berth.

[57] In the case where there are no additional movements between the first arrival at berth and the last departure from berth (i.e. the ship ends the previous voyage by arriving at berth in 'quay A', does not move, and leaves from the same 'quay A' to start a new voyage) the entirety of emissions and time should be reported as 'at berth'.

[58] Port limits are defined by the competent authority or body designated by Member States e.g. port Authority in each port.

- To be excluded for determination of time spent at sea.

- Drifting:
  - Considered as part of voyage if happening prior to arrival at port of call or after departure from port of call.
- Tank cleaning:
  - Considered as part of voyage if happening prior to arrival at port of call or after departure from port of call;
  - GHG emissions from movements to tank cleaning between the arrival at port of call and the departure from port of call (in the EEA) are considered as part of 'GHG emissions within EEA ports'.

4.2 Exemption from monitoring on a per-voyage basis

As explained in section 4.1, by default, the shipping company must monitor all relevant activity data separately for each voyage. Companies have to document their procedures to monitor and then calculate aggregated data in the monitoring plan, using the official template. However, a general derogation to this rule is applicable for certain ships, which are allowed to monitor at annually aggregated level. In accordance with Article 9(2) of the MRV Maritime Regulation, a shipping company is exempt from the obligation to monitor emissions and other relevant data on a per-voyage basis, if the two following cumulative conditions are met:

- all of the ship's voyages during the reporting period are EEA-related voyages (i.e. they either start or end at a port of call within the EEA); **and**
- the ship, according to its schedule, performs more than 300 voyages during the reporting period (i.e. calendar year).

In practical terms this exemption implies that providing data to the verifier on per voyage monitoring is not compulsory to the extent that other documents and data (such as Bunker Delivery Notes) can be used to calculate the ship's aggregated data[59]. The monitoring methods the shipping company should apply to the relevant parameters to be reported under the MRV Maritime Regulation are detailed in Section 8.2.

Please note that, for the purpose of the EU ETS, there is a further exemption[60]: where emissions would fall under the scope of any of the specific EU ETS derogations (provided for in Article 12(3-b), 12(3-c) or 12(3-d) of the EU ETS Directive[61]), shipping companies must monitor relevant information on a per-voyage basis, unless all voyages in the reporting period fall under the derogation[62].

[59] Despite this, the electronic reporting System (THETIS-MRV) offers nevertheless the option to enter all emissions data on a per-voyage basis should the shipping company prefer to do so.

[60] As in point 2.1 and point 2.2, Part C of Annex II to the Maritime MRV Regulation.

[61] Article 12(3-b), 12(3-c) or 12(3-d) of the ETS Directive provide for specific derogations related to, respectively, outermost regions, certain transnational public service contracts or obligations, and specific small islands with no road or rail link with the mainland and with a population of fewer than 200 000 permanent residents. See section 5.2 of this guidance document for details.

[62] This exceptional obligation to monitor on a per-voyage basis only affects the voyages and corresponding emissions falling under the scope of the said derogations, and does not require additional per-voyage monitoring on routes/voyages where the shipping company had no prior per-voyage monitoring obligations (i.e. voyages covered by Article 9(2) of Regulation (EU) 2015/757 but not impacted by the derogations foreseen under Article 12(3-b), 12(3-c) or 12(3-d) of the ETS Directive).

4.3 Applicable monitoring methods

This chapter provides an introduction to the methods to determine GHG emissions from ships. The methods provided by the MRV Maritime Regulation can be classified as follows:

1. Calculation-based approach (differing in the method how fuel consumption is determined):
   (a) Method A
   (b) Method B
   (c) Method C
2. Measurement-based approach:
   (d) Method D

Ships are not obliged to solely rely on one method. Any combination of methods A, B, C and D may be used if it enhances the overall accuracy of the emission determination. The choice of methodology needs to be laid down in the monitoring plan, assessed by the verifier, and submitted for the approval of the administering authority.

In section 4.4, the calculation-based method and the necessary formulae are explained. As can be seen there, the basic principle is to multiply the fuel quantity by emission factors to obtain the emissions. Thereafter, the three methods (A to C) for determining fuel quantity are introduced in section 4.5. The requirements for selecting or determining emission factors are then discussed in section 4.6.

Section 4.8 explains the principle of the measurement-based approach (method D). The possibility to combine methods on a single ship are then discussed in section 4.9.

After these sections that explain the monitoring of GHG emissions, the next sections explain the reporting requirements, i.e. which and how to aggregate data for the annual emissions report. It is important to understand these reporting requirements in order to ensure that the gathering of all necessary information will be considered when developing the monitoring plan. In this regard, the reporting rules under the MRV Maritime Regulation are presented in section 5.1 for the MRV Regulation, and in section 5.2 for the purposes of the EU ETS. In particular the latter section will explain the main steps for coming from the emissions reported for MRV Maritime purposes to the number of emissions for which allowances have to be surrendered.

4.4 Calculation-based approach

The principle of this method is the calculation of emissions by means of fuel quantity (actual fuel consumption for each voyage) multiplied by an emission factor. The greenhouse gases covered by MRV Maritime Regulation are CO_2, CH_4 and N_2O. The EU ETS covers CH_4 and N_2O only from 1 January 2026 onwards.

Total GHG emissions of each ship shall be calculated by summing up the individual emissions of each GHG, by mass, multiplied by their Global Warming Potential (GWP, see Table 4) using the following formula:

$$GHG_{MRV} = CO_{2,MRV} + CH_{4,MRV} \cdot GWP_{CH_4} + N_2O_{MRV} \cdot GWP_{N_20}$$

Here the index “MRV” signals that the emissions are those to be reported (per each ship) under the MRV Regulation, applying the scope of the MRV Regulation (see section 2.2). Adjustments to be made for obtaining the emissions to be covered by allowances in the EU ETS are presented in section 5.2. All the formulae in this section can be applied in principle either to the total fuel consumption over the reporting year, or separately to each voyage covered by the MRV Regulation and to the fuel consumption while being at berth.

Table 4: Global warming potential over 100 years, according to Commission Delegated Regulation (EU) 2020/1044, to be used for the gases relevant to MRV Maritime

GHG	GWP
CO_2	1
N_2O	265
CH_4	28

Companies shall calculate **CO_2 emissions** by adding the CO_2 emissions of all fuels *i* used aboard the ship, either separately for each emissions source or for the sum of all emissions sources, applying the following formula:

$$CO_{2,MRV} = \sum_{i}^{n\,fuel} \left(M_i - M_{i,NC}\right) \cdot EF_{CO_2,i}$$

Companies shall calculate **CH_4 emissions** by adding the CH_4 emissions resulting from the combustion of all fuels *i* used and the emissions caused by CH_4 slippage, applying the following formula:

$$CH_{4,MRV} = \sum_{i}^{n\,fuel} \left(\left(M_i - M_{i,NC}\right) \cdot EF_{CH_4,i}\right) + CH_{4,S}$$

Companies shall calculate **N_2O emissions** by adding the N_2O emissions of all fuels *i* used, applying the following formula:

$$N_2O_{MRV} = \sum_{i}^{n\,fuel} \left(M_i - M_{i,NC}\right) \cdot EF_{N_2O,i}$$

Where:

GHG_{MRV}……Greenhouse gas emissions to be reported under the MRV Maritime Regulation, expressed in tonnes CO_2 equivalent;

$CO_{2,MRV}$……Total aggregated CO_2 emitted, in tonnes;

$CH_{4,MRV}$……Total aggregated CH_4 emitted, in tonnes;

N_2O_{MRV}……Total aggregated N_2O emitted, in tonnes;

GWP_{CH4}……Global warming potential of CH_4;

GWP_{N2O}……Global warming potential of N_2O;

i……Index corresponding to the fuels used on board the ship in the reporting period;

M_i……Fuel consumption, as total mass of the specific fuel *i* used, in tonnes;

$EF_{CO2;i}$…… CO_2 emission factor for the combustion of fuel *i*;

$EF_{CH4;i}$…… CH_4 emission factor for the combustion of fuel *i*;

$EF_{N2O;i}$…… N_2O emission factor for the combustion of fuel *i*;

Cj……Emission factor of slipped fuel (slippage coefficient) as a percentage of the mass of the fuel *i* used by the emission source *j* [%]. *Cj* includes fugitive and slipped emissions. Fugitive and slipped emissions are emissions caused by the amount of fuel that does not reach the combustion chamber of the emission source or that is not consumed by the emission source because they are un-combusted, vented, or

leaked from the system. Note that slippage factors are relevant only for methane used as fuel, irrespective of its origin (i.e. both of fossil origin, as Liquified Natural Gas, or of biological origin, as biogas/biomethane).

$M_{i,NC}$……Total mass of fuel *i* (in tonnes) not combusted but released into the atmosphere.

$$M_{i,NC} = \sum_i \sum_j M_{i,j} \cdot C_j/100$$

$CH_{4,S}$……Amount of CH_4 (in tonnes) non combusted but released into the atmosphere. For the purpose of determining such amount, companies shall apply the following formula: $CH_{4,S} = M_{i,NC}$

All emission factors to be used here are to be understood as **Tank to Wake emission factors**, as listed in the table under point 2 of part A of Annex I to the MRV Maritime Regulation. They are further discussed in section 4.6

4.5 Methods for fuel quantity

For determining the fuel quantity consumed, the MRV Maritime Regulation allows three different approaches: method A, method B or method C.

Fuel consumption shall be determined separately for emissions from voyages between ports under a Member State's jurisdiction, from voyages which departed from ports under a Member State's jurisdiction, from voyages to ports under a Member State's jurisdiction, and for emissions within ports under the jurisdiction of a Member State. The fuel consumption within ports, at berth, when occurring under the jurisdiction of a Member State shall be determined separately (see section 4.1.1).

Sources of uncertainty (see section 4.10) and associated levels of uncertainty shall be considered when selecting any of the methods A, B or C.

As a general rule, the monitoring of fuel consumption can take place at aggregate level, i.e. resulting from the aggregation of all emissions source installed on board the ship. However, where an emission factor specific for the emission source[63] is applied, companies will have to monitor the fuel consumption of that emissions source separately, which in some cases might be possible only through application of method C[64].

4.5.1 Common elements of Methods A to C

In the following descriptions of Methods A to C (sections 4.5.2 to 4.5.4 below) there are recurring elements which are explained here jointly:

- Where a "period" is mentioned in the description of methods A to C, it means the time between two port calls or time within a port.
- For each fuel used during a period, the fuel type and the sulphur content of the fuel need to be specified.
- The method used for tank readings (whether by automated systems, soundings or dip tapes) shall be laid down in the monitoring plan. Uncertainty associated to the chosen method shall be specified. The

[63] That is the case of slippage coefficients for LNG and nitrous oxide emissions factors for hydrogen combustion.

[64] The application of method C may not be necessary if that emissions source is fed through a dedicated separate tank or if the same dedicated tank feeds a set of emissions sources to which the same slippage coefficient applies. In such cases, the same result can be attained through application of method A or method B.

relevant tank tables should be attached to the monitoring plan or at least made available to the verifier and to the administering authority upon request.

- Where the amount of fuel uplift or the amount of fuel remaining in the tanks is determined in units of volume, expressed in cubic meters, the shipping company shall convert that amount from volume to mass by using *actual density values*. The company shall determine the actual density by using one of the following methods:
  - On-board measurement systems;
  - The density measured by the fuel supplier at fuel uplift and recorded on the fuel invoice or BDN; or
  - The density measured in a test analysis conducted in an accredited fuel test laboratory, where available.

The actual density is expressed in tonnes per cubic meter (t/m^3) and shall be determined for the applicable temperature for a specific measurement. In cases for which actual density values are not available, a standard density factor for the relevant fuel type shall be applied once the monitoring plan has been found in conformity by the verifier.

Further details on the application of the methods for the determination of fuel consumption are provided in Annex II of this document (section 8.3).

4.5.2 Method A: BDN and periodic stocktakes of fuel tanks

This method is based on the quantity and type of fuel as indicated on the **Bunker Delivery Note (BDN)** combined with periodic stocktakes of fuel tanks based on tank readings. The fuel consumed is calculated as follows[65]:

M = B + D – E – O

Where

M……Mass of fuel consumed;

B……Mass of fuel contained in tanks at the Beginning of the period;

D……Mass of fuel Deliveries during the period;

E……Mass of fuel in tanks at the End of the period;

O……Mass of de-bunkered ("Offloaded") fuel during the period.

This method shall not be used when BDN are not available on board ships, especially when cargo is used as a fuel, for example, liquefied natural gas (LNG) boil-off.

Under existing MARPOL Annex VI regulations, it is mandatory to retain the BDN on board for 3 years after the delivery of the bunker fuel and is to be readily available.

The periodic stocktake of fuel tanks on board is based on fuel tank readings. It uses tank tables relevant to each fuel tank to determine the volume at the time of the fuel tank reading. The uncertainty associated with the BDN shall be specified in the monitoring plan. Fuel tank readings shall be carried out by appropriate methods such as automated systems, soundings and dip tapes. The method for tank sounding and uncertainty associated shall be specified in the monitoring plan.

[65] Annex I Part B point 1 specifies: "*The fuel contained in tanks at the beginning of the period, plus fuel deliveries during the period, minus fuel available (i.e. contained in tanks) at the end of the period and de-bunkered fuel between the beginning of the period and the end of the period together constitute the fuel consumed over the period.*"

4.5.3 Method B: Bunker fuel tank monitoring on board

Annex I Part B point 2 specifies: *"This method is based on fuel tank readings for all fuel tanks on board. The tank readings shall occur daily when the ship is at sea and each time the ship is bunkering or de-bunkering."*

The cumulative variations of the fuel tank level between two readings constitute the fuel consumed over the period. The calculation formula is therefore in principle the same as given for Method A (section 4.5.2). The difference is that Method B is fully relying on measurements onboard the ship instead of using the BDN. This requires more frequent tank readings. For the methods of tank readings, the same requirements apply as for Method A.

4.5.4 Method C: Flow meters for applicable combustion processes

Annex I Part B point 3 specifies: "*This method is based on measured fuel flows on board. The data from all flow meters linked to relevant greenhouse gas emission sources shall be combined to determine all fuel consumption for a specific period.*"

This means that not the change in the mass contained in tanks is monitored, but the continuous flow of fuels to the engines (and residual flows back to the tanks) are monitored, and added up over the period. While this may provide more accurate data than tank readings, the failure of a flow meter will mean that there is a data gap. This is a point to consider in the risk assessment. Relevant control measures will have to be put in place, and a method to prevent or to close data gaps.

The calibration methods applied and the uncertainty associated with flow meters used shall be specified in the monitoring plan.

4.6 Selection and determination of emission factors

Regarding the emission factor, the shipping company shall identify the emission factor values to be applied to each fuel type reported over the reporting period. As a general rule, the shipping company should apply the default (tank-to-wake) emission factor values as listed under point 2, Part A of Annex I to the MRV Maritime Regulation, which cover both those applicable to fuel combustion (for CO_2, CH_4, N_2O) and to slippage (C_j values)[66].

When there is fuel blending, ships shall not report the (weighted) average of the emission factors for the respective fuels but instead report separately the emissions factors of the pure fuel fractions composing the blend, in accordance with Annex I of the MRV Maritime Regulation[67].

The shipping company may provide actual emission factors diverging from the default ones in accordance with the conditions and restrictions provided in Article 10 (5) and (6) of Regulation (EU) 2023/1805

[66] Not all fuel types as in point 2, Part A of Annex I to the MRV Maritime Regulation are assigned an emissions factor value. In some cases, a value may not be available yet, and the symbols TBM (to be measured), N/A (not applicable), or a dash are shown. As specified in Annex I to the MRV Maritime Regulation, where a cell in the table indicates either TBM or N/A, the highest default value of the fuel class in the same column of the table as shown under point 2 shall be used. Where, for a particular fuel class, all cells in the same column indicate either TBM or N/A, the default value of the least favourable fossil fuel type shall be used. This rule does not apply to slippage coefficients, for which the symbol TBM or N/A refers to non-available values for the emissions source, in which cases a certified value in accordance with Article 10(6) of Regulation (EU) 2023/1805 shall be used.

[67] When a blend is used, the different pure fractions shall be meant to be consumed, for each voyage, in accordance with their pro-rata contribution to the blend mass. It is not possible to diverge from this by allocating a single fraction of the blend to a specific portion of the voyage.

('FuelEU Maritime Regulation')[68]. That Article requires that actual emissions factor values are *"certified by means of laboratory testing or direct emissions measurements"* in accordance with rules ("*international standards and certification references"*) to be laid down in an implementing act. At the time of finalising this version of the guidance document (July 2024) such conditions and restrictions are under development and, **until their finalisation, shipping companies shall apply default emissions factor values only.**

Note that it is not possible to apply an emissions factor of zero to sustainable biofuels for the determination of emissions for the purpose of the MRV Maritime Regulation. Since emissions factors are based on a tank-to-wake approach, zero-rating is not allowed for emissions within the scope of the MRV Maritime Regulation. However, the zero-rating of the CO_2 emissions factor for sustainable biofuels is foreseen by the derogation established under point 1.2, Part C, of Annex II to the MRV Maritime Regulation, which defines the rules for the determination of emissions within EU ETS scope. In practice, that means that the consumption of the same fuel batch may result in emissions to be reported under MRV, but zero emissions under the EU ETS. Where a company wishes to apply the derogation established in point 1.2, Part C, of that Annex II, the procedures, systems and responsibilities used to this end shall be documented in accordance with Table B.9 of the Monitoring Plan template. More information on monitoring within EU ETS can be found in chapter 5.2. Details on the relevant proof of sustainability to be provided for the purpose of zero-rating are given in **Annex III**.

4.7 Calculation approach: Examples

Example 1:

As a first example, we consider the case of a ship only consuming Marine Diesel Oil (MDO):

Fuel	Consumed quantity
Marine Diesel Oil (MDO)	200 tonnes

For MDO the following default emission factors apply for a dual-fuel Otto engine in accordance with point 2, Part A of Annex I to the MRV Maritime Regulation:

Type of Fuel	EF_{CO_2} t CO_2/t	EF_{CH_4} t CH_4/t	EF_{N_2O} t N_2O/t	C_j %
Marine Diesel Oil (MDO)	3,206	0,00005	0,00018	—[69]

The following calculations apply:

$$GHG_{MRV} = CO_{2MRV} + CH_{4MRV} \cdot GWP_{CH4} + N_2O_{MRV} \cdot GWP_{N20}$$

Note that for MDO no slippage needs to be taken into account since the use of MDO on board the ship does not cause slipped emissions[70]. Disaggregated by greenhouse gas, through the application of the default values as in Annex I of the MRV Maritime Regulation, the formula will produce:

[68] Actual emissions factors can be provided for CO_2, CH_4, and N_2O for all fuel types, with the exception of CO_2 emission factors for fossil fuels.

[69] Since the use of MDO onboard the ship does not determine slippage Annex I reports a dash, which stands for 'not applicable'.

[70] Accordingly, the table under point 2, Part A of Annex I to the EU MRV Regulation indicates the value 'not applicable' for the slippage coefficient for MDO.

$$CO_{2,MRV} = \sum_{i}^{n\,fuel} M_i \cdot EF_{CO_2,i} = 200 \cdot 3{,}206 = 641{,}2\ tCO_2$$

$$CH_{4,MRV} = \sum_{i}^{n\,fuel} (M_i \cdot EF_{CH4,i}) + CH_{4,S} = 200 \cdot 0{,}00005 + 0 = 0{,}01\ t\ CH_4$$

0,01 t CH_4 to be multiplied by the global warming potential value of methane (28) thus resulting in 0,28 t $CO_{2,e}$

$$N_2O_{MRV} = \sum_{i}^{n\,fuel} M_i \cdot EF_{N2O,i} = 200 \cdot 0{,}00018 = 0{,}036\ t\ N_2O$$

0,036 to be multiplied by the global warming potential value of nitrous oxide (265) thus resulting in 9,54 t $CO_{2,e}$

$$GHG_{MRV} = 641{,}2\ tCO_{2,e} + 0{,}28\ tCO_{2,e} + 9{,}54\ tCO_{2,e} = \mathbf{651{,}02\ tCO_{2,e}}$$

Example 2

As a further example, we take the case of a ship using the following fuel mix during the reporting period:

Fuel	Consumed quantity
Heavy Fuel Oil (HFO)	100 tonnes
Hydrotreated Vegetable Oil (HVO)	200 tonnes
Liquified Natural Gas (LNG)	300 tonnes

For these fuels, the following default emission factors for a dual-fuel Otto engine apply in accordance with point 2, Part A of Annex I to the MRV Maritime Regulation:

Type of Fuel	EF_{CO_2} t CO_2/t	EF_{CH_4} t CH_4/t	EF_{N_2O} t N_2O/t	C_j %
Heavy Fuel Oil (HFO)	3,114	0,00005	0,00018	—
Hydrotreated Vegetable Oil (HVO)	3,115	0,00005	0,00018	—
Liquified Natural Gas (LNG)	2,750	0	0,00011	3,1%

Furthermore, the following values are applied for the Global Warming Potential:

	CO_2	CH_4	N_2O
Global warming potential (GWP), t CO_{2}e / t GHG	1	28	265

The emissions of each GHG for each fuel are calculated as follows:

$$GHG_{MRV,fuel} = M_{fuel} \cdot EF_{GHG,fuel} \cdot GWP_{GHG}$$

Furthermore, for LNG, methane (CH_4) slippage must be taken into account, by first subtracting the slipped amount from the mass of fuel burnt, and thereafter adding the slipped methane before multiplying the resulting emissions with the GWP of methane. Thus, for LNG, methane emissions will be calculated according to the following:

$$CH_{4,MRV,LNG} = \left(M_{LNG} \cdot \left(1 - C_j/100\right) \cdot EF_{CH_4,fuel} + M_{LNG} \cdot C_j/100\right) \cdot GWP_{GHG}$$

This gives the following emissions:

Fuel	GHG	Emissions (t CO_2e)
HFO	CO_2	100 × 3,114 × 1 = 311,4
	CH_4	100 × 0,00005 × 28 = 0,14
	N_2O	100 × 0,00018 × 265 = 4,77
HVO	CO_2	200 × 3,115 × 1 = 623
	CH_4	200 × 0,00005 × 28 = 0,28
	N_2O	200 × 0,00018 × 265 = 9,54
LNG	CO_2	300 × (1 – 3,1/100) × 2,750 × 1 = 799,43
	CH_4	[300 × (1 – 3,1/100) × 0 + 300 × 3,1/100] × 28 = 0 + 260,4
	N_2O	300 × (1 – 3,1/100) × 0,00011 × 265 = 8,47
Total		**2 017,43 t CO_2e**

4.8 Measurement-based approach

In contrast to the calculation-based approaches, the greenhouse gases in the ship's exhaust gases are themselves the object of the measurement in the measurement-based approaches. This means that under this approach, direct greenhouse gas emissions measurements are used, rather than calculations based on fuel consumption[71]. The fuel consumption has to be reported nevertheless. To avoid duplication of the monitoring effort, this may be done via back-calculation using emissions and the CO_2 emission factor[72]. However, as explained in section 4.9, it has advantages to apply a second monitoring method[73] for corroborating the results of the main method. In case of method D, such second method will be particularly useful for closing data gaps in case of failure of the Continuous Emission Measurement System (CEMS) equipment. Therefore, using the said back-calculation should be considered only as second-best option.

In addition, the application of this method to determine emissions of a greenhouse gas e.g. CO_2 shall not prevent companies from applying another method to determine emissions of any other greenhouse

[71] Annex I Part B point 4 specifies: "*The direct greenhouse gas emissions measurements may be used for voyages and for greenhouse gas emissions occurring within ports located in a Member State's jurisdiction. For ships for which CO_2 reporting is based on this method applied to all emissions sources on board the ship, the fuel consumption shall be calculated using the measured CO_2 emissions and the applicable emission factors of the relevant fuels and emission sources. This method is based on the determination of greenhouse gas emissions flows in exhaust gas stacks (funnels) by multiplying the greenhouse gas concentrations of the exhaust gas with the exhaust gas flow. The application of this method to determine emissions of a greenhouse gas shall not prevent companies from applying any other of the methods described under this Part to any other greenhouse gas. The calibration methods applied and the uncertainty associated with the devices used shall be specified in the monitoring plan.*"

[72] Where method D is applied, the CO_2 emissions factors in line with the monitoring plan should be used since the application of method D to emissions and fuel consumption does not represent in itself a method to produce an actual emissions factor. Backward calculation of fuel consumption is not possible when method D is applied to greenhouse gases different from CO_2..

[73] Such as any of the methods under the calculation approach (method A, B, or C).

gas. For instance, direct measurement of CO_2 through a well-defined measurement point in a stack would not be able to provide measurement for fugitive and slipped emissions (e.g. CH_4 emissions).

The MRV Maritime Regulation does not give any specific requirements for the CEMS to be used, while requiring that the shipping company specifies in the monitoring plan the calibration methods applied and the uncertainty associated with the devices used. Therefore, the provisions of Article 42 to 46 of Implementing Regulation (EU) 2018/2066 (the EU ETS Monitoring and Reporting Regulation, "MRR") could be used as guidance. According to that section (regulating ETS stationary installations), the application of CEMS always requires two elements:

- Measurement of the GHG concentration; and
- Volumetric flow of the gas stream where the measurement takes place.

According to Article 43 of the MRR, emissions are first to be determined for each hour of measurement from the hourly average concentration and the hourly average flow rate. Thereafter all hourly values of the reporting year are summed up for the total emissions of that emission point. Where several emission points are monitored (e.g. two separate gas stacks/funnels), this data aggregation is done first for each source separately, before adding the emissions of all sources to result in the total emissions.

The shipping company must ensure that the measurement equipment is suitable for the environment in which it is to be used, and regularly maintained and calibrated. Nevertheless, the shipping company must be aware that equipment may fail once in a while. Therefore Article 45 of the MRR outlines how data from missing hours are to be conservatively substituted. The shipping company has to make provisions for such data substitution when developing the monitoring plan.

More information about CEMS can be found in MRR Guidance Document No. 1 for installations[74] and MRR Guidance Document No. 7 (CEMS)[75]. The latter document explains also the detailed requirements for quality assurance of CEMS using international standards.

4.9 Combinations of approaches

Shipping operators can combine seamlessly the different approaches outlined above, on the condition that no data gaps and no double counting occur. The choice of methodology has to be documented in the monitoring plan, which needs to be assessed by an independent verifier and approved by the administering authority.

This means that a shipping company can apply method A, B or C for the determination of the emissions for one greenhouse gas and can apply method D for other greenhouse gases.

Note that not only for method A, B and C, but also for method D shipping companies have the obligation to monitor the amount and emission factor for each type of fuel consumed on a per-voyage basis and on an annual basis.

When selecting the monitoring method, the shipping company shall consider the following:

- The uncertainty associated with the determination of the emissions (in particular of the fuel quantity) should be as low as possible. Therefore, if the instruments onboard allow for more than one of methods A to C to be applied, the option leading to the lowest uncertainty should be selected.

[74] https://climate.ec.europa.eu/document/download/d4f11230-9126-41a8-8c42-6131cd4e742e_en?filename=gd1_guidance_installations_en.pdf

[75] https://climate.ec.europa.eu/document/download/923025bb-76c8-4382-af9e-7db6f5eedb4c_en?filename=policy_ets_monitoring_gd7_cems_en.pdf

- The approach leading to the lowest risk for errors (data gaps, misstatements, failing measurement instruments, errors in calculations, etc.) should be selected. Simple data flows, standardised meter readings, instruments that have a backup, etc. are preferred.

As these two requirements sometimes lead to diverging preferences for one of the methods, there is no absolute rule for a choice. However, there may be situations where the risk and uncertainty assessment give different results for parts of the ship's equipment, which makes a combination a logical choice, as demonstrated by the following example.

Example:

A ship using HFO for the main engine has high-quality flow meters and a fully automated data acquisition system for all engines. It therefore uses method C for the main engine. However, for the auxiliary power unit it uses diesel. As it has its own tanks, its fuel consumption can be independently monitored. This unit has relatively low emissions, as it is used usually only while at berth. Therefore method A is the simplest way of monitoring.

Note on data flow and control activities:

It is considered best practice to carry out plausibility checks on emissions data as part of the control system. For this purpose it is useful to have "corroborative" data sources available. In practice this means that where possible, data from different methods should be compared. For this purpose the shipping company selects the best monitoring approach and data source as the main method for approval in the monitoring plan. The second-best method and data source is used for corroboration, in order to reduce the risk of severe mistakes in the emissions data.

In the example above, the flow meter is the main data source. However, the shipping company may still request the crew to perform daily tank readings in order to corroborate the main data. This would be part of the procedures for the control activities. In case of divergence of data, the shipping company will investigate the reasons for the divergence. For example, the flow meter might need more frequent maintenance and calibration. It is important in case of divergence that the main data source identified in the monitoring plan is used. Only where the analysis of mistakes provides evidence that there is a malfunctioning of the meter or another data gap, the corroborative data source should be used.

Further guidance on data flow and control activities is given in section 6.2.

4.10 Uncertainty and the selection of monitoring approaches

Part B of Annex I requires that "*Sources of uncertainty and associated levels of uncertainty shall be considered when selecting any of the methods A, B or C.*" Furthermore, the description of all 4 methods (A to D) state that the shipping company shall specify relevant uncertainties of measurement instruments in the monitoring plan. This section briefly explains the concept of uncertainty.

When somebody would like to ask the basic question about the quality of the MRV system of any emission trading system, he would probably ask: "How good is the data?" or rather "Can we trust the measurements which produce the emission data?" When determining the quality of measurements, international standards refer to the quantity of "uncertainty". This concept needs some explanation.

There are different terms frequently used in a similar way as uncertainty. However, these are not synonyms, but have their own defined meaning (see also illustration in Figure 4):

- **Accuracy**: This means closeness of agreement between a measured value and the true value of a quantity. If a measurement is accurate, the average of the measurement results is close to the "true" value (which may be e.g. the nominal value of a certified standard material[76]). If a measurement is not accurate, this can sometimes be due to a systematic error. Often this can be overcome by calibrating and adjustment of instruments.
- **Precision**: This describes the closeness of results of measurements of the same measured quantity under the same conditions, i.e. the same thing is measured several times. It is often quantified as the standard deviation of the values around the average. It reflects the fact that all measurements include a random error, which can be reduced, but not completely eliminated.
- **Uncertainty**[77]: This term characterizes the range within which the true value is expected to lie with a specified level of confidence. It is the overarching concept which combines precision and assumed accuracy. As shown in Figure 4, measurements can be accurate, but imprecise, or vice versa. The ideal situation is precise and accurate.

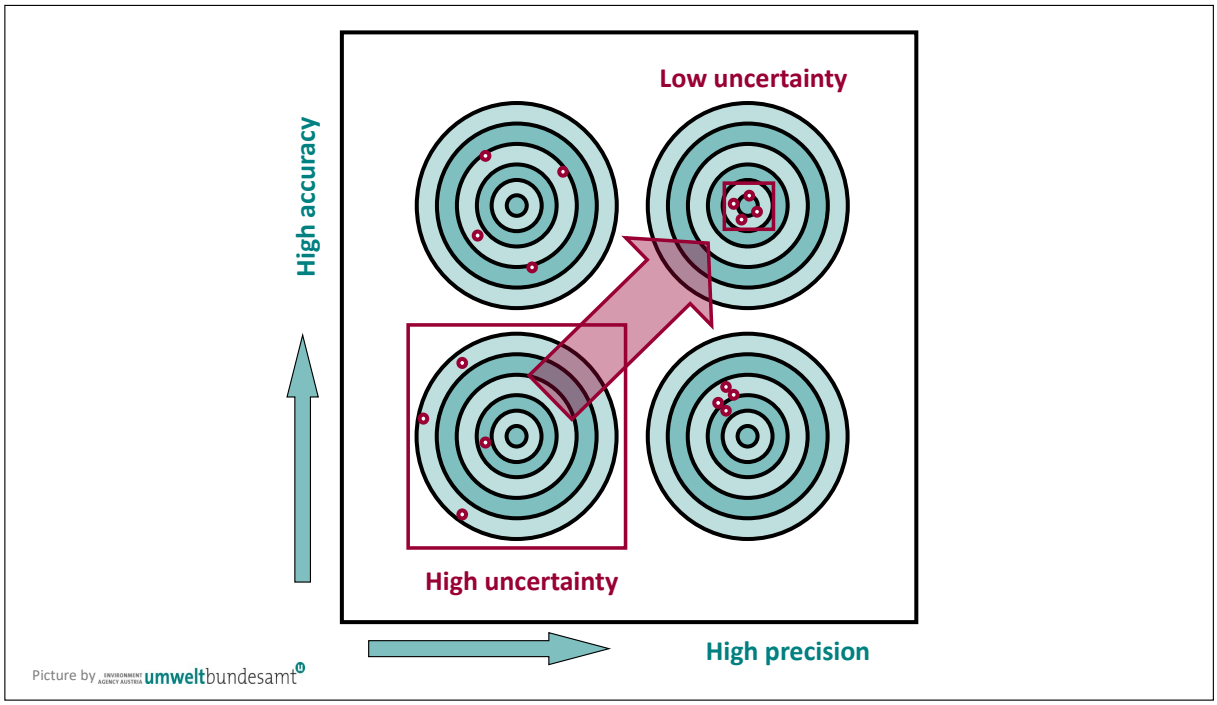

Figure 4: Illustration of the concepts accuracy, precision and uncertainty. The bull's eye represents the assumed true value, the "shots" represent measurement results.

If a laboratory assesses and optimizes its methods, it usually has an interest in distinguishing accuracy and precision, as this leads the way to identification of errors and mistakes. It can show such diverse reasons for errors such as the need for maintenance or calibration of instruments, or for better training of staff. However, the final user of the measurement result (in the case of the MRV Maritime Regulation

[76] Also a standard material, such as e.g. a copy of the kilogram prototype, disposes of an uncertainty due to the production process. Usually this uncertainty will be small compared to the uncertainties later down in its use.

[77] The MRV Maritime Regulation defines in Article 3(k): 'uncertainty' means a parameter, associated with the result of the determination of a quantity, that characterises the dispersion of the values that could reasonably be attributed to the particular quantity, including the effects of systematic as well as of random factors, expressed in per cent, and describes a confidence interval around the mean value comprising 95% of inferred values taking into account any asymmetry of the distribution of values.

and the EU ETS, this is the shipping company, the verifier and the administering authority) simply wants to know how big the interval is (measured average ± uncertainty), within which the true value is probably found.

In the EU ETS, only one value is given for the emissions in the annual emissions report. Only one value is entered in the verified emissions table of the registry. The shipping company cannot surrender "N ± x%" allowances, but only one precise value N. It is therefore clear that it is in everybody's interest to quantify and reduce the uncertainty "x" as far as possible. This is the reason why monitoring plans must be approved by the administering authority, and why shipping companies need a basic understanding of this concept.

To deal comprehensively with the overall uncertainty figure for emissions monitoring on board a ship, it is to be noted that the measurement accuracy of single equipment (e.g. flowmeters for receiving bunkers, density determination, storage in bunker tank,…) does not provide the full picture of the overall uncertainty levels for all processes of emissions and fuel consumption monitoring on board, which instead result from the combination of all relevant steps and processes. For this purpose, the error propagation law is applied.

For more details, a separate guidance document on the assessment of uncertainty in the EU ETS for stationary installations is provided (Guidance document No. 4[78]). Since ships' engines are in many aspects similar to combustion units in stationary installations, many concepts of this document are applicable to ships, with the exception that no tier system is defined for maritime transport activities. The use of the error propagation formulae is explained in Annex III of that guidance.

In case the shipping company has not yet performed a detailed uncertainty assessment, it may also apply the following default values for the level of uncertainty associated with emissions and fuel monitoring[79]:

Monitoring Method	Applicable default overall uncertainty level
Method A	± 7.5%
Method B	± 7.5%
Method C	± 7.5%

[78] https://climate.ec.europa.eu/document/download/873cfdb7-4039-4170-b3bb-49e1800ac320_en?filename=policy_ets_monitoring_gd4_guidance_uncertainty_en.pdf

[79] The applicable default values indicated in this guidance document should be taken into account as from the next revision of the monitoring plan when taking place after the publication of this document (July 2024).

5 MONITORING & REPORTING OF FURTHER INFORMATION

In chapter 4 guidance was given on the elements necessary for GHG emissions monitoring by shipping companies. Chapter 5 further elaborates on the additional information to be monitored and on how these data are to be compiled for the purpose of reporting.

5.1 Reporting requirements under MRV Maritime

Shipping companies shall, based on the monitoring plan, monitor greenhouse gas emissions as well as additional data (e.g. voyage details) for each ship on a per-voyage basis as laid down in Part A of Annex II of the MRV Maritime Regulation, and determine additional information on an annual basis as listed in Part B of Annex II of the MRV Maritime Regulation. From the information obtained that way, the shipping company has to compile the annual[80] emission report per ship. In the cases where a ship is exempted from the monitoring on a per-voyage basis (see section 4.2 and 8.2), only the aggregated annual data needs to be reported.

5.1.1 Monitoring on a per-voyage basis

For each voyage falling within the scope of the MRV Maritime Regulation (see section 2.2) the shipping company shall monitor the GHG emissions as outlined in sections 4.3 to 4.9, and the fuel consumption for each fuel as discussed in section 4.5. In addition, the following data needs to be monitored for each voyage:

- **Port of departure** and **port of arrival**;
- **Date and hour of departure and arrival at berth**, determined using Greenwich Mean Time (GMT/UTC);
- **Time spent at sea**, calculated based on port departure and arrival information and excluding anchoring;
- **Distance travelled**, preferably determined as real distance travelled (see details below);
- **Transport work**, determined by multiplying the distance travelled with the amount of cargo carried;
- **Cargo carried**, according to the parameters for cargo carried specified in the MRV Maritime Regulation and in Commission Implementing Regulation (EU) 2016/1928. See section 8.4 of this document for the specific parameters per ship type;
- **Other optional information**, i.e. information relating to the ship's ice class and to navigation through ice.

Note: The monitored data of each voyage must be made available to the verifier However, for the annual emission report in the IT system (THETIS-MRV) it is sufficient to report the annual totals, although a separate entry for each voyage is technically possible[81].

When determining the **distance travelled** and **time spent at sea**, shipping companies are further recommended to consider the following:

- Distance travelled should be determined as distance over ground to follow the approach decided at IMO’s MEPC 70.

[80] In case of transfer of ownership of a ship, the shipping company responsible for the ship before the transfer has to compile a similar report for the time period before the transfer, in accordance with Article 11(2) of the MRV Maritime Regulation.

[81] Through the reporting on a per voyage basis function in THETIS-MRV users can upload voyage data separately, which the system will then automatically aggregate to give annual emissions data for the purpose of the emissions report, also taking into account the segregation by geographical scope.

- Should the vessel be adrift (i.e. while waiting for a berth) the distance should be included as if the vessel is underway. Even if the main propulsion is temporarily not required, there will be still auxiliary generators and boilers in operation.
- Distances made for the purposes of tank cleaning operations should be included as if the vessel is underway.
- Ship to Ship Transfer within defined limits of a port is considered as a port call.
- Since the MRV Maritime Regulation stipulates that "time spent at sea" is to be calculated based on port departure and arrival information, it is recommended to use the arrival at the first berth and the departure from the last berth in a port where cargo operations have been conducted (i.e. in a port of call within the meaning of the Regulation).
- Standard voyage distances and the use of scheduled time between scheduled port of departure and scheduled port of arrival for the monitoring of time spent at sea should be only considered for short fixed voyages such as for ro-ro/ro-pax vessels. However, the usage of standard short voyages cannot be based exclusively on VTS distance, since distances and time spent at sea could be also subject to many factors such as avoiding shallow waters, severe weather conditions, or an Emission Control Area (ECA) transit.
- Given a high number of deviation scenarios, applying a "most direct route" (standard distance and time spent at sea) should be strongly discouraged, but could be used in order to fill data gaps, provided this approach is foreseen in the monitoring plan for filling those data gaps, approved by the administering authority, or assessed as in conformity by the verifier if the ship does not perform EU ETS activities.
- It should be borne in mind that any correction factors have to be defendable and must be justifiable towards the verifier. There is a risk of wrongly estimating distances (either as under or over estimation). It can create uncertainty in comparison to truly measured distances over ground and may result in an uneven, distorted playing field.

5.1.2 Monitoring on an annual basis

For each ship and for each calendar year, shipping companies shall determine emissions annual data using the per-voyage data collected as described in section 5.1.1, and annual data on the parameters required under the MRV Maritime Regulation, i.e. the parameters listed in Table 5. That table provides further guidance on how to determine the relevant data by aggregation of the respective per voyage data.

Table 5: Monitoring on an annual basis: parameters

Parameter	Additional information
Amount of each type of fuel consumed in total	Aggregated data of all voyages of the year[82] determined in accordance with chapter 5 of this guidance
Emission factor used for each type of fuel consumed	These are the factors laid down in the monitoring plan, except where actual factors are used (see section 4.6). For each fuel used, the emission factors for all relevant GHGs need to be listed, and – where applicable – the slippage coefficient for each relevant emissions source.

[82] "Year" is to be read as "part of the year until the transfer of responsibility for the ship" in case of "partial emissions reports" in accordance with Article 11(2) of the MRV Maritime Regulation.

Parameter	Additional information
Total aggregated greenhouse gas emitted within the scope of MRV Maritime Regulation	Aggregated data of all voyages of the year[82] determined in accordance with chapter 5 of this guidance. **Note that emissions of each greenhouse gas need to be reported separately.**
Aggregated greenhouse gas emissions: • from all voyages between EEA ports[83] • from all voyages which departed from EEA ports and arrived in non EEA ports • from all voyages from non-EEA ports to EEA ports • which occurred within EEA ports (and which occurred when at berth within EEA ports)	Sums to be derived from the per-voyage monitoring. The differentiation by port is required in particular for determination of the emissions to be reported under the EU ETS (see section 5.2). Note that emissions of each greenhouse gas need to be reported separately.
Total distance travelled	Sum of all voyages, using data in accordance with section 5.1.1.
Total time spent at sea	
Total transport work	
Average energy efficiency	See below.
Total aggregated GHG emissions relevant under the EU ETS[84]	For details please see section 5.2.
Optional information	Information relating to the ship's ice class and to the annual aggregated information on navigation through ice[85], building on the respective per-voyage data

Average energy efficiency shall be reported by using at least the following four indicators (including the applicable calculation formulae):

- **Fuel consumption per distance** = total annual fuel consumption / total distance travelled
- **Fuel consumption per transport work** = total annual fuel consumption / total transport work
- **Greenhouse gas emissions per distance** = total annual greenhouse gas emissions / total distance travelled
- **Greenhouse gas emissions per transport work** = total annual greenhouse gas emissions/total transport work.

In addition, when relevant, ships may (voluntarily) report the average energy efficiency by using the two following energy efficiency indicators:

- **Fuel consumption per time spent at sea** = total annual fuel consumption / total time spent at sea
- **Greenhouse gas emissions per time spent at sea** = total annual greenhouse gas emissions / total time spent at sea

Finally, shipping companies may report voluntarily a differentiated average **energy efficiency of laden voyages** (fuel consumption and greenhouse gases emitted per cargo transported[86]).

[83] For definition of relevant ports please see section 2.2.4, and for definition of relevant voyages see section 2.2.3.

[84] Point (k) of Article 10 of the MRV Maritime Regulation specifies this more precisely as "*total aggregated emissions of greenhouse gases covered by Directive 2003/87/EC in relation to maritime transport activities in accordance with Annex I to that Directive and to be reported under that Directive, together with the necessary information to justify the application of any relevant derogation from Article 12(3) of that Directive provided for in Article 12(3-e) to (3-b) thereof.*"

[85] Further details on how to determine navigation through ice are provided in Article 3(22) and 3(23) of the FuelEU Maritime Regulation.

[86] The unit for reporting depends on the type of cargo, see section 8.4.

5.2 Reporting requirements for the EU ETS

Although the data described in this section is relevant for the EU ETS, the legal basis for the reporting is enshrined in the MRV Maritime Regulation, Article 11a. This requires that a verified report regarding the aggregated emissions data of the shipping company is submitted to the administering authority. The content of that "Company-level Emissions Report" (CER) is defined in a delegated act and reflected in the implementing act[87] on MRV templates. This report basically requires that the data already reported and verified for each individual ship under the control of the shipping company is aggregated into the new report[88]. However, before doing so, the total emissions per ship falling under the scope of the MRV Regulation have to be further modified in accordance with Part C of Annex II of the MRV Maritime Regulation. All the relevant amounts calculated in accordance with points 1.1 to 1.7 of that Part C have to be included in the ship's emission report (as mentioned in Table 5). The respective calculation and reporting steps for each ship are described in this section. The shipping company shall bear the needs of these calculation steps in mind when developing the ship's monitoring plan and associated procedures in order to monitor all the relevant parameters throughout the year.

5.2.1 Step-by-step emission calculation per ship for the purpose of the EU ETS

Starting point: The shipping company has monitored all the relevant (per-voyage) data for the ship listed in section 5.1.1. The emissions data is available separately for each GHG, and the voyages to which the data relates are clearly identified.

Step 1 (Part C, point 1.1, of Annex II of the MRV Maritime Regulation)[89]: **Only the greenhouse gases covered** by the scope of the EU ETS are carried over to the next step. The emissions of gases not covered by Annex I of the EU ETS Directive are set to zero. In practice this means that for the reporting years 2024 and 2025, only CO_2 is reported. From 1 January 2026, methane (CH_4) and nitrous oxide (N_2O) are covered, too.

The result of this calculation is to be reported in the ship's annual emission report, and is used for performing the next applicable step. The same is done after each of the following steps.

Step 2: **CO_2 Zero-rating of sustainable biofuels and other renewable fuels[90]**:

The emission factors to be used for reporting under the MRV Maritime Regulation are "tank-to-wake" emission factors, i.e. they relate to the physical amount of GHG molecules that are emitted from the combustion process. However, under the IPCC guidelines for national GHG inventories, biomass emissions are accounted for at the point where the biomass is harvested. Emissions from combustion of biofuels would therefore be double counting. Consequently, the EU ETS allows to account CO_2 emissions of biofuel as zero provided that the biofuel complies with certain sustainability and GHG savings

[87] Commission Delegated Regulation (EU) 2023/2849, http://data.europa.eu/eli/reg_del/2023/2849/oj

[88] While the ship-level ER and the CER are due by the same deadline for submission through THETIS-MRV, the shipping company may prefer to first submit the ER as THETIS-MRV will source the emissions information of the underlying emissions reports associated to the fleet under the company's responsibility and allow for their automatic aggregation in the CER. For dealing with time constraints the shipping company is advised to coordinate with the verifier(s) involved.

[89] Step 1 in this guidance document relates to point 1.1 of Part C of Annex II of the MRV Maritime Regulation. Similarly, Step 2 relates to point 1.2 of that Part C, etc. Therefore, the legal references are not repeated for each step.

[90] In the MRV Maritime Regulation this step is termed "*Derogation from the general principle and use of emission factors pursuant to Article 14 of [the EU ETS Directive]*".

criteria defined by the Renewable Energies Directive[91] ("RED"). For rules on zero-rating, the MRV Maritime Regulation refers to the rules of the MRR[92] which establishes the link between the RED and the EU ETS.

The ETS also allows zero-rating of some other "renewable" fuels regulated by the RED. These are Renewable Fuels of Non-Biological Origin (RFNBOs[93]) and Recycled Carbon Fuels (RCFs[94]). RFNBO/RFC have to comply with a certain level of GHG savings[95] compared to conventional fossil fuels in order to be eligible for zero-rating.

Under this Step 2, shipping companies may replace the CO_2 emission factor for the biofuel, RFNBO or RCF used with an emission factor of zero for this fuel, under the condition that they obtain the relevant evidence for compliance with the relevant "RED criteria" together with the purchase of that fuel. Such evidence includes the proof that the same fuel is not claimed by any other user. For this purpose the RED requires a mass balance that ensures that the respective "proof of sustainability" is issued only to one user.

Notes:

- Only CO_2 emissions can be zero rated. In particular, the slippage coefficient and emission factors for CH_4 for biogas *cannot* be zero-rated.
- Under the EU ETS Directive, only half of the emissions from voyages between EEA ports and ports outside the EEA are subject to surrender obligations and fuel consumption monitoring must be done on a per voyage-basis. Therefore, for each type of eligible fuel, only half of the fuel mass consumed during the voyages between EEA ports and ports outside the EEA can be considered for zero-rating. The MRV Regulation requires that in case of mixed or blended fuels each component is reported separately. It therefore does not contain any rules for determining a "biomass fraction"[96] of a fuel, as the MRR for installations would require. The shipping company must therefore ensure that the fuel supplier provides the necessary evidence for the biomass fraction of a blended fuel separately, as if it were a neat biofuel.
- The exact rules for zero-rating of RFNBO/RCFs are currently under development. If necessary, this guidance will be updated when the respective amendment of the MRR will have been published.

More guidance on the conditions for zero-rating is given in section 5.2.2.

Step 3: Correction for **voyages between EEA ports and ports outside the EEA[97]**:

As mentioned in section 2.3, not all GHG emissions from maritime transport covered by the MRV Maritime Regulation are covered by the EU ETS. The latter covers 100 % of the emissions from voyages within the EEA and 50 % of emissions from voyages from third countries to EEA and from EEA to third countries. It also covers 100% of emissions released within EEA ports. This means that the ship's total

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[91] Directive (EU) 2018/2001, consolidated version: http://data.europa.eu/eli/dir/2018/2001/2023-11-20. The relevant criteria are further detailed in section 9.2.2 of this guidance document.

[92] Monitoring and Reporting Regulation (pursuant to Article 14 of the EU ETS Directive): Commission Implementing Regulation (EU) 2018/2066, http://data.europa.eu/eli/reg_impl/2018/2066/2024-01-01

[93] Defined as "*liquid and gaseous fuels the energy content of which is derived from renewable sources other than biomass*". Hydrogen or ammonia produced from water hydrolysis using renewable (not nuclear) energy qualify as RFNBO.

[94] Defined as "*liquid and gaseous fuels that are produced from liquid or solid waste streams of non-renewable origin which are not suitable for material recovery in accordance with Article 4 of Directive 2008/98/EC* [the Waste Framework Directive]*, or from waste processing gas and exhaust gas of non-renewable origin which are produced as an unavoidable and unintentional consequence of the production process in industrial installations.*" Such fuels are result of a CCU (Carbon capture and Utilisation) process.

[95] According to Article 29a of the RED (see footnote 91), GHG savings must be at least 70 % on a life-cycle basis. The relevant methodology for the calculation is given by Commission Delegated Regulation (EU) 2023/1185.

[96] In accordance with the MRR, "fractions" always mean the (molar or weight) fraction of carbon.

[97] For guidance on the term "EEA port" used in this guidance, please see section 2.2.4.

aggregated emissions of greenhouse gases resulting from step 2 need to be considered per type of activity in the reporting year. For all voyages either starting or ending in a non-EEA port the emissions of each GHG shall be multiplied by 50 %.

Step 4: **CO_2 Emissions verified as captured** and transported for permanent storage or permanently chemically bound[98]:

The MRV Maritime Regulation stipulates that the use of CCU/CCS is accounted for by multiplying with zero the amounts of such emissions calculated in accordance with Step 1, Step 2 and Step3 above. In practice, this means that if CO_2 emissions are captured and transported for permanent storage or to be permanently chemically bound in relation to voyages starting or ending outside of the EEA, only 50% of the captured CO_2 during these voyages should be multiplied with zero. More detailed rules may be developed as soon as the relevant legal framework of the EU ETS is known, and this guidance will then be updated accordingly.

Further information on CCU/CCS is provided in section 5.2.3.

Step 5: Specific **EU route exemptions[99]**:

In section 2.3.3 it was explained that certain routes for certain ship types are excluded from the EU ETS until 31 December 2030. It concerns notably the emissions from voyages between a port located in an outermost region of a Member State and a port located in the same Member State. That section also refers to the respective legal acts listing the islands and transnational public service obligations or contracts to which an exemption applies.

In practice this rule means that the shipping company needs to identify the voyages of the ship to be exempted under this step, and multiply its GHG emission (as determined in accordance with all the previous steps 1 to 4) by zero. The remaining GHG emissions are the input to the next step.

Step 6: **Rebate for Ice-class ships[100]**

If a shipping company wants to benefit from this rebate, which is applicable until 31 December 2030, and if the ship has ice-class "*IA or IA Super or an equivalent ice class[101], established based on HELCOM Recommendation 25/7*", the shipping company may reduce the emissions determined in accordance with Steps 1 to 5 by 5%.

Step 7: Phase-in[102] of requirements for maritime transport

As has been explained in section 2.3.1, the EU ETS for maritime transport activities is introduced gradually. Therefore, the emissions determined following the previous steps, are reduced accordingly. The emissions of the year 2024 are to be multiplied with 40 %, and the 2025 emissions by 70 %.

The result of this calculation is the quantity of allowances to be surrendered by the shipping company in respect of that ship.

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[98] This derogation is found in the MRV Maritime Regulation as "*Derogation from the general principle in the case of CO_2 emissions referred to in Article 12(3a) and (3b) of [the EU ETS Directive]*". Article 12(3a) refers to CCS, and 12(3b) to permanent CCU, see footnote 110.

[99] The MRV Maritime Regulation refers to this step as "Derogation from the general principle in the case of greenhouse gas emissions from a voyage or activities referred to in Article 12(3-d), (3-c) or (3-b) of Directive 2003/87/EC".

[100] The MRV Maritime Regulation refers to this step as "*Calculation of the ship's total aggregated emissions of greenhouse gases to be reported under Directive 2003/87/EC in the case that the company wants to benefit from the derogation provided for in Article 12(3-e) of that Directive.*"

[101] This includes ships with higher ice operating capability (e.g. Polar Classes PC1 – PC5) .

[102] "*Calculation of the ship's total aggregated emissions of greenhouse gases to be reported under Directive 2003/87/EC, taking into account Article 3gb of that Directive*".

Step 8: Company-level aggregation:

Having reported the GHG emissions resulting from each of the Steps 1 to 7 (where relevant) for each GHG separately, and having made the respective per-voyage data available to the verifier, the shipping company may proceed to aggregating the results of each step and of each ship to obtain the respective data for the whole shipping company.

Important note: As explained in section 2.5, in case of transfer of ships between companies, the company responsible for the ship at the end of the year is responsible for reporting the whole year's emissions under MRV Maritime. However, under the EU ETS, each company involved in the transfer is responsible for the emissions during the period when the ship was under the company's responsibility. Therefore, if a company has transferred a ship to another company, it will still have to include the relevant emissions within EU ETS scope in its aggregated company-level emissions report. This means it includes emissions of a ship for which it does not submit an annual emissions report under MRV Maritime but only a partial emissions report[103]. Therefore the shipping company must have in place suitable procedures that ensure the completeness of its emissions data that takes into account the possible impact of the transfer of a ship.

Note: Point 2, Part C of Annex II to the MRV Maritime Regulation requires the monitoring of data justifying the calculation of the different steps listed above. However, if the data collected in accordance with what was stated in section 5.1, all the relevant data is already available. It is to be noted though that shipping companies should establish relevant procedures as part of their monitoring plan that links each voyage monitored to the respective steps above, and to establish relevant control procedures for ensuring the correct application of those procedures.

5.2.2 Zero rating of sustainable biofuels and other renewable fuels

Part C, point 1.2, of Annex II of the MRV Maritime Regulation stipulates that shipping companies shall apply a CO_2 emission factor of zero instead of the default factor provided by Annex I of MRV Maritime Regulation (see section 4.6)[104] where the company uses a **biofuel complying with the sustainability criteria and greenhouse gas emission saving criteria[105]** for the use of biomass established by Directive (EU) 2018/2001 (the Renewable Energy Directive, "RED"). Applying the rules of the MRR[106], such fuels may be zero-rated (i.e. their CO_2 emission factor is considered zero) if the biofuels comply with the sustainability and GHG savings criteria of Article 29(2) to (7) and (10) of the RED.

A shipping company usually does not have to know how to apply these criteria in detail. In practice, a batch of bunkered fuel may be zero-rated if the shipping company receives a "Proof of Sustainability" (PoS) from the fuel supplier for exactly this quantity, issued under a certification scheme complying with Article 30 of the RED. These certification schemes may operate world-wide.

For information sources and more detailed rules on the zero-rating of biofuels please see Annex III.

[103] This is reflected in the emissions report templates as per Annex II and IV to Implementing Regulation (EU) 2023/2449. The partial emissions report and the full-year emissions report share the same template and structure. The emissions within MRV scope to be reported at the end of the reporting period in the full-year emissions report will include the sum of all emissions within MRV scope associated to the ship, including those from partial emissions report. The emissions reported in the company level emissions report (Annex IV) will only include those emitted during the periods in which the relevant ship(s) was under their responsibility.

[104] Note that the rule for using actual emission factors is possible only for non-fossil fuels.

[105] The relevant criteria are further detailed in section 9.2.2 of this guidance document.

[106] See footnote 37. The relationship between the MRR requirements and the RED is clarified in Article 38(5) of MRR.

For the zero-rating of RFNBOs and RCFs, the relevant rules under the EU ETS (requiring an amendment of the MRR) are currently under development. An update of this guidance document will be provided as soon as these rules will be available.

5.2.3 Detailed rules on carbon capture onboard ships

The rules on CCS (Carbon Capture and Storage) and CCU (Carbon Capture and Utilisation) under the EU ETS in general are currently being updated. Therefore, only preliminary guidance can be given here. The following principles apply:

- Where a ship captures a part of its CO_2 emissions[107] such that the CO_2 is neither released to the atmosphere nor in another way to the environment[108], the respective quantity of CO_2 can be accounted for to reduce the ship's GHG emissions for EU ETS purposes (taking into account the EU ETS geographical scope). However, the total emissions before capture are to be reported for the purpose of the MRV Maritime Regulation.
- The EU ETS Directive requires that the CO_2 is geologically stored in a storage site compliant with the "CCS Directive"[109]. Without such storage, the CO_2 is not eligible for deduction from the emissions. Therefore, it is not the amount of CO_2 captured, but the amount handed over to a CO_2 transport system operator or directly to a storage site (within the meaning of the MRR) which is the relevant parameter for further calculation. This means that e.g. the capacity for temporary storage of CO_2 onboard the ship may limit the amount deductible from the ship's emissions.
- Besides geological storage, the EU ETS Directive also allows "permanent CCU"[110] as reason for deducting CO_2 from actual emissions. More detailed rules in that regard are currently under development and will be taken into account in a later update of this guidance document.
- CO_2 capture is an energy-intensive process. Any additional emissions caused by emissions sources in order to provide that additional energy have to be covered in the ship's monitoring plan and the resulting additional emissions included in the emissions report.
- Where a ship is transporting CO_2 as cargo, emissions from leakage or boil-off from that loaded CO_2 will fall under the "normal" EU ETS rules for CO_2 transport and are outside the scope of the MRV Maritime Regulation and will not be included in the monitoring plan under the MRV Maritime Regulation (but under a permit and monitoring plan for the "normal" EU ETS).

[107] The EU ETS Directive has no rules for the capture of non-CO_2 gases.

[108] I.e. scrubbing of flue gas and subsequent release of the scrubbing water to the environment does not qualify as CO_2 capture.

[109] Directive 2009/31/EC; http://data.europa.eu/eli/dir/2009/31/oj

[110] Regarding the principle of permanence, the EU ETS Directive Article 12(b) states: "*An obligation to surrender allowances shall not arise in respect of emissions of greenhouse gases which are considered to have been captured and utilised in such a way that they have become* ***permanently chemically bound in a product so that they do not enter the atmosphere under normal use, including any normal activity taking place after the end of the life of the product***."

6 THE MONITORING PLAN

The shipping company shall monitor the required data throughout the reporting period on the basis of a monitoring plan which needs to be assessed as satisfactory by the verifier, and, for the ships falling within the scope of the EU ETS Directive, approved by the administering authority. Given its importance in ensuring the robustness and consistency of the collected data, the following sections give detailed guidance on related issues.

6.1 Drafting and modifying a monitoring plan

6.1.1 Monitoring Plan

The Monitoring Plan is a document in which the shipping company describes the design of the management system the ship has in place in order to monitor and report several data parameters related to the GHG emissions and Energy Efficiency of the vessel.

The Monitoring Plan should consist of a complete and transparent documentation of the monitoring method for the ship concerned along with the description of the relevant procedures, systems and responsibilities used to monitor the completeness and accuracy of the data provided in the Emissions Report in conformity with the MRV Maritime Regulation.

The submission date along with the minimum content of the Monitoring Plan is laid down in Article 6 of the MRV Maritime Regulation. More detailed requirements on the monitoring plan are laid down in Commission Implementing Regulation (EU) 2023/2449.

The shipping company shall produce and submit one Monitoring Plan for each ship under its responsibility which carries out activities covered by the MRV Maritime Regulation. To facilitate the process, THETIS-MRV allows the shipping company to extract and reuse previously entered information from one ship which applies in an identical manner to their entire fleet ('company-specific parts') so that the company will only have to enter separately the information which reflects the ship's technical characteristics and specific procedures ('ship-specific parts').[111]

To maximise synergies between the procedures for compliance with the obligations from the MRV Maritime Regulation and those established by the FuelEU Regulation[112], THETIS-MRV allows the shipping company also to reuse relevant information previously entered in the system when preparing the Monitoring Plan referred to in Article 8 of the FuelEU Regulation[113].

When developing a monitoring plan, operators should follow some guiding principles:

- Knowing in detail the situation of their own ships, the shipping company should make the monitoring methodology as simple as possible. This is achieved by attempting to use the most reliable data sources, robust[114] metering instruments, short data flows, and effective control procedures.

[111] THETIS-MRV offers a dedicated 'Cloning' functionality, which allows the user to extract and reuse company-specific parts from other monitoring plans. The procedure is described in the online tutorial video 'C15 Cloning of a Monitoring Plan' available at https://emsa.europa.eu/thetis-mrv/thetis-mrv-videos/.

[112] Regulation (EU) 2023/1805, OJ L 234, 22.9.2023, p. 48, http://data.europa.eu/eli/reg/2023/1805/oj

[113] In particular the procedures and methods to monitor fuel consumption and associated control activities, including the list of emission sources/fuel consumers, fuel tanks and measurement equipment should be the same in MRV Monitoring Plan and FuelEU Monitoring Plan.

[114] Measurement instruments in general must be fit for purpose, in particular capable to reliably work under the rough environmental conditions on sea. They must be regularly maintained, checked for functioning and calibrated in accordance with either requirements of legal metrological control, or according to use specifications of the producer of the instruments. The suggestion that instruments should be "robust" means that they should have a low risk of failure, either by their nature or by the procedures included in the monitoring plan for maintenance, checking and calibration.

- Shipping companies should imagine their annual emission report from verifier's perspective. What would a verifier ask about how the data has been compiled? How can the data flow be made transparent? Which controls prevent errors, misrepresentations, omissions?
- Because ships usually undergo technical changes over the years, monitoring plans must be considered living documents to a certain extent. In order to minimise administrative burden, shipping companies should be careful which elements must be laid down in the monitoring plan itself, and what can be put into written procedures supplementing the MP.

6.1.2 When does a shipping company need to modify the Monitoring Plan?

Shipping Companies are required to check at least once a year whether a ship's monitoring plan reflects the nature and functioning of the ship and whether the monitoring methodology can be improved. The MRV Maritime Regulation (Article 7) provides for certain (non-exhaustive) situations when companies are required to modify the monitoring plan, such as:

3. a change of company[115];
4. new greenhouse gas emissions[116] are generated due to new emission sources or due to the use of new fuels not yet contained in the monitoring plan;
5. a change in availability of data which may affect the accuracy of the measurement of greenhouse emissions, due to the use of new types of measuring equipment, new sampling methods or analysis methods or other reasons;
6. data resulting from the monitoring method has been found to be incorrect;
7. any part of the monitoring plan is identified as not being in conformity[117] with the requirements of the MRV Maritime Regulation.

In case of modifications of the monitoring plans, shipping companies shall notify the verifiers without undue delay.

In circumstances provided by points 2, 3 and 4 above, modifications of the monitoring plan shall be subject to assessment by the verifier. Following the assessment, the verifier shall notify the shipping company whether those modifications are in conformity with the requirements of the MRV Maritime Regulation.

Once a shipping company has received a notification of conformity, and for ships falling within the scope of the EU ETS Directive, it shall submit its modified monitoring plan to the responsible administering authority. Shipping companies shall also submit modifications provided under points 1 and 5 of the above to the responsible administering authority without undue delay once it has received a notification from the verifier that the monitoring plan is in conformity or, as far as point 1 is concerned, once it has notified the verifier.

The administering authority responsible shall approve the revised monitoring plan by 6 June 2025 or, for ships falling within the scope of Directive 2003/87/EC for the first time after 1 January 2024, within four months of the ship's first call in a port under the jurisdiction of a Member State.

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[115] To be meant as change of 'company' as entity responsible for obligations under the MRV Maritime Regulation. A change of company may be triggered by a change of ownership (sale/purchase of the ship) but also by a change in the regulated entity that assumes responsibility for MRV compliance (i.e. modifications concerning the document referred to in Implementing Regulation (EU) 2023/2599). Where modifications to the monitoring plan are limited to the change of company (i.e. a change in the company details of the shipping company), the verifier should be notified by the shipping company of such changes but it is not necessary for the verifier to carry out an additional assessment of the previously assessed monitoring plan. The above-mentioned modifications shall in any case be approved by the Administering Authority.

[116] The amendment of the MRV Maritime Regulation in 2023 introduces new GHGs for all ships, establishing new monitoring obligations starting the reporting year 2024. Therefore an update of all monitoring plans submitted before 2024 is necessary.

[117] E.g. as per the assessment carried out by an accredited verifier

6.1.3 Describing a procedure

The monitoring plan should ensure that the shipping company carries out all the monitoring activities consistently over the years, like according to a recipe book. In order to prevent incompleteness, or arbitrary changes by the shipping companies, the verifier's assessment first and the administering authority's approval later, are required. However, there are always elements in the monitoring activities, which are less crucial, or which may change frequently. Such monitoring activities may (or even shall) be put into "written procedures", which are mentioned and described briefly in the MP, but are not considered part of the MP.

Article 6(3) of the MRV Maritime Regulation requires procedures for the following purposes:

- Regular updating the list of emission sources onboard each ship;
- Monitoring of the completeness of voyages;
- Monitoring fuel consumption of the ship (including, as applicable, the chosen method for fuel consumption calculation for each emission source, the description of used measuring equipment, procedures for the measurement of fuel uplifts and fuel in tanks, and density, the procedures for recording, retrieving, transmitting and storing information regarding measurements, the method chosen for density determination, and a procedure to ensure that the total uncertainty of fuel measurements is consistent with the requirements of the MRV Maritime Regulation);
- Determining activity data per voyage (distance, passengers and cargo carried, time spent at sea between port calls, and if applicable, also the distance travelled and the time spent at sea when navigating through ice);
- Determine surrogate data for closing data gaps.

Furthermore, Part C of Annex I to the MRV Maritime Regulation requires written procedures for the purpose of describing data flow activities, the risk assessment, and control activities, and for avoiding data gaps. Such written procedures may be contained in full in the Monitoring Plan or described through references to external written procedures. More information about procedures can be found in Annex I of this document (section 7.3).

6.2 Control system and data flow

As human beings (and, in many cases, different information technology systems) are involved, mistakes in data flow activities can occur. Therefore, a control system is necessary. Both the risk assessment and control activities are part of a well-functioning control system, allowing the verifier to carry out more efficient verification activities. Both must be described in written procedures supplementing the Monitoring Plan.

The relevant provisions for shipping companies, as amended through Commission Delegated Regulation (EU) 2023/2776, are closely aligned to those applicable to stationary installations and aircraft operators contained in Commission Implementing Regulation (EU) 2018/2066. Therefore, the Guidance Document No. 6: 'Data flow activities and control system'[118], can be used by shipping companies to access detailed information on these topics. The document is almost directly applicable to the maritime transport sector and, for that purpose, 'operator' and 'aircraft operator' should be read as 'shipping company'.

[118] https://climate.ec.europa.eu/document/download/44dec508-ad8f-4a38-a284-1b809985d6c9_en?filename=policy_ets_monitoring_gd6_dataflow_en.pdf&prefLang=en

6.2.1 Control system

A control system sets measures that help minimise risks. A well-functioning control system helps to comply with monitoring and reporting principles within the EU ETS, namely: completeness, consistency, comparability, transparency, accuracy, integrity and continuous improvement.

In accordance with Part C of Annex I to the MRV Maritime Regulation, the control system for shipping companies must consist of the following elements:

- Written procedures for control activities;
- Written procedures for data flow activities;
- Risk assessment.

A control system should not be rigid, but dynamic. The shipping company is required to monitor the effectiveness of the control system, including by carrying out internal reviews and considering the findings of the verifier during the verification of emission reports.

When a company finds the control system ineffective or not commensurate with the risks identified, it must seek to improve it and update the monitoring plan or the underlying written procedures for data flow activities, risk assessments and control activities accordingly.

6.2.2 First steps of setting up a control system

As a first step, the shipping company creates the data flow providing a logical sequence of data collection and processing steps. Then, the shipping company must carry out a risk assessment to identify sources of risks of errors in the data flow from primary data (e.g. in case the engineer performs manually daily tank soundings) to final data in the annual emissions report (e.g. aggregated data from an IT system).

Thereafter, the shipping company must establish, document, implement and maintain written procedures, separately from the monitoring plan, for data flow activities as well as for control activities. The company must also describe those procedures and include references to them in the monitoring plan. The effectiveness of the control system is to be monitored and, when necessary, the procedures need to be improved.

6.2.3 Written procedures of a control system

The shipping company is required to establish, document, implement and maintain written procedures, for data flow activities as well as for control activities. This must be done separately from the Monitoring Plan.

Written procedures for control activities must at least include[119]:

- Quality assurance of the measurement equipment;
- Quality assurance of the information technology system;
- Segregation of duties in the data flow activities and control activities, and management of necessary competencies;
- Internal reviews and validation of data;
- Corrections and corrective action;
- Control of out-sourced processes;
- Keeping records and documentation, including the management of document versions.

[119] Point 1.3 of Part C of Annex I to the MRV Maritime Regulation.

The updated template for the Monitoring Plan (implemented in THETIS-MRV) provides the relevant fields for the description of these procedures.

6.2.4 Data flow activities

Monitoring of emissions data implies more than just reading instruments or carrying out chemical analyses. For the monitoring and reporting of greenhouse gas emissions, it is important for shipping companies to ensure that data is retrieved, collected, transported and stored in a controlled manner.

Therefore, the shipping company must define instructions on 'who takes data from where and does what with it'. These 'data flow activities' are laid down in written procedures accompanying the Monitoring Plan, which must be made available to the verifier and the Administering Authority upon request. The shipping company must describe those written procedures and include references to them in the Monitoring Plan.

When the shipping company starts designing the Monitoring Plan, it creates the data flow providing a logical sequence of data collection and processing steps. As errors may occur in the obtaining or transmission of data, an effective control system is necessary, as explained in the questions and answers below.

Data flows can be described in writing in different forms. For simple data flows, a short description may be sufficient, while in complex cases a data flow diagram will be indispensable. Furthermore, detailed checklists for each department involved and training material for staff may need to be developed.

Examples of how data flows can be described:

- Data flow diagram
- Task list
- Written procedures
- Check lists and lists of incidents or deadlines triggering activities.

Examples of these different data flows can be found in MRR Guidance Document No. 6: Data flow activities and control system[120].

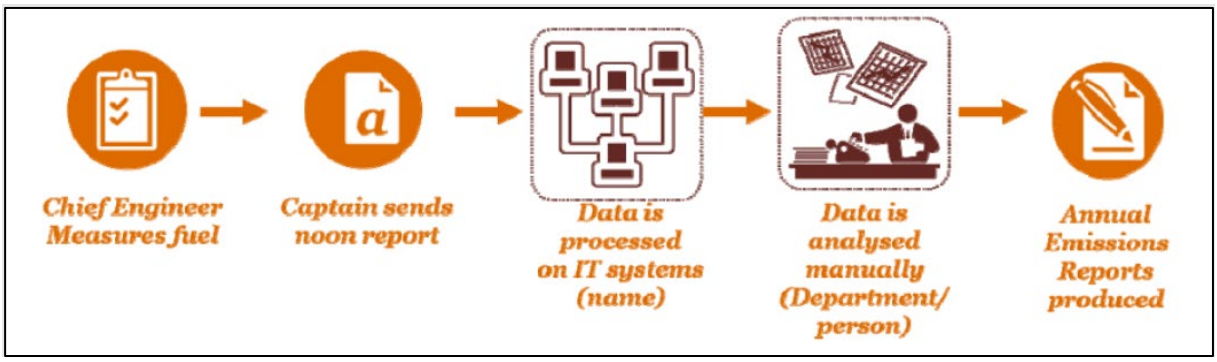

Figure 5: Example of a data flow diagram

[120] https://climate.ec.europa.eu/document/download/44dec508-ad8f-4a38-a284-1b809985d6c9_en?filename=policy_ets_monitoring_gd6_dataflow_en.pdf&prefLang=en

Figure 5 shows an example with the information about the procedure alongside a diagram: The Captain receives information from the Chief Engineer after taking the soundings of the fuel tanks using sounding tape, then he inserted into the daily noon report.

6.2.5 Risk assessment

A risk assessment is the first step to follow when establishing a control system. It helps the shipping company to identify points in the data flow where control activities are needed, and where they can be applied more effectively. The shipping company should regularly update its risk assessment, adapting it to relevant changes (e.g. to the ship configuration or to new IT systems). This may lead to the identification of new risks and a need to update the control procedures as well.

Please note that Article 15(1) of the MRV Maritime Regulation requires the verifier to carry out a risk analysis. Such risk analysis, however, is distinct from the risk assessment to be carried out by the shipping company pursuant to Part C of Annex I to the MRV Maritime Regulation, since its purpose is to support the verifier with the identification of necessary verification activities.

6.2.5.1 What does 'risk' for a shipping company mean in the context of MRV?

'Risk' (R) is a parameter which takes into account both the probability (P) of an incident and its impact (I). In terms of emissions monitoring, the risk refers to the probability of a misstatement (omission, misrepresentation or error) being made, and its impact in terms of annual emission figures.

To simplify, it can be said that R = P × I.

Therefore, if either probability or impact is high, the risk will be high as well, unless the other parameter is very low. Where probability and impact are high, the risk will be very high, as indicated in Figure 6.

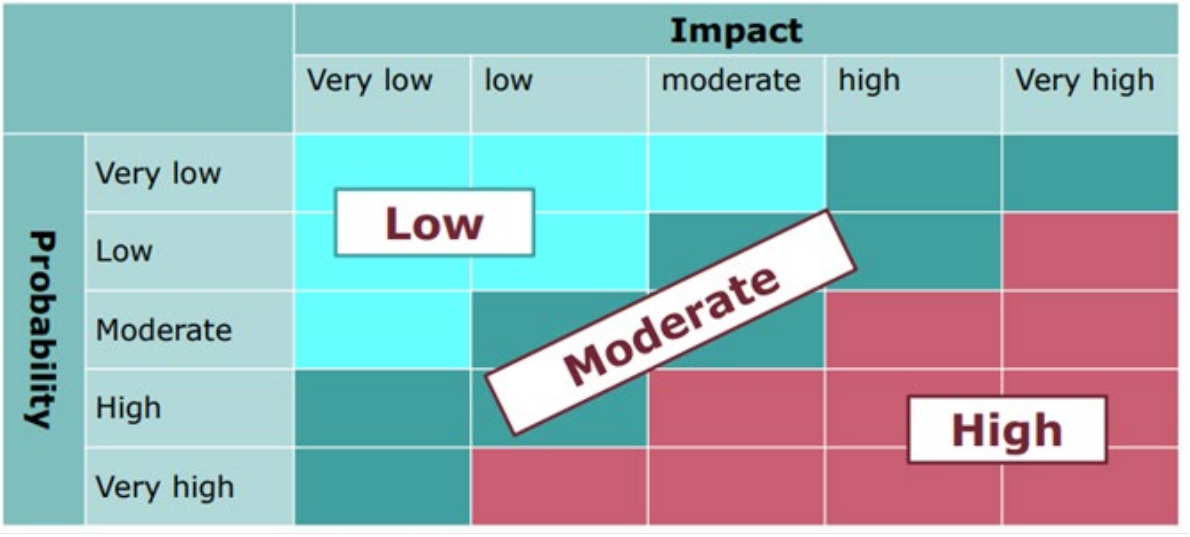

Figure 6: Example for how to classify risks

6.2.5.2 What steps are shipping companies required to take after carrying out the risk assessment?

Once the shipping company has assessed the risks associated with its data flow, the second part of the control system must be established, i.e. appropriate control activities to mitigate the identified risks. A typical example of control activity is the four-eyes principle, i.e. the review of data/information/reports by an independent second person. The shipping operator can establish that it should at least be applied to the overall annual emissions report (in analogy to the independent review of the verifier). Other examples of control activities are: keeping backups of data in IT systems, data quality checks like trend analyses or data completeness checks, or checking (calibrating) measurement instruments at regular intervals.

In a next step the shipping company must assess the risks (now mitigated) once more to determine if the control measure will be effective and applied properly.

This is an iterative process. If the result is not satisfactory, the shipping company will have to take a step back and re-develop its control activities. In some cases it might be necessary to go back to the early steps of monitoring plan development, selecting more appropriate data sources or rearranging the data flow in a sequence which is less prone to errors.

6.3 The improvement principle

The MRV Maritime Regulation requires the shipping company to explore possibilities to improve the monitoring methodology when the ship itself is unchanged. For implementing this “improvement principle”, there are two requirements:

- Shipping companies shall endeavour to take account of the recommendations included in the verification reports (Article 4(7)), and
- Shipping companies must check regularly (at least once a year) on their own initiative, whether the monitoring methodology can be improved (Article 7(1) MRV Maritime Regulation).

A recommendation of improvement is a suggestion from the verifier to improve the shipping company's performance in monitoring and reporting GHG emissions, cargo carried, transport work, distance travelled and /or time spent at sea.

During verification following a year in which recommendations for improvement were made in a verification report, the verifier shall verify whether the shipping company has implemented those recommendations for improvement and the manner in which this has been done. If the shipping company has not implemented those recommendations, the verifier shall assess whether this increases or may increase the risk of misstatements.

7 ANNEX I – HOW TO PREPARE AND REVISE THE MONITORING PLAN

The aim of this Annex is to provide best practices on how shipping companies should prepare their monitoring plans in accordance with the template contained in Annex I to Implementing Regulation (EU) 2023/2449. It has been written to support the implementation of the MRV Maritime Regulation by explaining its requirements in a non-legislative language and providing some examples. However, it should always be remembered that the MRV Maritime Regulation and the related Delegated and Implementing Regulations set the primary legal requirements.

This Annex follows the monitoring plan template structure as contained in Annex I to Implementing Regulation (EU) 2023/2449. It has to be noted that the electronic template available in THETIS-MRV may sometimes differ from such a structure, as different tables may be grouped or sliced into different section(s) of the IT interface. Tutorial videos available on the THETIS-MRV page[121] explain in detail how the requirements established in Implementing Regulation (EU) 2023/2449 have been implemented in the THETIS-MRV IT environment.

7.1 Use of electronic templates and monitoring plan submission

Shipping companies must use standardised monitoring plans based on the templates defined by the Commission[122]. Starting 1 January 2024, the monitoring plans need to be submitted through **THETIS-MRV**[123].

The drafting of the monitoring plan in accordance with such templates can be done either by filling in the online form in THETIS-MRV or by uploading files in THETIS-MRV in accordance with IT format made available on THETIS-MRV[124].

Unless otherwise specified in Annex I to Implementing Regulation (EU) 2023/2449[125], all fields of the monitoring plan are mandatory and shall be duly filled in by the shipping company to produce a complete monitoring plan. If the mandatory fields are not applicable, the shipping company should indicate “N/A” in those fields. Checking the completeness of the monitoring plan further falls within the verifier’s assessment tasks[126].

THETIS-MRV offers users the possibility of attaching documents to the monitoring plan, through predefined labels or free description. Those can include for instance the assessment report issued by the verifier (as referred to in Article 9 of the Commission Delegated Regulation on verification activities, accreditation, and approval of monitoring plans[127]), a copy of the mandate to be provided in line with Commission Implementing Regulation (EU) 2023/2599 (when applicable), or the risk assessment in

[121] https://emsa.europa.eu/thetis-mrv/thetis-mrv-videos/.

[122] Such templates are defined in Annex I to Implementing Regulation (EU) 2023/2449, http://data.europa.eu/eli/reg_impl/2023/2449/oj.

[123] https://mrv.emsa.europa.eu/#public/eumrv

[124] At the time of writing THETIS-MRV allows the upload of files in XML format. Further information can be accessed at https://mrv.emsa.europa.eu/#public/faq

[125] As in the case of fields explicitly labelled as ‘voluntary’ or which apply only to certain ship types and/or are dependent on other selections.

[126] This notably includes assessing whether fields have been correctly marked as ‘Not Applicable/N/A’ by the shipping company.

[127] Commission Delegated Regulation (EU) 2023/2917 of 20 October 2023 on the verification activities, accreditation of verifiers and approval of monitoring plans by administering authorities pursuant to Regulation (EU) 2015/757 and repealing Commission Delegated Regulation (EU) 2016/2072. http://data.europa.eu/eli/reg_del/2023/2917/oj.

accordance with Part C of Annex I to the MRV Maritime Regulation. Once attached to the Monitoring Plan of a ship,[128] such documents will be available to all users in the Monitoring Plan workflow established in the system, including Administering Authorities (where applicable). This is relevant also considering that, pursuant to Article 73 of the Commission Delegated Regulation on verification activities, accreditation, and approval of monitoring plans, the company '*shall provide the administering authority responsible with the verifier's conclusions of the assessment of the monitoring plan and any additional information that enables it to carry out the approval procedures*'. Therefore, pending guidance from each administering authority, THETIS-MRV might be used as a tool to provide such documents (including as attachments to the monitoring plan).

Because of their potential volatility, hyperlinks to external servers do not qualify as accepted attachments to the Monitoring Plan and may be disregarded by the Administering Authorities.

7.2 Using the appropriate Language

Monitoring plans can be established in any language agreed between the shipping company and the accredited verifier. However, there is an obligation to ensure that an English translation of the satisfactorily assessed monitoring plan is available.

Companies should communicate to the verifiers and, where applicable[129], administering authorities the content of the monitoring plan in an easy and clear way.

7.3 Describing a procedure

By default, the monitoring plan shall include a description of each relevant procedure. Please note that the complete procedure itself does not have to be included. This is to ensure flexibility in cases where smaller details of the procedure can change frequently (e.g. the name of the responsible person): such minor changes do not justify an update of the monitoring plan. The description in the monitoring plan must be sufficiently detailed to fit the purpose of the monitoring plan, namely:

- to provide clear and transparent information to the verifier as a basis for its assessment;
- to provide sufficient information that allows the administering authority to make an informed decision on whether or not to approve the monitoring plan. This is only possible where the content of the procedure is described in sufficient detail to assess whether it is in compliance with the legal requirements of the MRV Maritime Regulation.

In addition, the full text of the procedure has to be sufficiently clear and complete to provide unambiguous instructions to the staff of the shipping company and the ship's crew.

Simple procedures will be completely reflected by the description. However, when the procedure is more elaborated, it may be established and described in an external source (such as a written procedure or harmonised quality, environmental or energy management standards[130]). In the latter case, a brief description will suffice, although it should contain a reference to the full procedure and indicate where its full version is stored. In any case, the shipping company will have to grant access to such external

[128] Documents can be uploaded in THETIS-MRV either as attachments to the Monitoring Plan or directly in the ship's page editable by the user. Once uploaded, the attachments will be visible to all users having access to the ship's page.

[129] Please note that companies with ships falling only under the scope of the MRV Maritime Regulation, but not under the scope of the EU ETS Directive, would not be attributed to any administering authority.

[130] A reference could be made to procedures or systems effectively implemented as part of their existing management systems, such as the International Safety Management Code (ISM Code), the Ship Energy Efficiency Management Plan (the SEEMP), Systems and controls covered by harmonised quality, environmental or energy management standards, such as EN ISO 9001:2015, EN ISO 14001:2015 or EN ISO 50001:2011, or any other relevant internal procedures established by the company.

sources to the verifier or the Administering Authority upon their request. While existing procedures established outside the monitoring plan should be used and referred to in the monitoring plan to the best extent possible, it has to be noted that a mere reference to an existing procedure without a brief description of the same will not suffice. In addition to the description of the procedure itself, Tables describing procedures in the monitoring plan shall contain the following elements:

Title of procedure

The procedure shall be identified as indicated in the monitoring plan template contained in Annex I to Implementing Regulation (EU) 2023/2449.

Reference to existing procedure

A reference to an external procedure shall be entered when the monitoring plan contains a brief description of the procedure. The reference could for instance include the name of the relevant manual, the chapter and/or paragraph where the procedure is stored (e.g. *Operations Manual, Chapter 7.2.1*). In cases where the monitoring plan contains the full description of the procedure, the value N/A shall be entered.

Version of existing procedure

The version and date of the procedure shall be entered (e.g. *Version 2, November 2023*). This information is critical to ensure the access to the correct version of the procedure. In cases where the monitoring plan contains the full description of the procedure, the value N/A shall be entered.

Name of Person or position responsible for this procedure

The company should mention in the Monitoring Plan the name or the position of the person responsible for the procedure, as referred to in its internal organigram (e.g. *The Operational Manager*). This enables the shipping company to record responsibilities and identify whom to contact in case queries are raised about the procedure.

Location where records are kept

The location of where records are kept should be specified in order to ensure availability of information in case of need, for instance in the course of verification activities, of activities carried out by the Administering Authority during the approval process, but also for the shipping company itself in case of changes to the monitoring plan. A reference to exact location where hard and/or e-copies of the relevant records are stored shall be included (e.g. *Technical Department Files at the Headquarters of SafeSea Ltd., Willow road, 13, Houston - USA*)

Name of the IT system used (where applicable)

The name, version and module of the system used within the relevant procedure, as per IT system provider manual, shall be inserted (e.g. *Best Navigate Software, Module: vessel manager*). For internal system, characteristics for identification can be specified.

Data sources (where applicable)[131]

The source from where the data is collected shall be indicated (e.g. *BDN, GPS, etc.)*

What follows below is an example of a full table describing a procedure, as per Table B.7 of the monitoring plan template. In this example the shipping company provides a full description of the procedure within the monitoring plan, as it is short enough for this purpose, and keeping a separate more extensive version of the procedure is not necessary.

[131] The indication of data source is required in the tables referring to description of methods.

Example

Title of procedure	Review of completeness of data sources
Reference to existing procedure	Expl.B7
Version of existing procedure	V 3 (in force: 24 March 2024)
Name of Person or position responsible for this procedure	Assigned Superintendent Engineer (Technical Department)
Short description of procedure (a brief description of the procedure can be provided if already existing outside the monitoring plan)	In case of known changes to an emission source onboard the ship, the technical manager shall inform the assigned Superintendent Engineer of the changes and provide them with all the necessary information. Periodic comparisons between the engine room drawings of the ship and the actual situation on board are carried out throughout the year. In the absence of known changes, the technical manager shall confirm at least once a year, by the end of June, whether any relevant changes have occurred. The responsible assigned Superintendent Engineer reviews and updates the list of the emission sources in the related Monitoring Plan and in any other report and document that the shipping company maintains with the latest information of the emission sources on board, when applicable, in order to ensure completeness and accuracy of monitoring and reporting in accordance with the Regulation.
Location where records are kept	The Monitoring Plan of the ship (accessible online through THETIS-MRV). A back up hard copy of the monitoring plan is made available onboard and a further copy is stored at the Company's Office/ Technical Department Files.
Name of the IT system used (where applicable)	*Ship Engineering Tool (SET)* V 3.42 (at tech. department) THETIS-MRV
Data sources (where applicable)	Engine room drawings; Maintenance Log, company's investment documentation.

7.4 Detailed guidance to the Monitoring plan Template

7.4.1 Part A Revision record sheet

This Part shall include reference to parts where revisions or modifications have been made, including a brief but complete explanation of changes. The version number, reference date, and status at reference date are automatically attributed by the THETIS-MRV IT system and cannot be edited by the shipping company.

Example

Table B.2. Change of address, Table C.2.1. Change of method to determine fuel consumption.

7.4.2 Part B Basic Data

Table B.1. Identification of the ship and shipowner details

This table gathers identification data on the ship and shipowner details. Where the shipowner is also the responsible entity assuming responsibility for MRV and, where applicable, EU ETS compliance (i.e. 'the shipping company'), some of the same information data will also have to be reported under Table B.2.

IMO ship identification number

Refers to unique seven digit IMO number as assigned by IHS Maritime and shown on the ship's hull, in accordance with SOLAS regulation XI-1/3.

IMO unique company and registered owner identification number of the registered owner

Refers to the IMO number of the registered owner as number as recorded under the IMO Unique Company and Registered Owner Identification Number Scheme accordance with SOLAS regulation XI-1/3-1.

Name of the shipowner

The legal entity that owns the vessel. This shall correspond to the registered owner, i.e. the owner specified on a ship's certificate of registry and as recorded under the IMO Unique Company and Registered Owner Identification Number Scheme.

Gross Tonnage

Gross tonnage (GT) means the gross tonnage calculated in accordance with the tonnage measurement regulations contained in Annex I to the International Convention in London on 23 June 1969, or any successor convention[132].

Voluntary open description field

This may concern certain information related to the characteristics of the business activities of the ship based on its type (cruise line etc.).

This information may help to gain a better understanding of the potential fluctuation of energy efficiency between certain voyages or reporting periods (e.g. dry docking, breakdown, etc.).

Furthermore, shipping companies may insert additional technical characteristics that may affect the energy efficiency of the vessel (e.g. Mewis Duct, Propeller boss cap fin, Anti-fouling, Hull surface coating) as well as additional contact persons for the ship.

Table B.2. Company information

This table shall contain the information of the company assuming responsibility for MRV and, where applicable, EU ETS compliance in respect of the ship, i.e. 'the shipping company'[133].

The information provided about the 'Contact person' will help the Administering Authority to establish direct contact for any questions about the Monitoring Plan. The contact person for the 'shipping company' should notably be a person authorised to act on behalf of the 'shipping company' (i.e. the entity assuming responsibility for MRV and EU ETS compliance, when applicable) and should be accessible by the Administering Authority.

An additional contact person, such as someone working for a third party assisting the 'shipping company' in fulfilling its monitoring and reporting obligations (i.e. a contact within the technical manager or bareboat charterer), can be indicated in the 'Additional information' section under the 'Further info.' tab within the Monitoring Plan page of THETIS-MRV.

Table B.3. Emissions sources and fuel types used

The monitoring and reporting must be complete and cover greenhouse gas emissions from the combustion of all fuels. Therefore, all emissions sources onboard the ship must be listed and described in

[132] As per Article 3(e) of the MRV Maritime Regulation. Reductions on the gross tonnage of a ship granted on the basis of any other instrument or regulation shall not be considered within the MRV Maritime Regulation.

[133] As defined in Article 3, point (w), of Directive 2003/87/EC.

the monitoring plan, irrespective of the amount of emissions produced over the reporting period. The list of standard emissions source types as in Commission Implementing Regulation (EU) 2023/2449 includes 'Main engines', 'Auxiliary engines', 'Gas turbines', 'Boilers', 'Inert gas generators', 'Fuel cells', 'Waste incinerators'[134], and the category 'Other', to cover any other emissions source type. Where an emissions source does not match any of the default types, the type 'Other' will apply.

The emissions source class allows for an additional segregation, within the same emission source type, which may be needed if different emissions factors (including slippage coefficients) apply[135].

The shipping company must list all fuel types applicable over the reporting period in respect of the different emissions sources installed on board. When identifying the applicable fuel types[136], the shipping company shall refer to the default fuel types listed in Annex I to the MRV Maritime Regulation. Where there is fuel blending, each component of the blended fuel must be considered as a separate fuel. The Monitoring Plan should therefore list separately all the relevant fractions of a blend, indicated as pure fuels.

When providing the technical description of the emissions source, if an emissions source underwent engine power limitations, the shipping company should include both the power and corresponding SFOC before and after the limitation.

Example

Emission source reference no.	**Name of the emissions source**	**Type of the emissions source**	**Emissions source class**	**Technical description of emission source (performance/power, specific fuel oil consumption (SFOC), year of installation, identification number in case of multiple identical emission sources, etc.)**	**(Potential) Fuel types used**
1	Hitachi Zosen Type MAN B & W 6S60MC Mk6	Main Engine	ICE (other)	Serial No: 3896 Year of Installation: 2001 Rated Power (MCR): 10750 kW @ 99 RPM SFOC (MCR): 172 g/ kWh	HFO LFO MGO
2	HYUNDAI-HIMSEN 6H21/32	Auxiliary Engine	ICE (other)	Serial No: BA5832-1 Year of Installation: 2016 Rated Power (MCR): 1200kW @ 900RPM SFOC: 195g/kWh	HFO LFO MDO MGO
3	WARTSILA W6L20DF	Auxiliary Engine	LNG Otto (dual fuel medium speed)	Serial No: PAA124785 Year of Installation: 2017 Rated Power (MCR): 1123kW @1200RPM SFOC: 198g/kWh SFC: 7010(kJ/kWh)	MDO MGO LNG

[134] In the case of waste incinerators only the emissions from the combustion of pilot fuels shall be considered, thus excluding emissions from waste combustion itself.

[135] When such a further segregation is not needed (i.e. because the same emission factors apply within a certain emissions source type), the value 'class' may be left empty.

[136] The list of fuel types has been expanded following the adoption of Commission Implementing Regulation (EU) 2023/2449, and now also includes: 'H2 (Fossil)', 'NH3 (Fossil), 'Methanol (Fossil)', 'Ethanol', 'Bio-diesel', 'Hydrotreated Vegetable Oil (HVO)', 'Liquified bio-methane as transport fuel (Bio-LNG)', 'Bio-methanol', 'Other Biofuel', 'Bio-H2', 'e-diesel', 'e-methanol', 'e-LNG', 'e-H2', 'e-NH3', 'e-LPG', 'e-DME', and 'Non-fossil Other fuel'.

Emission source reference no.	Name of the emissions source	Type of the emissions source	Emissions source class	Technical description of emission source (performance/power, specific fuel oil consumption (SFOC), year of installation, identification number in case of multiple identical emission sources, etc.)	(Potential) Fuel types used
4	WARTSILA MOSS AS	Inert Gas Generator	Inert Gas Generator	Serial No: n/a Year of Installation: 2016 Performance: 4500 Nm^3/h SFOC: 333 kg/h	MDO MGO

Table B.4. Emission factors referred to in Annex I to Regulation (EU) 2015/757

The shipping company must identify the emission factor to be applied to each fuel type applicable over the reporting period. As a general rule, the shipping company should apply the default (tank-to-wake) emission factor values listed in Annex I to the MRV Maritime Regulation, which cover those factors applicable to both fuel combustion (for CO_2, CH_4, N_2O) and slippage (C_j values). The possibility to provide actual emission factors diverging from the default ones can still be pursued in accordance with the conditions and restrictions provided in Annex I to the MRV Maritime Regulation, which refers to Article 10, paragraphs (5) and (6) of Regulation (EU) 2023/1805 ('FuelEU Maritime Regulation'). For further details on the determination and use of actual emission factors, please refer to section 4.6.

In case of use of other non-fossil fuels without a default emission factor in Annex I to the MRV Maritime Regulation, the company should provide the emission factor determined in accordance with Articles 32 to 35 of Commission Implementing Regulation (EU) 2018/2066, along with the methodology for sampling, methods of analysis and a description of the laboratories used, if any.

Table B.5 Slippage coefficient referred to in Annex I to Regulation (EU) 2015/757

Companies should indicate the emission factor of slipped fuel (slippage coefficient), as defined in point 1, Part A of Annex I to Regulation (EU) 2015/757. Slippage coefficients are dependent on the emission source class. The possibility to demonstrate actual values diverging from the default values presented in point 2, Part A of Annex I is subject to the same conditions and restrictions as the ones for the emission factors referred to under Table B.4.

Where default slippage coefficients are not listed for a specific emission source class[137], companies should apply a slippage coefficient of zero.

Table B.6. Application of carbon capture and storage technologies referred to in Part C, point 1.4, of Annex II to Regulation (EU) 2015/757

Companies should specify, when applicable, which carbon capture and storage technologies are installed onboard, and list the emissions sources to which they are applied and the reference to evidence for compliance with the requirements referred to in Directive 2003/87/EC.

[137] This applies to cases of emissions sources consuming LNG for which slippage occurs but no default emissions factor is provided (e.g. boilers, gas turbines, or any other relevant emissions source under the type 'Other').

Table B.7. Procedures, systems and responsibilities used to update the completeness of emission sources

Companies should provide details about the systems, procedures and responsibilities used to track the completeness of the list of emission sources over the reporting period.

Example

Description of procedure: In case of known changes to an emission source onboard the ship, the Technical manager shall inform the assigned Superintendent Engineer for the changes and provide them with all the necessary information.

Periodic comparisons between the engine room drawings of the ship and the actual situation on board are carried out throughout the year. In the absence of known changes, the Technical manager shall confirm at least once a year, by the end of June, whether any relevant changes have occurred.

The responsible assigned Superintendent Engineer must review and update the list of the emission sources in the related Monitoring Plan(s) and in any other report and document that the Company maintains with the latest information of the emission sources on board, when applicable, in order to ensure completeness and accuracy of monitoring and reporting in accordance with the Regulation.

Name of person or position responsible for this procedure: Assigned Superintendent Engineer/ Technical Department

Location where records are kept: The list is saved in the Monitoring Plan of the ship, which is accessible online through THETIS-MRV. A back up hard copy of the monitoring plan is made available onboard and a further copy is stored at the Company's Office/ Technical Department Files.

Table B.8. Procedures, systems and responsibilities used to determine and update emission factors in accordance with Annex I to Regulation (EU) 2015/757

Where a shipping company intends to deviate from default emission factors, the shipping company must provide details about the systems, procedures and responsibilities used to determine and update emissions factors applicable over the reporting period. The description of the procedure should include reference to the relevant information sources from which emission factors values have been derived.

Where the company provides actual emission factors diverging from the default ones the Table must contain the description of the procedures established to this end[138], including the method by which compliance with the conditions and restrictions provided in Annex I to the MRV Maritime Regulation is demonstrated.

If laboratory analyses are used, the applicable sampling plan and evidence for the competence of the used laboratory should be attached to the monitoring plan[139].

The procedure should also ensure that changes of fuel type and/or the applied emissions factors are tracked effectively over the reporting period.

[138] For details on the possibility for shipping companies to provide actual emissions factors see Section 4.6 of this guidance document.

[139] Specific standards may apply to laboratory analyses and laboratory competence depending on the fuel type being analysed. For non-fossil fuels not listed in the table under Part A, Annex I to the MRV Maritime Regulation, Articles 32 to 35 of Commission Implementing Regulation (EU) 2018/2066 should be considered. For non-fossil fuels listed in the table, companies should refer to Article 10(5) and (6) of Regulation (EU) 2023/1805.

Table B.9 Procedure used to determine the CO_2 emission factors of biofuels and RFNBOs/RCFs referred to in Part C, point 1.2, of Annex II to Regulation (EU) 2015/757

The procedure should, when applicable, include the method by which compliance with the applicable sustainability and GHG savings criteria for biofuels and GHG savings criteria for RFNBOs/RCFs is demonstrated.

7.4.3 Part C Activity Data

Table C.1. Conditions of exemption related to Article 9(2)

If all of a ship's voyages during the reporting period either start from or end at a port under the jurisdiction of a Member State and if the ship, according to its schedule, is planned to perform more than 300 voyages during the reporting period, the company may be exempted from the obligation to monitor relevant information on a per-voyage basis (Art. 9 (2) of the MRV Maritime Regulation) within the limits of point 2, Part C, of Annex II[140]. It is up to the decision of the company to make use of the exemption while providing evidence for meeting the eligibility criteria for the exemption.

Companies will be asked to lay down in their monitoring plans whether they opt for the exemption, respectively.

Further information on how to prepare the Monitoring Plan for companies making use of the exemption is provided in section 8.2 of this document.

Table C.2. Monitoring of fuel consumption

Table C.2.1. Methods used to determine greenhouse gas emissions and fuel consumption of each emission source

Companies can insert as an emission source one of the following categories: 'All sources', 'Main engines', 'Auxiliary engines', 'Gas turbines', 'Boilers', 'Inert gas generators', 'Fuel cells', 'Waste incinerators' or 'Other'. Companies can select one (or more if it enhances the overall accuracy of the measurement) of the following categories: 'Method A: BDN and periodic stock takes of fuel tanks', 'Method B: Bunker fuel tank monitoring on-board', 'Method C: Flow meters for applicable combustion processes' or 'Method D: Direct greenhouse gas emissions measurement'.

Example

Emission source	Chosen methods for fuel consumption
All sources	Method B

Table C.2.2. Procedures for determining fuel bunkered and fuel in tanks

The procedure must describe how bunkering is performed to ensure that tanks are fuelled with the agreed quantity[141]. Another procedure must describe how fuel consumption is monitored in a consistent and accurate manner. In addition, a procedure can be in place in case where an external, independent Bunker Quantity Survey (BQS) Surveyor comes on board so as to provide extra support in the procedure of fuel bunkering. Companies can create a list of forms involved during the bunkering procedure (Bunker

[140] According to which the monitoring on a per-voyage basis of certain information may still be required to benefit from the derogation provided for in Articles 12(3-d) to 12(3-b) of the EU ETS Directive (Directive 2003/87/EC).

[141] A description of a detailed procedure for fuel related procedures can be found in section 5.1 of the best practices document on monitoring and reporting of fuel consumption.

Plan Record, Bunkering Checklist, Oil Transfer Procedures Table etc.). Companies furthermore must also develop dataflow activities with reference to fuel determination. When describing the procedures, companies should also indicate the responsible person(s), the locations where records are kept and, when applicable, the IT system used

Table C.2.3. Regular cross-checks between bunkering quantity as provided by BDN and bunkering quantity indicated by on-board measurement

The procedure must describe how the shipping company cross-checks the bunkering quantity between on board measurements vs. the quantity provided by the supplier as displayed on the BDNs.

Example

The Chief Engineer performs cross-checks between the sounding readings and the Bunker Delivery Note(s), every time upon completion of the bunkering operations. The quantity and receipt number of the Bunker Delivery Note(s) are recorded into the Sounding Form located on board.

Table C.2.4. Description of the measurement instruments involved

Companies must insert the name of the measurement instrument (e.g. sounding tape, flowmeter, etc.) involved (relevant to method A, B, C, D), the sources used (tanks, boilers, etc.) along with the technical characteristics (year of installation or purchased, maintenance period, accuracy etc.) in order to signify that the measurement equipment is in good condition. Measurement instruments must be regularly maintained, checked for correct functioning and calibrated. In case of malfunctioning detected, they must be replaced without undue delay[142].

Example

Measurement Equipment	Elements applied to (Emission sources, tanks)	Technical Description (age, specification, maintenance intervals)
Name of manufacture, Type (sounding tape, flowmeter, CO_2 sensor), Model	Main engine	Date of Installation, Reference to manufacture specifications, Calibration and interval standards used, maintenance intervals.

Table C.2.5. Procedures for recording, retrieving, transmitting and storing information regarding measurements

Shipping companies shall describe the whole process of how data information related to fuel is recorded, retrieved, transmitted and stored before it is reported into the annual emission report. Data flow diagrams and task lists are proven and helpful tools to understand the procedure, and should be provided unless similar information can be provided in a different way.

[142] Annex I of the MRV Maritime Regulation, Part C, point 1.4: "… *the company shall ensure that all relevant measuring equipment is calibrated, adjusted and checked at regular intervals including prior to use, and checked against measurement standards traceable to international measurement standards, where available, and proportionate to the risks identified.*
Where components of the measuring systems cannot be calibrated, the company shall identify those components in the monitoring plan and propose alternative control activities.
When the equipment is found not to comply with the performance requirements, the company shall promptly take necessary corrective action."

Example

Recording and retrieving: The Chief Engineer responsible for recording fuel measurements performs manually daily tank soundings (always as near as possible to xxx o'clock). Chief Engineer then informs the Master who is responsible for retrieving these values and entering them into the X system in order to be transmitted to shore.

Transmitting and Storing: The exchange of information or "transmitting" regarding fuel measurements for all greenhouse gas emissions sources installed on board, is governed by internal procedure (reference) sets clearly the steps which need to be followed: four types of reports (arrival, departure, noon and port) are sent from the Master through the system X to the Technical and Operations departments on shore each with specific values on the fuel consumed per greenhouse gas emission source at specific time intervals.

Table C.2.6. Method for determination of density of fuels

In the case where the amount of fuel bunkered or the amount of fuel remaining in the tanks is determined in units of volume or is measured through a volume flow meter, the company should convert that amount from volume to mass by using actual density values by using one of the following options:

(a) on-board measurement systems;

(b) the density measured by the fuel supplier at fuel bunkering and recorded on the fuel invoice or BDN;

(c) the density measured in a test analysis conducted in an accredited fuel test laboratory, where available.

Example

Further information along with the usage of standard default values temperature correction have been provided in section 8.3 of this document.

Table C.2.7. Level of uncertainty associated with fuel monitoring

Fuel quantity determination is inherently subject to uncertainty. Point (f)(iv) of Article 6(3) of the MRV Maritime Regulation specifies that companies should develop a procedure to ensure the total uncertainty of fuel measurements is consistent with the requirements of the MRV Maritime Regulation. In order to limit administrative burden, the use of default values for the level of uncertainty associated with fuel monitoring may be considered, unless the shipping company has more detailed information available. Companies are encouraged to use actual uncertainty values in their procedures and in the monitoring plan. The purpose of knowing the uncertainty associated with emissions monitoring is to improve data quality over time, in particular when selecting the most appropriate monitoring method, and when measurement instruments need to be replaced.

For applicable default uncertainty values see section 4.10 of this document.

Table C.2.8. Procedures for ensuring quality assurance of measuring equipment

Companies should describe in the Monitoring Plan the procedures with regards the effective functioning of relevant measuring equipment (calibration; malfunctions, repairs; accuracy, determining reference figures and comparative measurements). Measuring equipment manuals, technical datasheets, certificates can be used as a reference. Often companies include this procedure within the Planned Maintenance System. Forms include but not limited to: Calibration status report or instrument calibration record.

Moreover, training and familiarization of personnel with the measuring equipment can also be included in the procedure.

Example (in case of manual sounding)

Before performing a sounding, the Chief Engineer or the crew member assigned by the Chief Engineer to perform the sounding, should make sure that: The sounding tape to be used is of sufficient length for the height of the tank to be gauged. The sounding tape is graduated in feet, inches, and fractions of an inch; feet and hundredths of a foot; or meters, centimetres, and millimetres. Markings are visible. The sounding tape is not kinked or spliced. In case any of the above does not hold, then the sounding tape should be discarded and a sounding tape fulfilling the criteria above should be used.

Example (in case of flow meters)

The quality of measuring equipment is supported by the fact that company performs maintenance and calibration of flow meters according to the manufacturer's specifications and if not feasible by the operating experience. This is outlined in the company's Planned Maintenance System (PMS) which describes clearly the procedure and the roles of doing so. Additionally the technical department checks periodically the output of the flowmeter to ensure that works properly.

If a flow meter malfunctions, then the chief engineer informs the technical department and all the necessary steps are followed to immediately replace it.

Table C.2.9. Method for determining the split of fuel consumption into freight and passenger part (for ro-pax ships only)

Companies should describe in the Monitoring Plan the procedures applied to allocate the amount of fuel consumption and respective greenhouse gas emissions to freight and passenger according to the EN 16258 by selecting either 'Mass method' or 'Area method'.

Table C.2.10. Procedures for determining and recording the fuel consumption on laden voyages (voluntary monitoring)

Companies should describe in the Monitoring Plan the relevant procedures with a view to assist on a better understanding of the average energy efficiency indicators; specifically, by removing the ballast - no cargo - transported voyages, an alternative 'laden' average energy efficiency indicator could be derived, either using distance travelled or transport work (distance travelled and cargo carried) solely in relation to the laden voyages.

Table C.2.11. Procedures for determining and recording the fuel consumption for cargo heating (voluntary monitoring for chemical tankers)

Companies should describe in the Monitoring Plan the above procedures with a view to assist on a better understanding of the average energy efficiency indicators; specifically, by removing the amount of fuel consumed for heating cargo purposes, an alternative average energy efficiency indicator could be derived. This information could potentially serve the purpose of comparing the average energy efficiency indicators of two ships within the same category (type & size), as heated cargoes lead to an increase in the total fuel consumed.

Table C.2.12. Procedures for determining and recording the fuel consumption for dynamic positioning (voluntary monitoring for oil tankers and 'other ship types'):

Companies should describe in the Monitoring Plan the above procedures with a view to assist on a better understanding of the average energy efficiency indicators; specifically, by removing the amount of fuel consumed for dynamic positioning purposes, an alternative average energy efficiency indicator

could be derived. This information could potentially serve the purpose of comparing the average energy efficiency indicators of two ships within the same category (type & size), as dynamic positioning leads to an increase in the total fuel consumed.

Table C.3. List of voyages

Companies should provide details about the systems, procedures and responsibilities used to ensure the completeness of the list of voyages over the reporting period. The Table should provide a description of the procedure in place to keep an updated detailed list of voyages during the reporting period which are carried out under EU MRV scope, including the necessary information for the application of the methodology foreseen for the determination of emissions within ETS scope[143]. The procedures in place should ensure completeness and non-duplication of data.

Data flow procedures of recording, monitoring and reporting voyages along with the IT system diagram (if any) may be used.

Example

The recording of all voyages is done through the noon, arrival, departure and port reports which are reviewed by the Operations Department. This information is processed through system X, which maintains information for all in scope voyages. The filtering of EU MRV voyages as well as voyages falling under the EU ETS (either with 50% or 100% of their emissions), including of those benefitting from exemptions from surrendering obligations, is done through system X as per EU voyage definition.

Table C.4. Distance travelled

As explained in section 5.1.1 of this document, distance travelled is determined as distance over ground. Should the vessel be adrift (i.e. while waiting for a berth) the distance should be included as the vessel is underway.

Example

The distance travelled may be calculated by the two Electronic Chart Display and Information System (ECDIS) which are installed on board per vessel and connected with the two GPS apparatus. The Master reports distance travelled through the daily messages (departure/ noon/arrival) and records distance travel on the Log Book.

Table C.5. Amount of cargo carried & Number of passengers

Companies have to explain here how the amount of cargo carried will be compiled and calculated. Cargo carried can be recorded and retrieved in different ways. The method to be used actually has to be described in the monitoring plan. Companies will be asked to provide details about the procedures, responsibilities and data sources for determining and recording the cargo carried.

The monitoring plan should also use the units for determining 'cargo carried' as specified in Commission Implementing Regulation (EU) 2016/1928.

Example (for a Tanker ship)

Before loading, the Chief Officer performs ullage measurements using portable instruments (which are certified and annually inspected). A second ullage measurement is performed again upon completion of loading.

[143] As detailed in Part C to Annex II of the Maritime MRV Regulation.

Ullage measurements on all cargo tanks are converted from volume to mass of cargo through utilisation of density. Cargo calculation reports are then cross-checked by the Captain with the Bill of Lading (B/L).

Loading takes place always at the presence of a Cargo Surveyor (who can be from the supplier's side when loading or buyer's side when unloading).

As a control, for every loading or unloading operations of more than 50 tonnes, a second measurement shall be obtained from electronic cargo tank soundings conducted by the Chief Officer before and after loading. Further cross-check is performed between cargo tank electronic readings and ullage measurements.

Table C.6. Time spent at sea

Determining and recording the time spent at sea from the arrival at the first berth and the departure of the last berth in a port, as explained in section 5.1.1 of this document.

Anchorage is excluded from time spent at sea.

Example

The Master reports the time as per the GPS indications (or the Master Clock(s) / local time zone or GMT) in the Deck Log Book and in the Daily Noon Reports, Arrival and Departure. Time spent at sea is calculated at the end of each voyage and recorded in the voyage documents.

7.4.4 Part D Data gaps

The risk of the occurrence of data gaps should be minimized by developing an appropriate monitoring plan. The risk should be further reduced by carrying out a dedicated risk assessment and design of appropriate control activities and procedures (see section 6.2 of this document). However, it is not possible to completely exclude events that require the closure of a data gap.

There are several reasons for data gaps or estimations in order to deliver data to be used in the emissions report. It can be distinguished between events that require the closure of a data gap and those that require the correction of existing data. Corrections can be made by using secondary data. In contrast to this, estimations have to be used for real data gaps, i.e. when no information by the applied monitoring approach, either the primary one or the alternative one listed in the monitoring plan, is available. Estimation methods should be applied with the aim to determine conservative surrogate data, limited to a specific period of time/event and to the relevant parameter[144].

Companies will be asked to provide a description of the method to treat data gaps regarding the parameters other than fuel consumption (i.e. list of voyages, distance, total time spent at sea, cargo carried, number of passengers) as well as control activities to prevent missing data.

This may be the case if information is missing, lost or found corrupt. It should include a back-up solution for each parameter and a formula/description of the calculation.

For example, assume that a flow meter did not output values for 1 day. The Chief Engineer is responsible for noticing this data gap and applying the back-up monitoring method e.g. tank sounding. The Chief Engineer should report the failure promptly to the managing office. If for any other reason, the Chief Engineer cannot close or detect this data gap, then the shore side is responsible for closing it, by applying formulae, historic data etc.

[144] In accordance with the MRV Maritime Regulation, when estimation methods are implemented, the shipping company shall take all necessary measures to achieve a prompt application of the monitoring plan. The occurred situation should therefore quickly addressed, by (a) closing the data gap, and (b) improving the MP so that in the future that same data gap does not occur again (or, in such an event, make sure that the revised MP contains a clearly defined method for closing the gap).

Table D.1. Methods to be used to estimate greenhouse gas emissions and fuel consumption

For closing data gaps regarding greenhouse gas emissions and fuel consumption, shipping companies can select one of the four methods (A, B, C, D) not used as the main monitoring method, and describe how that is applied to estimate fuel consumption in case of a data gap[145].

Example using Method A

In the event of a data gap due to unexpected conditions, the performance manager (shore) communicates its existence to the Chief Engineer who fills the gap once arrival established using the average of the Remain On Board (ROB) difference between arrival and departure ROBs. He then records the value as an error to the engine log book and communicates this to the Performance Manager (shore).

Example using Method B

When the related data is missing, the Chief Engineer requests to perform as soon as possible tank sounding in order to close the gap. In the case where the missing data is not immediately identified then the responsible Superintendent closes the gap manually by using the average fuel consumption of the previous and the next day.

Table D.2. Methods to be used to treat data gaps regarding distance travelled

Example

In the event of a data gap related to distance travelled, while using an automated/electronic chart navigation system, the master can fill the gap by means of back-up methods such as terrestrial or celestial navigation being documented in the Deck Log Book.

Table D.3. Methods to be used to treat data gaps regarding cargo carried

Example (bulk carrier)

In the event of a cargo related document been lost and therefore the occurrence of a data gap, then the Master can report values from other cargo related documents such as Bill of Lading, Mate Receipt or Statement of Facts.

If the total transported cargo cannot be ascertained otherwise, the draft readings may be used to estimate it. From the drafts, the total displacement of the ship is calculated (based on the hydrostatic properties included in the stability booklet or loading computer). By subtracting the Light Weight of the ship, the content in all tanks, as well as consumables, provisions, spares and Crew, the Cargo can be derived.

Table D.4. Methods to be used to treat data gaps regarding time spent at sea

Example

In the event of a data gap related to time spent at sea, the responsible Operator must immediately communicate with the Master and raise the existence of it and close it using the data from the Statement of Facts documents.

[145] The method to be applied to treat data gaps should be based on one of the four monitoring methods allowed under the MRV Maritime Regulation. Where the shipping company finds that the method it plans to apply for the treatment of data gaps does not match any of the four methods (A, B, C, D), then the selection 'Not Applicable' is also possible, in which case the shipping company should still describe in the dedicated field of Table D.1 the estimation method it plans to apply.

The data gap can be filled by using the average of the time difference in hours between Arrival and Departure excluding anchoring.

7.4.5 Part E Management

Table E.1. Regular check of the adequacy of the Monitoring Plan

Companies shall check regularly, and at least annually, whether a ship's monitoring plan reflects the nature and functioning of the ship and whether the monitoring methodology can be improved.

The company should provide a description of the procedure in place to regularly evaluate whether the monitoring plan remains adequate or whether a revision is needed.

The procedure should cover at least: checking the list of emissions sources ensuring that monitoring remains complete and that any relevant change in the nature and functioning of the ship is taken into due account; assessing compliance with the uncertainty values as identified in the monitoring plan; evaluating potential measures for improvement of the applied monitoring methodology.

Example

The HSQE manager includes the Monitoring Plan in the official company procedures being subject to review and/or updates through the Management of Change procedure. This should be done at least annually and on a when needed basis, for example when new flow meters are installed, new procedures are in place or roles and responsibilities are amended, and in general changes which can affect the Monitoring Plan of a vessel.

Table E.2. Procedures for data flow activities[146]

The procedures should provide a clear picture of how data about fuel consumption, transport work and other relevant information is collected from various sources and aggregated for the emission report in accordance with the requirement of the MRV Maritime Regulation.

Data flow procedures can be described in writing in different forms. For simple data flows, a short description may be sufficient, while in complex cases a data flow diagram may be necessary. Examples for data flow activities include reading from instruments, sending samples to the laboratory and receiving the results, aggregating data, calculating the emissions from various parameters, and storing all relevant information for later use.

Where a number of procedures are used, the company should furthermore provide the details of an overarching procedure which covers the main steps of data flow activities along with a diagram showing how the data management procedures link together.

Example

The shipping company provides a brief description of the overarching procedure for MRV data flow management in the form of a task list: 1. Check on a weekly basis if the necessary data is available and complete; 2. Perform calculation; 3. Store results for finalising annual emissions report and verification activities. The procedure further list primary data sources (e.g. mass of fuel consumption, emission factors), further data processing steps, persons responsible for the procedure, and IT system used.

[146] See also section 6.2 of this guidance document for further details on data flow activities.

Table E.3. Procedures for risk assessment

The procedure contained in the monitoring plan should describe how the assessments of inherent risks and control risks are undertaken when establishing an effective control system, as contained in the risk assessment required under Part C of Annex I to the Regulation[147].

Example

The company lists the different steps followed in performing the risk assessment, the impact levels, the probability of occurrence considered for each incident.

Table E.4. Control activities: Quality assurance and reliability of information technology

In case of an internal IT system used, the shipping company must ensure that the relevant systems are designed, documented, tested, implemented, controlled and maintained in a way that ensures processing reliable, accurate and timely data in accordance with the risks identified in accordance with the procedure described in Table E.3. In particular, shipping companies should describe the back-up procedure in place (i.e. how often are backups taken? Are they tested? Where are they stored? Who has access to those backups? etc.), the user access management procedure (i.e. who is responsible for granting privileges, are the super privileges reviewed? Password policy etc.), the change management procedure (i.e. how requests / issues are reviewed, tracked, are there any user acceptance tests performed?) as well as the logging & monitoring procedure admin action. The company should further ensure that the IT system's data processing steps are documented in a transparent way and provide the verifiers with the possibility to test the integrity of the data and the data processing steps.

Example

- **Function tests**: Within a week after a new version of the process control software has been installed, the Chief Engineer performs a test for appropriate functioning, e.g. by entering test data from the previous month and comparing results with actual data obtained in the previous software version.
- **Backup to servers** will occur every day after regular business hours. Full backup includes all the primary files. Only one full backup will be done once a week. Incremental Backups includes only files that have changed since the last full backup. The next time an incremental backup is done, this file is skipped (unless it is modified again).
- **Access control**: Only software that logs access to core data is applied. The passwords are assigned by the IT department of the shipping company by applying procedure 123/2024.

Table E.5. Control activities: Internal reviews and validation of data relevant to Regulation (EU) 2015/757

Companies should have a procedure which ensures quality of information before submitting the respective reports to verifiers. The procedure should lay down checks to be performed within the shipping company, but to the extent feasible by independent persons not involved in the primary data collection. Minimum review checks may include: data completeness check; trend analysis (relative comparison of data over several years), comparison of fuel consumption reported with purchase records, criteria for rejecting data, etc.

[147] Companies are required to regularly update the risk assessment, submit it to the verifier and make it available to the Administering Authority upon request. Since the obligation to establish the risk assessment in full may be complied with outside of the monitoring plan, this table may contain a brief description of the procedure together with the reference to the full procedure.

Example

For example, this procedure will formalise all actions conducted by the Operations Department with regards to the checks and the reviews applied to measurements related to fuel, time, distance and cargo.

Cargo: The reported cargo values are observed so as to make sure that the number is not bigger than the DWT nominal value. If discrepancies are found, communication with the vessel is established.

Distance: Distances are validated by the Operations Department with the geographical shape and previous similar voyages. Noon reports and reported distances are checked on a monthly basis and validated. In rare cases where a big deviation is found, communication is established with the vessel directly.

Time: The Operations Department performs cross-checks between the sum of steaming hours + non steaming hours + off hire/lay off hours versus the difference (in hours) between dates from berth to berth. If a difference higher than 10 hours is identified, communication is established with the vessel directly and it is included as an error in the Logbook.

Fuel consumption: The Operations Department performs periodical consistency checks between the total amount and type of fuel purchased and bunkered (via BDNs), the fuel consumed (monitored & reported) together with the respective tanks (storage & service) stock-takes. This cross-check could be carried out on a single voyage basis or within a series of voyages over a given reporting period.

Table E.6.Control activities: Corrections and corrective actions

To establish a systematic and controlled way of reporting and reviewing any non-conformity identified within the Company or on board the vessels, and of deciding and following-up on corrections and corrective actions.

Non-conformity is an observed situation where the objective evidence indicates the non-fulfilment of a specific requirement. Such requirements are MRV related procedures, control and MRV management system performance.

The procedure to be described should include: (1) how an MRV non-conformity is reported, (2) Review of a non-conformity, (3) how to implement the corrective action and (4) how corrective actions are followed-up.

Table E.7.Control activities: Outsourced activities (if applicable)

A procedure for deciding how to outsource to a third party a service related to the shipping company's MRV management system, and for ensuring quality of outputs.

The procedure should describe how the decision to outsource an activity related to MRV is taken, and how quality in delivered results is ensured. The Company should develop a Supplier Performance Rating system and a series of criteria (e.g. level of confidence, response and time availability etc.) based upon which the quality of the services received by the third party is assessed at periodic intervals depending on the length of the outsourced service.

Table E.8.Control activities: Documentation

All companies which are ISM certified do have in place such a procedure for the relevant documentation. The procedure should further be extended to include all MRV relevant documents and data, specifying the process of document and data retention, including how the data is stored so that any relevant information is made readily available upon request of the Administering Authority or the verifier.

A version management system for relevant documentation should be established, so that users can easily identify the versions in force of relevant documents and track revision history.

All records should be kept in specific files both on board and in the office and be legible, readily identifiable and retrievable. Records should be stored and retained in such a manner as to avoid deterioration or damage.

Example

The Company's filing system is divided in the filing system of each department (i.e. Operations Department, Technical Department and HSQE Department). Each Department is responsible to maintain all hard copies in the floor it is located for at least 5 years after the date of issue. Document of compliance should be kept for at least 18 months.

The filing system on board each ship is divided in the systems of the Master, Chief Engineer, Chief Officer and bridge. All records are retained for at least 5 years after the date of issue. Copies of information not contained in THETIS-MRV are kept for 10 years at the office of the shipping company.

7.4.6 Part F Further Information

Table F.1.List of definitions and abbreviations

Companies should list any (individual) abbreviations, acronyms or definitions that they have used in completing this monitoring plan (e.g. PMS: Plant Management System, SMS: ship Management system etc.).

Table F.2.Additional information

In this chapter companies may enter any additional information on the MRV matter that they consider relevant for their ship and relevant management procedures (e.g. Data flow diagrams, tasks lists, organizational diagram etc.).

8 ANNEX II – FURTHER GUIDANCE ON DETERMINATION OF RELEVANT PARAMETERS

8.1 Determination of technical efficiency

According to Article 11(3) and 21(2) of the MRV Maritime Regulation and to part A, point 9 of the template for emissions reports[148], the technical efficiency of a ship is to be reported by using the Energy Efficiency Design Index (EEDI), the Energy Efficiency Existing Ship Index (EEXI), or the Estimated Index Value (EIV). This section provides to companies and verifiers best practices on how to derive the technical efficiency of the ship if the EEDI or the EEXI are not applicable.

8.1.1 Background and Scope

The attained EEDI and EEXI are to be reported where required by and in accordance with MARPOL Annex VI, Regulations 22 and 23.

Only for ships not covered by the EEDI or the EEXI, the Estimated Index Value (EIV) has to be reported for ship types as listed in:

(d) MEPC.231(65), paragraph 3: bulk carrier, gas carrier, tanker, containership, general cargo ship, refrigerated cargo carrier, combination carrier, ro-ro cargo ship, ro-ro cargo ship (vehicle), ro-ro passenger ship and LNG carrier.

(e) MEPC.233(65), paragraph 5: cruise passenger ships having non-conventional propulsion, including diesel-electric propulsion, turbine propulsion, and hybrid propulsion systems.

For the ship types which are not covered by the above guidelines, it is not required to report EIV, to be reported as "Not applicable".

Companies are encouraged to report voluntary EEDI or EEXI values[149], if available, instead of the EIV.

It is to be noted that EIV figures for determining ship type dependent reference lines within the EEDI framework have been calculated for a certain build period and have been fixed for this purpose.

The following section provides the calculation methodology and on how it could/may be applied to accommodate the legal reporting requirements on MRV.

8.1.2 Calculation of EIV

To specify the calculation method for the EIV in the context of the MRV Maritime Regulation, Commission Implementing Regulation (EU) 2023/2449 refers to IMO Resolution MEPC.215(63). This Resolution has been replaced by MEPC.231(65) – Guidelines for calculation of reference lines for use with the Energy Efficiency Design Index (EEDI) and more recently supplemented by MEPC.233(65). The calculation of the EIV is described in paragraphs 13 - 19 and 8 - 9, respectively:

The formula for calculating the EIV value for each ship (excluding containerships and ro-ro cargo ships (vehicle carrier), ro-ro cargo ships, ro-ro passenger ships and LNG carriers) is as follows:

[148] In accordance with Annex II to Implementing Regulation (EU) 2023/2449.

[149] Certified independently by e.g. classification societies

$$Estimated\ \ Index\ Value = 3.1144 \cdot \frac{190 \cdot \sum_{i=1}^{NME} P_{MEi} + 215 \cdot P_{AE}}{Capacity \cdot V_{ref}}$$

Specific formulae (and input parameters - $P_{ME(i)}$ and P_{AE}) for containerships and vehicle carriers[150], ro-ro cargo ships, ro-ro passenger ships and LNG carriers are provided in MEPC.231(65).

For cruise passenger ships having non-conventional propulsion same information is provided in MEPC.233(65), remaining input parameters other than Capacity and V_{ref} are provided in MEPC.1/Circ. 866.

Data should be taken from available documents. If available, the reference speed can be obtained from the power-speed curves produced following sea trials at the time of delivery. These curves were submitted by the yard to the shipping company and they constitute an important document for the ship. Alternatively, data can potentially be obtained for vessels equipped with hull & fuel performance monitoring systems.

If no other values are available, the IHSF database should be used for EIV input parameters.

The importance of consistency of data sets for the three parameters P_{ME}, Capacity and V_{ref} has to be underlined.

8.1.3 Verification

Verification of the reported technical efficiency should focus on the correct use of attained EEDI and EEXI values or on the correct calculation of EIV values including plausibility checks of input values.

In case of no changes in EIV values compared to previous emissions report for a ship, results of verification of previous emissions reports should be considered by the verifiers to avoid repetition of verification activities.

8.2 Monitoring methods for ships using the exemption from per-voyage monitoring

In case of application of Article 9(2) of the MRV Maritime Regulation, following monitoring methods should be used:

Determination of **distance travelled** and **time spent at sea:**

- Use of standard distance considering routing elements such as avoiding shallow waters or an ECA transit
- Annual distance travelled: multiplying the distance travelled with the number of annual voyages (calculation per standard route and subsequent aggregation)
- Time spent at sea: use of scheduled time between scheduled port departure and scheduled port arrival
- Annual time spent at sea: multiplying the scheduled travel time with the number of annual voyages (calculation per standard route and subsequent aggregation)

Determination of **cargo carried** and **transport work**:

[150] Vehicle carrier is a sub-type of ro-ro cargo ships

- Deviation from per-voyage monitoring possible in case of single standard routes (cargo and distance to be multiplied to calculate transport work)
- Use of commercial documents with aggregated cargo figures (either total annual or per standard route)

Determination of **fuel consumption** and **greenhouse gas emissions**:

- Fuel monitoring and recording should be carried out at the beginning of the monitoring period and at the end of the monitoring period for each fuel type and/or each storage tank and upon bunkering and de-bunkering.
- Companies may follow more frequent intervals according to their internal procedures.
- Fuel consumption (and subsequently greenhouse gas emissions) in ports may be calculated by multiplying the estimated hourly consumption while the ship is at berth with the average time spent at berth and the number of annual voyages.

Note: Unless all the performed voyages are of the exact same length, the need of having a parcel calculation (per-voyage monitoring derived) to obtain the annual reporting value will still remain.

8.3 Determination of fuel consumption and greenhouse gas emissions

8.3.1 Fuel oil consumption

This section provides best practices for onboard monitoring of fuel oil and recording of data for the purpose of monitoring of fuel consumption required by the MRV Maritime Regulation.

8.3.1.1 Responsibilities

The Master has ultimate responsibility for the monitoring of ship's bunker consumption and for reporting the data to the office as set by the company's procedures.

The Chief Engineer is responsible for the overall bunker operations, including the verification of bunker received, the sounding of the bunker tanks and calculation of the exact quantity of bunkers onboard.

8.3.1.2 A generic fuel oil system inboard

Figure 7 shows a generic ships fuel oil system.

The diagram indicates that fuel oil onboard undergoes several process steps before being used. Own process steps are e.g.: bunkering, storage, heating, settling, cleaning (centrifuging) and in-between several transfers take place.

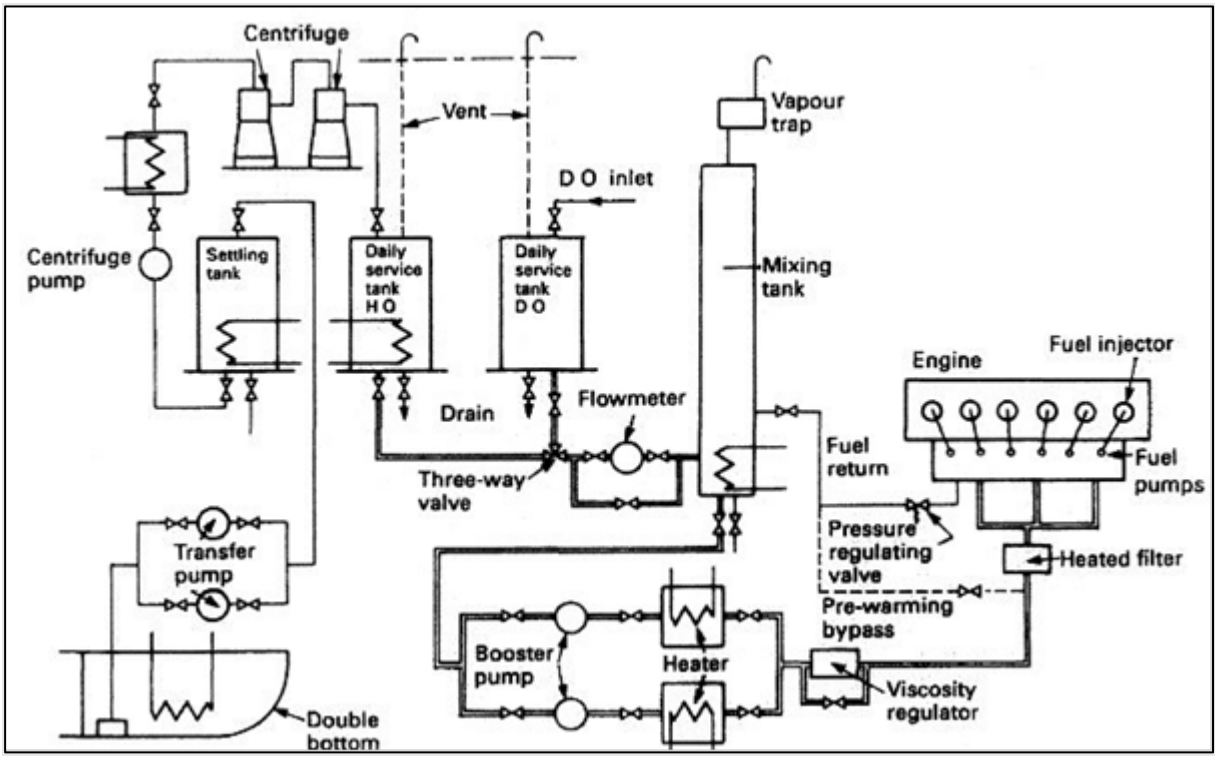

Figure 7: Generic ship fuel oil system; source: https://www.machineryspaces.com/

8.3.1.3 Tanks sounding fuel oil measurement and Monitoring

This is a generic guidance for fuel oil measurement through manual sounding/ ullage measurements. Depending on the situation onboard, it should be taken into account that not all ships may need to follow each step and the frequency of measurements provided below.

Fuel consumption "within port" and "at sea"

For clarification, the fuel consumption "within port" is the total amount of fuel from the time the ship arrives at first berth of a port and up to the time the ship leaves the last berth of the port where commercial cargo operations or embarkation/disembarkation of passenger took place. In other words, fuel consumption ''within port'' is to be meant as fuel consumption within the port of call, according to its definition in the MRV Maritime Regulation.

For example: a chemical tanker's "within port" fuel consumption should include the total of the fuel consumed after the ship is securely moored at the first berth of a port including: fuel used for cargo operations to that berth and any other berth of the same port, fuel consumption used by the ship to move from one berth to another berth and fuel consumption used by the ship for moving out to sea for cargo tank cleaning and return to a berth of the same port[151].

The total fuel consumed "within port" results from the difference between the fuel measured on board when the ship arrives at the first berth of a port and the fuel measured on board when the ship leaves

[151] For further details on the segregation between fuel consumption ''within port, at berth'' and ''movements within port'' please see section 4.1.1 of this document.

the last berth of the port (eventual fuel bunkered during the stay in the port is not accounted for in this measurement).

All other fuel consumption except the above should be considered as “at sea”.

Frequency

The frequency of fuel tanks’ stock takings through soundings / ullages should occur:

8. For fuel monitoring method A[152]:
   - Upon bunkering and de-bunkering
   - Upon arrival to the first berth of a port[153] and before leaving the last berth of the port where commercial cargo operations or embarkation/ disembarkation of passengers took place[154] prior to engaging on a voyage for a port outside the scope of the Regulation.
   - For ships in short and regular trades and for ships using shore power while at berth the measurements may take place either upon arrival at the first berth or before leaving the last berth.[2]
   - Allocation of all fuel consumption (for each fuel type) not under the scope of the regulation is needed as the sum is to be subtracted from the amount provided in the Bunker Delivery Note (BDN)
9. For fuel monitoring method B[155]:
   - Upon bunkering and de-bunkering
   - Fuel tank readings for all bunker tanks onboard should occur daily when the ship is at sea[156]. These could be on a daily basis at 12:00 noon time, the start/end of a canal crossing, a voyage interruption, etc.
   - While at sea passage prior entry and exit of a Sulphur Emission Control Area (SECA), if there is a fuel switch.
   - Tank readings should also occur at the start and end of the time spent within a port of call[157].

Calculating the volume of bunker in each tank

The ship specific sounding/calibration tables produced by shipyard for each individual bunker tank should be used to determine the volume of bunker in each tank taking into account the trim and list of the vessel.

ASTM D 1250-80 Standard Guide for Petroleum Measurement, table 54B, or equivalent tables or a substantiated software for temperature and atmospheric pressure corrections of density and mass calculations should be used.

The software could additionally be supported by dedicated ship specific software for trim, list and temperature corrections is available on board.

[152] Annex I, Although Method A is based on fuel data from BDN, ships need to measure fuel in tanks to make the balance at the end of the voyage or the end of the monitoring period.

[153] Under the scope of the Regulation.

[154] This may be applicable for fuel monitoring method B as well.

[155] Annex I, B Methods for Determining GHG Emissions, (b) Bunker fuel tank monitoring on board

[156] Fuel tank readings from tanks that have no transfer nor consumption can be omitted.

[157] This could imply more than one tank reading within the same day, depending on the length of the port stay.

Density

Density values to be used could be one of the following:

- on-board measurement systems;
- the density measured by the fuel supplier at fuel bunkering and recorded on BDN;
- the density measured in a test analysis conducted in an accredited fuel test laboratory, where available.

The source of density values should be stated at all times. However, the fuel oil volumes recorded onboard after each monitoring may always be related to the standard temperature of 15°C [158].

To cater for most practical handling onboard with the density issue – as an alternative to above- volume to mass conversion – may be done using standard conversion factors. The company may use bespoke conversion factors for the entire reporting period subject to criteria for establishing these have met the agreement of the verifier. The company may also use the following standard conversion factors:

- 0,96 when using RME180, RMG 180/380/500/700 or RMK 380/500/700
- 0,88 when using MGO/MDO

These standard conversion factors derive from ISO 8217 Fuel Standard figures after having been corrected with ASTM D1250 density temperature variation tables (using 60˚C - 80˚C for IFO/HFO and 40˚C for MDO/MGO) and apply regardless of whether the volume measurements are made in the bunker tanks or at a volume flowmeter placed between the service tank and the engine inlet.

Density for commingled bunkers

When there are 2 types of fuels (or more) are mixed and stored in one fuel tank then the density volume to mass conversion factor of the fuel tank of the mixed oil should be calculated as per the below mentioned formula:

$$\frac{\text{`A` fuel volume x Density (A)} + \text{`B` fuel volume x Density (B)}}{\text{`A` fuel volume} + \text{`B` fuel volume}} = \text{mixed fuel Density}$$

Density for blended fuels

In the rare event that fuel types with different densities are blended in a tank, the weighted average density should be determined, unless a density analysis of the mixed fuel sample is available.

$$\rho_w = \rho_{add} \times \frac{m_{add}}{m_{total}} + \rho_{exist} \times \frac{m_{exist}}{m_{total}}$$

Where:

ρ_w is the weighted average density of fuel in the tank after additions [t/m^3]

ρ_{add} is the density of the fuel added to the tank [t/m^3]

m_{add} is the amount of fuel added to the tank [t]

m_{total} is the total amount of fuel in the tank after addition [t]

ρ_{exist} is the density of the existing fuel in the tank before addition [t/m^3]

m_{exist} is the existing amount of fuel in the tank before addition [t]

[158] Reference is made to: ISO 8217; Specifications of Marine Fuels

Gauging equipment

In general, there are several methods of gauging fuel tanks, e.g., manual soundings, gauges with audible noise when an oil interface is reached, pressure transducers, radar and so forth; each ship will adapt this part for description according to the equipment they use.

As back-up for fixed installed tank sounding/ gauging equipment, the method of determination of a tank's sounding or ullage is suggested to be manual soundings. The tape or measuring device is to be graduated in feet, inches and fractions of an inch; or meters, centimetres, and millimetres.

Tapes which have been kinked or spliced or which contain illegible markings should not be used.

Gauging criteria

Vessel's equipment used for gauging should always be substantiated for accuracies. This should be done by:

- Checking the condition and calibration (if applicable) of the instrumentation used for gauging the quantity of bunkers on board;
- Recording the calibration certification (if applicable);
- Visual inspection of ullage tape to ensure there has been no damage to the tape and/or whether any repairs have been made that may alter readings.

Repeated measurements are taken for each tank to obtain at least two consistent readings. If two measurements are not similar then an average reading based on at least three measurements is recommended to do.

8.3.1.4 Continuous fuel oil monitoring

This procedure is for ships using flowmeters on consumers (e.g. main engines, auxiliary diesels, inert gas generators, boilers, etc.).

The data from all flow meters linked to fuel consumers minus the data from all flow meters at the return lines from the same consumers (if applicable) should be combined to determine fuel consumption over a period[159].

Regardless if the fuel measurements are automatically recorded and transmitted, it is a good practice for ships engaged in long voyages when at sea to record daily measurements in the Engine Logbook. Depending on type of ship operation the master, chief engineer or the operator may follow other practice as per company SMS.

The validity of fuel flowmeters should be compared on a periodic basis through comparison with the fuel figures that derive from flowmeters and tank soundings. The ship operator's PMS should provide guidance on comparison frequency.

To ensure proper readings, fuel flowmeters onboard should be calibrated as per maker's recommendations or based on the ship's operational experience if flow meter is maintaining operational accuracy within manufactures suggested tolerances. Any records of manufacturer calibration should be maintained onboard and captured within the PMS onboard.

[159] The need for a fuel meter in the return line may not be necessary depending on the arrangements, e.g. on where in the system the supply meter is fitted.

In the event that a fuel measurement cannot be made due to failure of a flow metering device the daily fuel consumption should be determined by utilising the tank soundings method[160].

Volume flowmeter

The amount of fuel consumed is determined in units of volume, expressed in litres, and it is converted to mass by using the density values corrected for the applicable temperature by the use of the formula below:

$M = \rho \times V$

Where:

M: mass of fuel (*kg*)

V: volume of fuel (*l*)

ρ: density at applicable temperature (*kg/l*).

Density values to be used should originate from BDN or provided through a fuel test analysis conducted in an accredited fuel test laboratory. Source of density values should be stated at all times.

ASTM D 1250-80 table 54B or equivalent tables or a substantiated software for temperature corrections of density should be used.

Temperature to be used for density corrections should be the fuel temperature at the flowmeters.

Mass flowmeters

The mass flow meters measures directly the mass flow rate of the fuel and eliminates the need for further mathematical calculations to derive the mass of fuel consumed.

8.3.1.5 Fuel oil monitoring and recording

This section describes the different sequences of fuel oil handling onboard. This includes that fuel oil measurements on board ships are (or can be) done for different situations and purposes. The sequence and procedures in this chapter are generic and not each of them may apply to all the different ship types and ship trades we are faced with.

Ships may develop (or have) assessment procedures for dealing with possible mistakes or omissions that could occur and lay down control measures that are to be taken by the company to minimize this risk for data gaps.

Data flow charts for every fuel oil measurement method in use would be helpful to indicate the sequence of actions step by step along with the control activities.

Bunkering

Bunkering should be covered by routine operational procedures. Therefore, in this paper a description of bunkering is not included as an own part / chapter. However, to just provide an info on what could / might be included in such descriptions, an own annex is attached for informational reasons.

[160] means inherently that this is a fall-back solutions for filling (avoiding) data gaps for Methods A), B) and/ or C)

“Noon report”

As a matter of routine but on a voluntary basis only, ships engaged on long voyages do report the total amount of fuel on board on a daily basis[161]. The report is done at noon local time where the ship is located. This measurement provides also a daily monitor of the fuel consumption. The Officer in charge makes relevant entries in the Engine Log Book.

However, ships engaged in shorter voyages may not do this reporting.

Weekly measurement

As a matter of best practice for good housekeeping but also to check and confirm proper function of mass flow meters, volumetric flow meters, ships may measure by manual tank sounding and make the balance of the fuel oil onboard on a weekly basis.

The procedure to follow was presented under section 8.3.1.3.

The Chief Engineer makes entries into the Engine Room log of the fuel oil remaining on board (ROB) and, comparing with the previous measurement results, could make the balance of the total fuel consumed during that week.

End of voyage measurement

As a matter of best practice for easy monitoring and recording of the fuel consumption for each voyage, ships do measure the fuel oil ROBs at the end of each voyage or as determined by company SMS.

The procedure is similar to the one done as presented in section 8.3.1.3.

Fuel oil monitoring in ports

A separated fuel oil monitoring / consumption analysis is required for ships in ports. Although ships may have various ways to monitor fuel consumption while in port, some ships may separately assess / calculate it using a method that with a reasonable accuracy establishes the mass of the individual fuel types consumed during the port stay(s).

8.3.1.6 Default emission factors for fuels not included in Annex I to the MRV Maritime Regulation

Annex I to the MRV Maritime Regulation includes most of the fuel types currently used and alternative fuels that are expected to appear in the market in the near future, nevertheless the annex isn’t an exhaustive list as there are emerging technologies that may appear and lead to new products.

Annex I segregates fuel types by viscosity grades instead of sulphur content. For clarity the table presented in IMO Resolution MEPC.391(81) could be used[162]:

Table 6: Emission factors for fuels not included in Annex I to the MRV Maritime Regulation

Type of fuel	Sulphur content	Reference	Emission factor (t CO_2 / t fuel)
Heavy Fuel Oil	Very low Sulphur Fuel Oil (VLSFO)	ISO 8217 Grades RME, RMG and RMK, 0.10 < S ≤ 0.50%	3,114
Heavy Fuel Oil	High Sulphur Fuel Oil (HSFO)	ISO 8217 Grades RME, RMG and RMK exceeding 0.50% S	3,114

[161] If the shipping company opts for monitoring Method B) it is required, for Method A) and C) it is a suggestion.

[162] The MRV Maritime Regulation does not require segregation of fuel types by sulphur content. Hence, irrespective of their sulphur content, the reported fuels should always be reported in accordance with one of the standard fuel types listed in Annex I.

Type of fuel	Sulphur content	Reference	Emission factor (t CO_2 / t fuel)
Light Fuel Oil	Ultra Low Sulphur Oil (ULSFO)	ISO 8217 Grades RMA, RMB and RMD maximum 0.10% S	3,151
Light Fuel Oil	Very Low Sulphur Fuel Oil (VLSFO)	ISO 8217 Grades RMA, RMB and RMD, 0.10 < S ≤ 0.50%	3,151
Marine Diesel/Gas Oil	Ultra Low Sulphur Oil (ULSFO)	ISO 8217 Grades DMX, DMA, DMZ and DMB maximum 0.10 % S	3,206
Marine Diesel/Gas Oil	Very low Sulphur Fuel Oil (VLSFO)	ISO 8217 Grades DMX, DMA, DMZ and DMB, 0.10 < S ≤ 0.50%	3,206

Annex I does not include a default value for ethane. It is recommended to use as default value the emission factor in resolution MEPC.364(79) EEDI Guidelines.

Table 7: Emission factors for ethane

Type of fuel	Emission factor (t CO_2 / t fuel)	Emission factor (t CH_4 / t fuel)	Emission factor (t N_2O / t fuel)	C_j (Slippage co-efficient)
Ethane	2,927	TBM[163]	TBM	N/A

For recycled carbon fuels, as for any future upcoming new non-fossil fuels not listed in Annex I, the shipping company should determine the emission factors in accordance with Articles 32 to 35 of the MRR.

8.3.1.7 Example for a general description of bunkering procedures

Chief Engineer or other appointed crew members[164] check **all bunker tanks** and complete the respective part of the “Bunkers Calculation” Form.

All quantities of bunkers are recorded separately.

Common practice is to plan to receive new bunker **in empty bunker tanks**. If not possible, comingling of different fuel batches may happen. In general, comingling is not favourable.

The appointed Engineer Officer has to implement the bunkering plan, supervise bunkering process and ensure that bunkering procedure is followed throughout the bunkering operations.

Relevant actions to secure correct assessment of the bunker received:

- carry out a pre-bunkering survey of the bunker barge, as per shipping company / bunker suppliers agreement, in order to determine exact quantity onboard together with the appointed Deck Officer of the watch.
- check all bunker tanks.
- witness the completion of the ullage report (for this purpose, the co-operation of bunker barge personnel should be secured)
- sign and obtain a copy of the completed ullage report;
  the copy should be attached to the Bunker Receipt Form.

[163] Refer to Annex I to the MRV Maritime Regulation for meaning and application of acronyms.
[164] or otherwise stated by company procedures

- inform Master and request approval to start receiving bunkers when both quantity i.e. own vessel and bunker barge have been completed.
- upon completion of the bunkering, the Master and the Chief Engineer should arrange for a post bunkering survey (own vessel and bunker barge) similarly as with the “pre-bunkering survey procedures’ above.
- the Chief Engineer reviews the BDN and declaration of compliance with MARPOL Annex VI, presented by the bunker barge.
- during the review, Chief Engineer compares received quality and quantity against the Company’s bunkering information i.e. ordered regarding quality and quantity.
- both the Chief Engineer and the Master should sign for acceptance the Bunker Delivery Note issued by the bunker barge only if they agree with the figures received.

Note: The ship (i.e. the chief engineer on behalf of owner) issues a Letter of Protest in the following situations, but not limited to:

- shortage of bunker delivered,
- quality issues (e.g. failure of fulfilling ISO specifications)
- slow pumping rate,
- ship’s fuel samples not signed by the supplier
- lack of co-operation from bunker barge personnel to conduct mutual ullage inspections.

Upon completion of each bunkering, the following documentation is to be submitted to ships´ operational Head Office:

10. Bunkering Report Form.
11. Bunkers Quantity Calculation Form
12. Bunkering samples registration and consumption log Form
13. Bunkering pre-loading plan Form
14. Letter of Protest, if applicable
15. Ship-Barge Safety Checklist Form or Ship-Shore Safety Checklist Form, if bunkering by barge or terminal respectively.

The Chief Engineer should also maintain copies onboard. All relevant forms and checklists are kept on board for minimum 3 years.

Officer in charge makes relevant entries in the Engine Log Book and in the Oil Record Book.

8.3.2 LNG consumption – on-board monitoring of boil off gas (BoG)

This section provides best practices to the verifier and the company for the on-onboard monitoring of boil off gas (BoG) and recording of data for the purpose of monitoring of fuel consumption required by the MRV Maritime Regulation.

8.3.2.1 Background

As required by the MRV Maritime Regulation, the company defines in the monitoring plan which monitoring method is to be used to calculate fuel consumption for each ship under its responsibility and ensure that once the method has been chosen, it is consistently applied. However, the ‘Method A’ states

that “This method shall not be used when BDN are not available on board ships, especially when cargo is used as a fuel, for example, liquefied natural gas (LNG) boil-off”[165].

Since BDN cannot be used for the BoG, it is important for the verifier and the company to ensure that BoG measurement, calculation and documentation is in accordance with in fact use and is accurate, relevant and consistent.

LNG tankers are designed to carry natural gas in liquid form at a temperature of about - 163°C, close to the vaporization temperature. Despite that tank insulation is designed to limit the admission of external heat, even a small amount of it will cause slight evaporation of the cargo. This natural evaporation, known as “natural boil-off” (NBoG) is unavoidable[166] and has to be removed from the tanks in order to control / limit the cargo tank pressure. Typical values are about 0,15%/day and below, recent projected LNG carriers are offered with a NBoR close to or even beneath 0,1%[167].

Where insufficient NBOG volumes are available for propulsion, forced vaporization of LNG can be effected or otherwise liquid fuel (HFO /MDO/MGO) can supplement the additional energy demand. The force vaporized LNG is called Forced Boil Of Gas (FBOG). The NBOG and the FBOG will be collectively called BOG in this paper.

Boil-off gas (BoG) handling systems (known as Gas Management Systems) are typically used onboard LNG carriers as a means of pressure and temperature control. BoG is sent to the engine room via gas heaters by low capacity compressors and is burned by the main boilers or nowadays by dual fuel diesel engines as fuel.

On steam turbine powered vessels, the main boilers are capable of operating under different fuel combustion modes such as exclusively BoG mode (NBoG or NBoG + FBoG), combined BoG and fuel oil mode, and exclusively fuel oil mode. Although steam turbine systems have been the main form of propulsion used onboard LNG carriers and still comprise a large percentage of the operating LNG fleet, diesel engines capable of using BoG as fuel have become a preferred solution due to their higher operating efficiencies.

LNG carriers with diesel engines are required[168] to have a “Gas Combustion Unit” onboard. This GCU acts as a secondary means of controlling the tank pressure, in particular to cater for certain conditions like bad weather causing excessive NBoG generation, the temporary inability of the engines to burn gas or at engines’ low load operation lower than what is required to consume the available NBOG for propulsion and other services or when the vessel is idle. The flow to the GCU is to be included in the amount “consumed”. In general, GCU’s are equipped with flowmeters. However, there might be other uses for the GCU which may cause conflicts, e.g. when preparing for dry-dock, contaminated BoG / inert gas mixture is disposed off in this unit.

On the Steam LNG Carriers if the required energy for propulsion and other services drops below the energy available by the BOG, the main boilers continue to consume the available BOG and the excess steam generated is dumped directly into the condenser.

The natural Boil-off rate (BoR) is the amount of liquid that is evaporating from a cargo and expressed in % of total liquid volume per unit time.

[165] Use of cargo as fuel may apply to other low flash point hydrocarbons like ethane, LPG, etc.

[166] With the exception of vessels with re-liquefaction capability

[167] It may be noted that first boil-off phases contain almost exclusively nitrogen which has no calorific value for combustion. Since nitrogen mass does not contribute to GHG emissions, shipping companies may subtract the nitrogen mass content for each laden voyage from LNG consumption in line with the procedures described in IMO 2022 Guidelines (Res. MEPC.346(78)) and IACS REC 175 Section 9.1,

[168] To fulfil the “historical 2 times 100% BoG capacity rule”

It shall be noted that the MRV Maritime Regulation requires the reporting for LNG carries has to be done as follows:

- LNG cargo carried onboard to be reported in VOLUME units
- LNG consumed onboard as fuel to be reported in MASS units

It should be noted that a number of LNG carriers are equipped with re-liquefaction systems which depending on the capacity can partially or fully re-liquefy the NBOG and send it back to the cargo tanks.

8.3.2.2 Responsibilities

Usually the Master has overall responsibility for the monitoring of ship's bunker consumption and BoG use/ consumption. This will be described in detail in company´s management procedures.

8.3.2.3 A generic BoG handling system onboard LNG vessels

The following diagram shows a generic ships BoG fuel oil system.

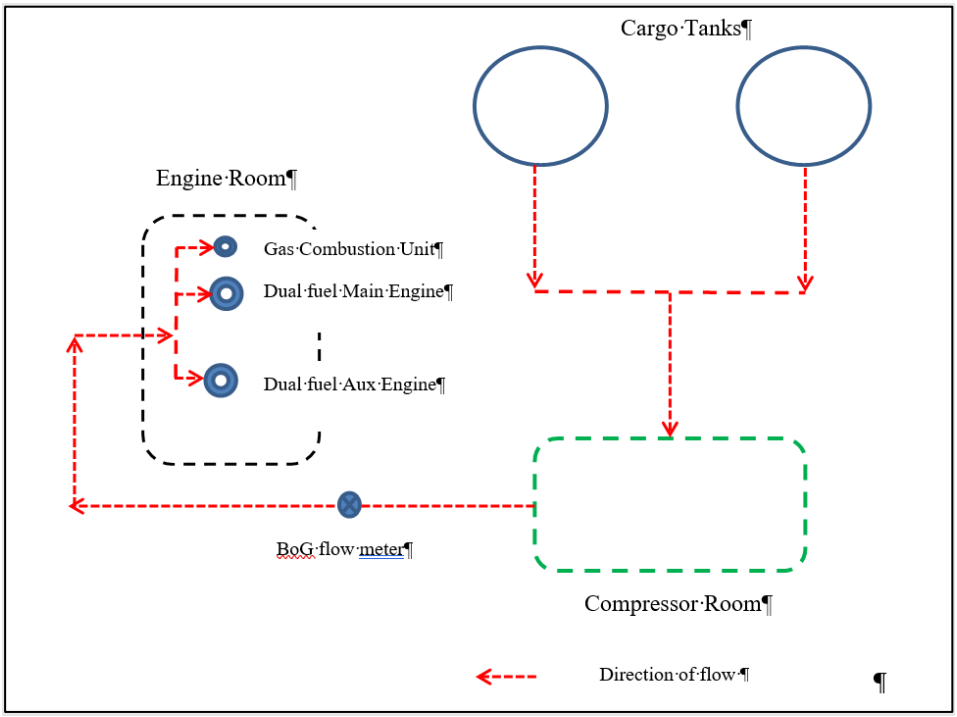

Figure 8: A generic ships BoG fuel oil system

8.3.2.4 BoG measurement and monitoring

The BoG can be measured by calculating the total LNG consumed for a voyage by custody transfer measurement system (CTMS) or by flow meters (onboard).

CTMS systems are the predominant systems available for all LNG carriers. They are used for determining the amount of cargo loaded or discharged and they have universally accepted with commercial relevance and are typically third-party verified.

a) Calculating BoG quantity by CTMS

Cargo consumed on the passage is calculated by using the “CTMS closing” (final volume on board at the loading terminal upon completion of loading) and “CTMS opening” (total volume upon arrival at the discharge terminal just before commencement of discharging) figures.

CTMS measures the volume of cargo in the tanks and further calculations convert the volume to weight / mass at the reference temperature. Therefore, the BoG is calculated as the difference between “CTMS closing” figure at the loading port and the “CTMS opening” figure at the discharging port.

In case of cargo discharge at several locations in a port of call, the discharged volumes have to be aggregated. In case of further discharges in other ports of call (in other words: during the subsequent voyages), the volumes discharged in these ports have to be added to the discharged volume, until new cargo is loaded.

b) Calculating BoG quantity by flow meters

If it is chosen to measure the BoG with flow meters instead of measuring through the CTMS, the BoG is measured either in volume and then converted to mass using appropriate density, pressure and temperature corrections or measured directly in mass (coriolis type flow meters).

Flow meters are typically installed on the BoG supply lines to the main boilers, diesel engines and the GCU as the case may be. The sum of all such flow meters determines the total BoG consumed.

In cases where the BoG is measured via onboard volume flow meters, the method to convert volume to weight (e.g. using the composition of the cargo at load port for deriving its density and converting volume to mass) will be decided by the company and described in the company’s management procedures. Bases on this method, the BoG used to fuel the ship during the voyage will be determined.

Shipping companies may determine the LNG vapour density for onboard flow meters using standard temperature of 15°C and at vapour space conditions ρ_{vt} by the following calculation based upon ideal gas laws[169]:

$$\rho_{vt} = \frac{T_s}{T_v} \cdot \frac{T_v}{T_s} \cdot \frac{M_m}{I} \quad \left[\frac{kg}{m^3}\right]$$

Where:

T_s is the standard temperature of 288 K (15°C)

T_v is the average temperature of vapour in degrees in Kelvin

P_v is the is absolute pressure of vapour space in bar

P_s is the standard pressure of 1,013 bar

M_m is the molecular mass of vapour mixture in [kg/kmol] (provided from industry tables or from shore)

I is the ideal gaseous molar volume at standard temperature (288 K) and standard pressure (1,013 bar) = 23,645 [m^3/kmol]

[169] The formula is derived from SIGTTO publication: 'Liquefied Gas Handling Principles on Ships and in Terminals' (LGHP4) 4th Edition, Section 8.5.2.

Note: An accurate knowledge of the vapour composition in deriving M_m is not necessary and the deviation of saturated liquid gas vapours from the ideal gas laws is usually ignored.

The amount of BoG consumed at berth may be derived by the flow meters installed on the piping supplying gas to the consumers (engines, boilers, etc.).

However, for the consumption in ports, the CTMS (opening and closing) might not in all cases reveal the full picture. Therefore, flow meters are the favourable alternative for port consumption. In particular, the shore meters of the vapour return line are useful to mention in this context as they are a commercial method which is applied, accurate and typically verified by a specialized 3rd party. Usually, the commercial calculation process does explicitly calculate the amount (the balance) consumed by the ship during the cargo operations.

8.3.2.5 Accuracy and calibration of measuring equipment

All measuring equipment used for the monitoring should be maintained in good order and calibrated or certified for "fitness of purpose" in accordance with the maker's guidance. Further information on maintenance procedures or in correlation with the PMS should be provided from the shipping company.

A copy of maintenance records and/ or the calibration certificate should be kept on board.

8.3.2.6 Other relevant considerations

Existing EU legislation, namely the Directive (EU) 2016/802 relating to a reduction in the sulphur content of certain liquid fuels and more specifically the Commission Decision 2010/769/EU allow LNG carriers to use a specified BoG mixture as an equivalent abatement method to the low sulphur content oil-based fuels, i.e. for sulphur compliance reasons. For this purpose, it is required by Article 4 of Commission Decision 2010/769/EU that these ships are equipped with continuous monitoring and metering of the boil-off gas and marine fuel (i.e. pilot fuel) consumption.

The European Commission and EU Member States (through the Committee on Safe Seas and the Prevention of Pollution from Ships (COSS)) agreed, under certain circumstances (ship-specific design, operational profile & predefined BoG mixtures) on an extension to this equivalence also for propulsion purposes while sailing in the SECA.

Thus, it should be assumed that all the LNG carriers that would trade in the EU and planning to use BoG and marine fuel mixture as an abatement method, are already equipped with such continuous measuring/ metering devices plus related recording logs.

8.3.3 Assignment of fuel consumption and GHG emissions to passenger and freight transport (for ro-pax ships)

For ro-pax ships, Commission Implementing Regulation (EU) 2023/2499 requires a split of the total fuel consumption and GHG emissions in order to assign a part of the consumption/ emissions to passenger transport and the remaining part to freight transport (see part D, points 8 and 9 of the template for emissions reports as in Annex II to Implementing Regulation (EU) 2023/2499). This allows for better reflecting the nature of this ship type when expressing operational energy efficiency.

For the split of the total fuel consumption and GHG emissions it is recommended to use the methodology defined in EN 16258[170].

[170] EN 16258:2012 Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers), Brussels: European Committee for Standardization (CEN)

EN 16258 allows the vessel's total GHG to be split in a passenger and a freight element, in one of following two ways:

1. By mass
2. By area

As regards the "mass" option, data should be taken for the determination of cargo carried (see section 8.4.2.2).

As regards the "area" option, all public passenger areas plus the part of the cargo decks used for passenger vehicles is allocated to "passengers" segment. All freight deck areas minus freight deck areas allocated to passenger vehicles is allocated to freight.

Following two issues should be considered when applying the area method:

a) Hanging decks on ro-pax ships

Hanging decks could be understood as vertical moveable decks that enables a RoRo freight deck to be divided in to 2 or more decks enabling the vessel to accommodate more cargo with less height. Hanging decks may be split in to several sections each capable of being utilized independently.

For RoPax vessels fitted with hanging decks the company states, in the monitoring plan (MP), how many of these are to be included in the vessels freight capacity. The share of the hanging decks that is declared in the MP is to be substantiated based on either:

1. past performance
2. on the performance of a vessel serving the same trade
3. based on the company's estimated use for the coming period
4. the actual utilization on hanging as recorded by the vessel[171]
5. based on such other method that satisfies the verifier.

The so declared capacity, including hanging decks, should remain unchanged for the monitoring period[172]. Should a fundamental change to the use of hanging decks be anticipated during a reporting period, a revision to the MP is to be made under Article 7 of Regulation (EU) 2015/757.

b) How to allocate part of the freight deck to passenger car accommodation

The "passenger area" should include the area of the freight deck(s) allocated to passenger vehicles. A passenger vehicle is to be understood as "a vehicle whose sole purpose is to transport passengers and their personal luggage."

The company should therefore in the monitoring plan state (in lane-meters or area) the area of the freight decks allocated to vehicles belonging to freight paying passengers. This so defined area should be part of the "passenger area" when spitting the vessels GHG emissions. This area should be declared in the MP and is to be substantiated by either:

1. based on past performance;
2. on the performance of a vessel serving the same trade;
3. based on the company's estimated use for the coming period;

[171] In this case calculation of the vessels allocation of the GHG to passengers and freight will have to be calculated for each voyage being reported.

[172] Unless method 4 is selected.

4. the actual utilization as recorded by the vessel[173];
5. based on such other method that satisfies the verifier.

The so declared passenger area of the freight decks should remain unchanged for the monitoring period[174].

Should a fundamental change to the use of freight decks for passenger vehicles be anticipated during a reporting period, a revision to the MP is to be made under Article 7 of the MRV Maritime Regulation.

8.4 Determination of cargo carried

8.4.1 Parameters for cargo carried

Parameters for 'cargo carried' are specified for 14 ship types and a category 'others' (in Annex II to the MRV Maritime Regulation, as amended, and in Commission Implementing Regulation (EU) 2016/1928). Furthermore, the emissions report template as specified by Commission Implementing Regulation (EU) 2023/2449 allows for the reporting of additional parameters on a voluntary basis.

The following table provides an overview of the ship categories, their definitions and the applicable cargo parameters:

Table 8: Overview of the ship categories, their definitions and the applicable cargo parameters

Ship type	Definition in the context of the MRV Maritime Regulation	Cargo parameter	Remarks
Passenger ship[175]	-	Number of passengers	To be understood as ship with a passenger capacity above 12 persons but not carrying cargo.
Ro-ro ship	A ship designed for the carriage of roll-on-roll-off cargo transportation units or with roll-on-roll-off cargo spaces.	Mass of the cargo on board, determined as the actual mass *or* as the number of cargo units (trucks, cars, etc.) multiplied by default values for their weight[176] *or* occupied lane meters multiplied by default values for their weight	To be understood as ro-ro cargo ships.
Container ship	A ship designed exclusively for the carriage of containers in holds and on deck.	Total weight in metric tonnes of the cargo or, failing that, the amount of 20-foot equivalent units (TEU) multiplied by default values for their weight.	

[173] In this case calculation of the vessels allocation of the GHG to passengers and freight will have to be calculated for each voyage being reported.

[174] Unless method 4 is selected.

[175] Including the subtype passenger cruise ship.

[176] 'Weight' and 'mass' are to be considered as synonyms in the context of the MRV Maritime Regulation and in this document.

Ship type	Definition in the context of the MRV Maritime Regulation	Cargo parameter	Remarks
		Where cargo carried by a container ship is defined in accordance with applicable IMO Guidelines or instruments pursuant to the Convention for the Safety of Life at Sea (SOLAS Convention), that definition shall be deemed to comply with this Regulation.	
Oil Tanker	A ship constructed or adapted primarily to carry crude oil or petroleum products in bulk in its cargo spaces, other than combination carriers, noxious liquid substances (NLS) tankers or gas tankers.	Mass of the cargo on board	
Chemical tanker	A ship constructed or adapted for the carriage in bulk of any liquid product listed in Chapter 17 of the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk or a ship constructed or adapted to carry a cargo of NLS in bulk.	Mass of the cargo on board	In addition to the monitoring and Additional voluntary reporting of annual average density of the cargoes transported
LNG carrier	A tanker for the bulk carriage of liquefied natural gas (LNG) (primarily methane) in independent insulated tanks.	Volume of the cargo on discharge, or if cargo is discharged at several occasions during a voyage, the sum of the cargo discharged during a voyage and the cargo discharged at all subsequent ports of call until new cargo is loaded.	
Gas carrier	A tanker for the bulk carriage of liquefied gases other than LNG.	Mass of the cargo on board	
Bulk carrier	A ship which is intended primarily to carry dry cargo in bulk, including types such as ore carriers as defined in Regulation 1 of Chapter XII of the 1998 International Convention for the Safety of Life at Sea (the SOLAS Convention), but excluding combination carriers.	Mass of the cargo on board	Additional voluntary reporting of annual average density of the cargoes transported

Ship type	Definition in the context of the MRV Maritime Regulation	Cargo parameter	Remarks
General cargo ship	A ship with a multi-deck or single-deck hull designed primarily for the carriage of general cargo excluding specialised dry cargo ships, which are not included in the calculation of reference lines for general cargo ships, namely livestock carrier, barge carrier, heavy load carrier, yacht carrier, nuclear fuel carrier.	Deadweight carried for laden voyages and zero for ballast voyages	Mass of the cargo on board as additional voluntary parameter
Refrigerated cargo ship	A ship designed exclusively for the carriage of refrigerated cargoes in holds.	Mass of the cargo on board	
Vehicle carrier	A multi-deck roll-on-roll-off cargo ship designed for the carriage of empty cars and trucks.	Mass of the cargo on board, determined as the actual mass *or* as the number of cargo units multiplied by default values for their weight *or* occupied lane meters multiplied by default values for their weight	Deadweight carried as additional voluntary parameter
Combination carrier	A ship designed to load 100 % deadweight with both liquid and dry cargo in bulk.	Mass of the cargo on board	Additional voluntary reporting of annual average density of the cargoes transported
Ro-pax ship	A ship, which carries more than 12 passengers and which has roll-on/roll-off cargo space on board.	Number of passengers on board *and* Mass of cargo on board, determined as the actual mass or the number of cargo units (trucks, cars, etc.) multiplied by default values for their weight *or* occupied lane meters multiplied by default values for their weight	
Container/ Ro-Ro cargo ship	A hybrid of a container ship and a ro-ro cargo ship in independent sections.	Volume of the cargo on board, determined as the *sum* of the number of cargo units (cars, trailers, trucks and other standard units) multiplied by a default area and by the height of the deck (the distance between the floor and the structural beam) *and* of the number of occupied lane-metres multiplied by the height of the deck (for other ro-ro cargo) *and*	

Ship type	Definition in the context of the MRV Maritime Regulation	Cargo parameter	Remarks
		of the number of TEUs multiplied by 38,3 m^3	
Other ship types	-	Mass of the cargo on board *or* Deadweight carried for laden voyages and zero for ballast voyages	Other ship types not falling under any of the above categories

8.4.2 Guidance on application of parameters for cargo carried

This section provides further guidance for some ship types to which more complex rules apply.

8.4.2.1 Determination of cargo carried for ro-ro ships

For ro-ro (cargo) ships, the company specifies in the monitoring plan (Table C.5.) which of the following options will be used for determining cargo carried:

1. Actual cargo weight
2. Actual loaded lane-meters multiplied with the default weight per lane-meter
3. Number and types of units multiplied by default weight per unit

Where options 2 or 3 are applied, the company lists in the monitoring plan (Table C.5.) the relevant default values to be used. These default values have to be representative for the trade in which the vessel is intended to trade and the so applied default value(s) have to be substantiated by the company to the satisfaction of the verifier. Such substantiation can be:

- past performance,
- on the performance of a vessel serving the same trade,
- based on the company's estimated use for the coming period,
- based on another method that satisfies the verifier.

The so declared default weights have to remain unchanged for the reporting period unless the monitoring plan is revised in accordance with Article 7 of the Shipping MRV Regulation to reflect a fundamental change to the average weights per lane-meter or per unit during a reporting period.

8.4.2.2 Determination of cargo carried for ro-ro passenger (ro-pax) ships

For ro-pax ships, the company specifies in the monitoring plan (Table C.5.) which of the following options will be used for determining cargo carried:

1. Actual cargo weight;
2. Actual loaded lane-meters multiplied with the default weight per lane-meter;
3. Number and types of units multiplied by default weight per unit.

Where options 2 or 3 are applied, the company lists in the monitoring plan (Table C.5.) the relevant default values to be used. These default values have to be representative for the trade in which the vessel is intended to trade and the so applied default value(s) have to be substantiated by the company to the satisfaction of the verifier. Such substantiation can be:

- past performance,

- on the performance of a vessel serving the same trade,
- based on the company's estimated use for the coming period,
- based on another method that satisfies the verifier.

The so declared default weights have to remain unchanged for the reporting period unless the monitoring plan is revised in accordance with Article 7 of the MRV Maritime Regulation to reflect a fundamental change to the average weights per lane-meter or per unit during a reporting period.

The passenger vehicle units loaded in the area allocated to passenger vehicles (which is included in the area allocated to the passenger area), must not be included in the calculation of cargo mass.

8.4.2.3 Determination of cargo carried for vehicle carriers

For vehicle carriers, the company specifies in the monitoring plan (Table C.5.) which of the following options will be used for determining cargo carried:

1. Actual cargo weight;
2. Actual loaded lane-meters multiplied with the default weight per lane-meter;
3. Number and types of units multiplied by default weight per unit.

Where options 2 or 3 are applied, the company lists in the monitoring plan (Table C.5.) the relevant default values to be used. These default values have to be representative for the trade in which the vessel is intended to trade and the so applied default value(s) have to be substantiated by the company to the satisfaction of the verifier. Such substantiation can be:

- past performance,
- on the performance of a vessel serving the same trade,
- based on the company's estimated use for the coming period,
- based on another method that satisfies the verifier.

The so declared default weights have to remain unchanged for the reporting period unless the monitoring plan is revised in accordance with Article 7 of the MRV Maritime Regulation to reflect a fundamental change to the average weights per lane-meter or per unit during a reporting period.

In addition, on a voluntary basis, for vehicle carriers, cargo carried may also be determined as deadweight carried for laden voyages (and zero for ballast voyages).

8.4.2.4 Determination of cargo carried for general cargo ships

Commission Implementing Regulation (EU) 2016/1928 specifies the parameter for cargo carried to be applied for general cargo ships as "*deadweight carried for laden voyages and zero for ballast voyages*".

For laden voyages, deadweight carried is calculated as follows:

DWT carried = volume displacement x water density – ship's lightweight – fuel weight

Where:

DWT carried: expressed in metric tonnes

Volume displacement: measured volume displacement of a ship at a load draught condition, determined as the volume of the moulded displacement of the ship, excluding appendages, in a ship with a metal shell, and means the volume of displacement to the outer surface of the hull in a ship with a shell of any other material, expressed in cubic metres

Water density: relative water density at departure of the laden voyage concerned, expressed in metric tonnes per cubic metre

Ship's lightweight: the actual weight of the ship with no fuel, passengers, cargo, water and other consumables on board, expressed in metric tonnes

Fuel weight: weight of the fuel on board determined at the departure of the laden voyage concerned, expressed in metric tonnes

For the determination of the above parameters, following methods and sources should be used:

- Visual readings of the draught can be used to calculate the volume displacement with the help of a certified draft measurement scale. Digital readings could be used to validate the visual readings. For the ship's crew it will not be that burdensome, as the crew at almost all times already do visual reading. Draught measurements should be done just before departure/beginning of the voyage.
- The ship's lightweight should be taken from the stability booklet approved by the Administration or an organization recognized by it.
- To calculate the amount of fuel (by weight) the same three proposed monitoring methods (A, B and C) as for the fuel consumption should be used.

The methods applied to determine the volume displacement, the water density and the fuel weight have to be consistently applied during the entire reporting period and have to be specified in the monitoring plan (Table C.5.).

In addition, on a voluntary basis, for general cargo ships, cargo carried may also be determined as mass of the cargo on board.

8.4.2.5 Determination of cargo carried for container ships

The MRV Maritime Regulation foresees two options to determine the amount for cargo carried which is expressed as mass of the cargo on board:

1. Actual cargo weight
2. Number of 20-foot equivalent units (TEU) multiplied by default values for their weight

The selected option is specified in the monitoring plan (Table C.5.) and applied consistently for the entire reporting period.

For option 1, the actual cargo weight should be determined using the verified gross mass information used under the new SOLAS regulations applicable to packed containers (reference is made to MSC.1/Circ.1475).

Where option 2 is applied, the company lists in the monitoring plan (Table C.5.) the relevant default values to be used. The use of a single default value of 12 tonnes per TEU is recommended as well as the use of a single default value of 2 tonnes per empty TEU.

It should be noted that the container industry uses a variety of standard container sizes, but standard default weights (consistent with the 12 tonne default figure per TEU and 2 tonnes per empty TEU) are easily calculated. The use of following standard conversion factors and default weights as noted below is recommended.

Table 9: Standard conversion factors and default weights depending on container size

Container Size	TEU Conversion factor (TEU equivalents)	Default weight empty containers (in tonnes)	Default container weights (in tonnes)
20’ ST TEU 8’6” plus 20’ High Cube (HC)	1.0	2	12
40’ ST FFE 8’ 6” (forty-foot equivalent unit)	2.0	4	24
40’ High Cube (FFE 9’6”) plus 45’ and 48’	2.25	4.5	27

ST - Standard, TEU - twenty-foot equivalent unit, FFE – forty-foot equivalent, HC – high cube

8.4.2.6 Determination of cargo carried for LNG carriers

Cargo carried for LNG carriers is determined as volume. LNG carriers often use boil off gas as a fuel. This means that the amount of LNG on board at the start of a voyage is larger than the amount of LNG discharged as cargo at the end of a voyage. For the determination of cargo carried, the amount of cargo is monitored at the discharge terminal.

The discharged volume of LNG is equal to the amount of cargo carried in case of discharge of the total amount at one single location. In case of discharge at several locations in a port of call, the discharged volumes have to be aggregated. In case of further discharges in other ports of call (in other words: during the subsequent voyages), the volumes discharges in these ports have to be added to the discharged volume, until new cargo is loaded.

For example, if an LNG carrier loads LNG at port A, then sails to port B where it discharges X m^3 and onwards to port C where it discharges Y m^3, and finally returns to port A where it does not discharge any LNG, the amount of cargo on the voyage from A to B amounts to X+Y m^3, the amount of cargo on the voyage from B to C amounts to Y m^3, and the amount of cargo on the voyage from C to A is zero”. This example also shows how to calculate the amount of cargo on voyages where no cargo is discharged.

To obtain information about discharged volumes of cargo, the Custody Transfer Management System (CTMS) should be used.

8.4.2.7 Determination of cargo carried for chemical tankers, bulk carriers and combination carriers

In addition to the monitoring and reporting of the amount of cargo carried, on a voluntary basis, the average density of the cargoes transported in the reporting period could be monitored and reported for chemical tankers, bulk carriers and combination carriers.

For that purpose, information about the methodology and procedures applied should be specified in the monitoring plan (Table C.5.) and applied consistently for the entire reporting period.

8.4.2.8 Determination of cargo carried for other ship types

For all other ships not covered by the definitions of one of the 14 categories, the company selects one of the two parameters:

- Mass of the cargo on board;
- Deadweight carried for laden voyages and zero for ballast voyages.

This choice is to be specified in the monitoring plan (Table C.5.) and applied consistently for the entire reporting period.

9 ANNEX III – BIOFUELS AND ZERO-RATING

9.1 Demonstrating compliance with sustainability criteria for biofuels

Note: In order to make this guidance document a self-standing information source for shipping companies, section 9.1 contains a (slightly adjusted) copy of relevant parts of MRR Guidance Document No.3 (GD3, Biomass issues in the EU ETS)[177]. However, detailed information on the functioning of RED certification schemes are not repeated here. Therefore, the interested reader is invited to look up those details in GD3.

9.1.1 Alignment of EU ETS and RED

An important element of the MRR[178] for phase 4 of the EU ETS is the alignment of requirements for biomass with those of the Renewable Energy Directive (RED).

The exact rules for the application of zero-rating rules are currently under review in the MRR, as rules for RFNBO/RCFs will be included. An update of this guidance will be provided when those rules have been become available.

The relevant provisions for applying **sustainability and GHG savings criteria** (this document refers to both of those cumulatively as the "**RED criteria**") are found in Article 38(5) of the MRR. That Article requires that the RED criteria have to be met in order to apply an (CO_2) emission factor of zero to biomass. This is referred to as "zero-rating" the biomass in this document. Article 38(5) of the MRR clarifies that **if those criteria are not met, the material must be treated like a fossil fuel**. In the context of the MRV Maritime Regulation this means that the biofuel cannot be zero-rated and therefore the emission factor for biofuels, based on the fuel carbon content, as given in Annex I of that Regulation, has to be used.

9.1.2 Definitions

Article 3 of the MRR copies the biomass-related definitions[179] from the RED as follows:

> *'(21) 'biomass' means the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin;*
>
> *(21a) 'biomass fuels' means gaseous and solid fuels produced from biomass;*
>
> *(21b) 'biogas' means gaseous fuels produced from biomass;*
>
> *(22) 'bioliquids' means liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass;*
>
> *(23) 'biofuels' means liquid fuels for transport produced from biomass;*

From these definitions, the following can be concluded:

[177] https://climate.ec.europa.eu/document/download/2289952b-4d59-494c-8c49-c0a559c403d6_en?filename=gd3_biomass_issues_en.pdf

[178] EU ETS Monitoring and Reporting Regulation, full information given in footnote 37.

[179] Definitions here are not mutually exclusive. For example, wastes and residues can be at the same time biomass fuels or bioliquids, if they are used as fuels without further processing.

- In the context of installations:
  - Gaseous biomass is referred to as **biogas**, but it is also included in the term **biomass fuel** is used;
  - Liquid biomass is referred to as **bioliquid**. The term "biofuel" is relevant only for transport purposes (in the EU ETS this is important for aviation).
  - Solid biomass is included in the term **biomass fuel**.
- In the context of aircraft operators:
  - Only liquid fuels are currently used for aviation. Liquid biomass is referred to as "**biofuel**", as it is relevant for transport purposes.
- **For shipping companies, liquid biofuels as well as biogas[180] (including in liquefied form, "bio-LNG") will be relevant.**

9.1.3 Implications of the RED criteria

A source stream[181] *(for shipping companies, only fuels are relevant)* can be either fossil, biomass or a mixture of both. The application of RED criteria leads to the need to distinguish furthermore the following types of source streams (some may appear as theoretical cases):

1. Fossil source streams;
2. Biomass where sustainability and/or GHG savings criteria apply[182]:
   - Criteria are satisfied: Biomass is zero-rated;
   - Criteria are not satisfied: Biomass is treated like a fossil source stream, i.e. allowances must be surrendered for these emissions.
3. Biomass where RED criteria do not apply: Always zero-rated (case not relevant except for stationary installations).
4. Mixed source streams[183]:

   (f) Fossil / biomass mix, where either RED criteria do not apply, or where they apply and are satisfied: The emission factor is the preliminary emission factor[184] multiplied by the fossil fraction.

   (g) Fossil / biomass mix, where RED criteria apply and are not satisfied: The whole source stream is treated as fossil.

   (h) Biomass mix or fossil / biomass mix, where RED criteria apply and only a part of the biomass satisfies the applicable RED criteria: These source streams are to be treated like those under point 4(f), with the non-sustainable part considered as part of the fossil fraction.

Examples of source streams:

- Point (a): This could be fibre wood panels, where biomass (wood, for which the RED criteria are satisfied by certification under a voluntary scheme) is mixed with resins which are usually made from fossil raw materials.

[180] Note that zero-rating applies only to CO_2 emissions. Therefore, CH_4 emissions including slippage will have to be reported as if the gas were fossil natural gas.

[181] Source stream means either fuel or process material leading to emissions. For details see Guidance document No. 1 (general guidance for installations).

[182] Cases where the RED II criteria do not apply exist only in stationary installations.

[183] Note that the concept of "biomass fraction" does not exist in context of MRV Maritime, as all components of blended fuels have to be reported separately, i.e. a maritime fuel can be only 100% fossil or 100% biofuel.

[184] Article 3(36) of the MRR defines: "*'preliminary emission factor' means the assumed total emission factor of a fuel or material based on the carbon content of its biomass fraction and its fossil fraction before multiplying it by the fossil fraction to produce the emission factor*". In context of MRV Maritime, all the tank-to-wake emissions factors would be considered in this way.

- Point (b): This could be a liquid fuel where the supplier claims that x% biofuel has been added, but does not provide evidence for meeting the RED criteria for that amount.
- Point (c): An example would be rape seed methyl ester ("biodiesel"), where the rape seed oil satisfies the sustainability criteria and respective evidence is provided, while the methanol is either stemming from fossil sources, or where it is claimed to be biomass, but no evidence for meeting the RED criteria is available.

Note that the above classification assumes that the whole source stream has the same composition, or is analysed using the same methodology where calculation factors are not based on default values[185]. However, the situation may occur that a certain biofuel, bioliquid or biomass fuel is used, where some batches delivered do satisfy the relevant RED criteria, while other batches do not (or where the operator, aircraft operator or shipping company does not hold the necessary proofs of sustainability). In such a case the operator or aircraft operator may in its monitoring plan and emissions report either consider this material as one source stream with different biomass fraction values, or as two distinct source streams, one being biomass without meeting RED criteria, and one biomass with RED criteria met. In case of MRV Maritime, the shipping company does not have that choice, but each fuel must be reported always separately.

The same approaches apply to mixed source streams where the biomass fraction only sometimes complies with the relevant sustainability criteria[186].

The above considerations lead to practical **consequences when setting up the monitoring plan** in relation to biomass: The simplest way forward would be to establish a written procedure[187] which requires the shipping company to attribute each batch of biofuel used for activities covered by the EU ETS to either a "RED compliant biofuel"[188] or to a "non-RED complaint biofuel", depending on whether a proof is available for meeting the applicable sustainability and/or GHG savings criteria or not. The ways of obtaining such proof are discussed in section 9.2 below.

9.2 Practical approach for RED criteria

The Commission's website dedicated to renewable energy is:
https://energy.ec.europa.eu/topics/renewable-energy_en

Information on voluntary schemes for certification of biofuels and biomass fuels can be found at https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en

These websites should be useful for looking for guidance on all issues regarding the assessment of RED criteria which is not covered by guidance on the EU ETS websites.

[185] Similar to e.g. different batches of coal which are analysed separately, but all reported under the same source stream "coal".

[186] Note, however, that in case of stationary installations, the selection of either approach has implications on the selection of appropriate tiers. If separate source streams are chosen, the sustainable biomass source stream is always a *de-minimis* source stream, while a source stream with fossil or non-sustainable biomass fractions may have to comply with higher tiers, depending on its associated emissions (see section 5.2 of GD 1). In case of MRV Maritime, no tier concept is applicable. Fuels always have to be reported separately.

[187] See sections 6.1.3 and 7.3 on the topic of "written procedures" supplementing the monitoring plan. Such a written procedure should be described and referenced to in Table B.9 of the monitoring plan.

[188] Note that the MP and CER templates use also the simpler terminology "sustainable biomass" and "non-sustainable biomass", where "RED II compliant / non compliant" is more precise.

According to the RED, there are three ways in which economic operators can demonstrate compliance with the sustainability and GHG savings criteria for biofuels, bioliquids and biomass fuels:

- by means of a 'national scheme'[189];
- by using a 'voluntary national or international scheme' that the Member State accepts. If the Commission has formally recognised the scheme, the certificates and proofs of sustainability of the scheme must be accepted by all Member States. Therefore, using a recognised scheme gives legal certainty to economic operators, ensures harmonised implementation of the RED requirements and reduces the need for additional documentation;
- by providing all relevant evidence and GHG calculations themselves, having the information appropriately audited[190] (if this approach is accepted by national authorities in the Member State).

For shipping companies which plan to purchase biofuels outside the EU, **only the option using (international) voluntary schemes recognised by the Commission** is an available option. For biofuels purchased in a Member State, other national or voluntary schemes recognised by the Member State may also be used.

For zero-rating biomass under the EU ETS rules, the burden of proof concerning a biofuel, bioliquid or biomass fuel meeting the requisite sustainability and/or GHG savings criteria remains with the installation's operator or aircraft operator, or shipping company. Possible proof can be provided from applicable documentation ensuring compliance with a national system or the availability of certificates containing evidence of sustainability issued under a voluntary scheme recognised by the Commission or the installation's (or aircraft operator's administering) Member State under the RED (see sections 9.2.3 to 9.2.4).

The Member State relevant for the maritime sector in the EU ETS is the Member State of the administering authority (see section 2.4).

The evidence provided should furthermore indicate the amount of delivered biomass and identify the batch to which they relate. If the biomass has not already been certified (or where the certification does not cover all steps in the supply chain), the operators, aircraft operators or shipping companies would have to perform the necessary assessment themselves and have it audited accordingly by an auditor accepted by the Member State's legislation. Note, however, that the national legislation of the Member State may contain other provisions. Some Member States may e.g. accept only biomass that has been certified by a scheme recognised by the Commission.

Where compliance with the applicable RED criteria cannot be confirmed to the satisfaction of the administering authority[191], the biofuel, bioliquid or biomass fuel will have to be treated like a fossil source stream and not zero-rated[192].

[189] The term refers to a certification scheme established in a Member State. National schemes can be recognised by the Commission. If the national scheme is recognised, it is valid in all Member States, otherwise only in the Member State that put it in place.

[190] Such audit is mandatory according to Article 30(3) of the RED II: "*[…] Member States shall require economic operators to arrange for an adequate standard of independent auditing of the information submitted, and to provide evidence that this has been done. […]*". This audit can be performed by an EU ETS verifier only if the latter has the proven competence (i.e. accreditation) for that task (see section 3.4.6.5 of GD3).

[191] Not only the administering authority, but also the verifier during verification will assess if the evidence for meeting the sustainability criteria is sufficient.

[192] This means that the CO_2 emission factor for biofuels, based on the fuel carbon content, as given in Annex I of the MRV Maritime Regulation will apply.

9.2.1 General responsibilities

The Member State where the installation is situated, the administering Member State in case of aircraft operators, or the Member State of the administering authority in case of shipping companies is responsible for defining the rules under which compliance with the RED criteria must be demonstrated for the biofuels, bioliquids and biomass fuels used by the relevant regulated entities (installations, aircraft operators, or shipping companies). Biomass certification schemes under the RED can cover different parts of the supply chain, and "economic operators" are often certified for only part of the supply chain. For the purpose of the EU ETS the burden of proof for compliance with the RED criteria is on the user of the biomass, i.e. the operator of the installation, the aircraft operator or the shipping company, as these are the persons who have the obligation of reporting emissions. However, for practical reasons, they will often have to rely on data and information provided by third parties, i.e. either the supplier or producer of the biomass or biofuel.

9.2.2 Which criteria apply?

In most cases where "biomass" is mentioned in the MRR, it is added that "Article 38(5) applies". That article[193] clarifies the relationship between the MRR requirements and the RED, and in particular how the sustainability and GHG saving criteria of the RED are to be applied in order to allow the emissions from biomass to be zero-rated. The following points are worth noting:

- As the RED applies to renewable energy, the RED criteria apply only to energy uses of biomass in the EU ETS, i.e. to combustion emissions within the meaning of the MRR[194]. This is clarified in the MRR itself, as Article 38(5) states "… *biofuels, bioliquids and biomass fuels used for combustion shall fulfil the sustainability and the greenhouse gas emissions saving criteria*…"
- As the RED itself does not contain a definition of the term "installation", the MRR clarifies that the definition of "installation" of the EU ETS Directive applies[195].
- Not all the criteria given in Article 29 of the RED apply. In particular:
  - The "land related" sustainability criteria of Article 29(2) to (7) of the RED apply;

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[193] Article 38(5) of the MRR:

"*Where reference is made to this paragraph, biofuels, bioliquids and biomass fuels used for combustion shall fulfil the sustainability and the greenhouse gas emissions saving criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001.*

However, biofuels, bioliquids and biomass fuels produced from waste and residues, other than agricultural, aquaculture, fisheries and forestry residues are required to fulfil only the criteria laid down in Article 29(10) of Directive (EU) 2018/2001. This subparagraph shall also apply to waste and residues that are first processed into a product before being further processed into biofuels, bioliquids and biomass fuels.

Electricity, heating and cooling produced from municipal solid waste shall not be subject to the criteria laid down in Article 29(10) of Directive (EU) 2018/2001.

The criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001 shall apply irrespective of the geographical origin of the biomass.

Article 29(10) of Directive (EU) 2018/2001 shall apply to an installation as defined in Article 3(e) of Directive 2003/87/EC.

The compliance with the criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001 shall be assessed in accordance with Articles 30 and 31(1) of that Directive.

Where the biomass used for combustion does not comply with this paragraph, its carbon content shall be considered as fossil carbon."

[194] Some borderline cases exist where it may not be clear if a material is a fuel or a process input, such as pore-forming agents in the ceramic industry. In this case, may be used as guidance: "*Where the CO_2 emissions stem from a process which has a primary purpose other than the generation of heat, the competent authority may agree that the source stream is not acting as a fuel. Hence, such source streams serve non-energetic purposes and the sustainability criteria do therefore not apply.*" (see also section 3.5 of GD2 on free allocation rules for installations).

[195] In context of maritime transport, this is only relevant in relation to the installation that produces the biofuel. Article 3(e) of the EU ETS Directive: *'installation' means a stationary technical unit where one or more activities listed in Annex I are carried out and any other directly associated activities which have a technical connection with the activities carried out on that site and which could have an effect on emissions and pollution;*

- The GHG saving criteria of Article 29(10) of the RED apply;
- The additional efficiency criteria for electricity production (Article 29(11) of the RED) do *not* apply;
- Some provisions contained in Article 29(1) of the RED are copied into the MRR in order to clarify their applicability. In particular, this includes the simplification that for municipal solid waste the GHG saving criteria do not apply.
- Furthermore, the RED criteria apply irrespective of the geographical origin of the biomass.

Guidance document No.3 contains a "decision tree" in section 3.4.2, which describes in detail for which types of materials the sustainability criteria, the GHG savings criteria, both or none of the RED criteria apply. However, as for shipping companies it is assumed that they will rely on RED certification schemes, the details are not repeated here.

9.2.3 National systems in EU Member States

Member States' implementations of the RED are currently partly still under development. They use diverse approaches. There is no complete overview available of Member States' national systems on providing evidence of biomass sustainability and GHG savings. Operators, aircraft operators and shipping companies should obtain information on national systems from the relevant competent or administering authority.

The RED does not explicitly require a Member State to publish dedicated information. However, it is considered best practice to provide transparent information to operators. For the purpose of the EU ETS, Member States are therefore encouraged to consider practical ways of making information available to the public regarding the sustainability of biomass (by producer, brand, generic type or other suitable grouping), suppliers or producers thereof, or similar information, which allow the user of these biofuels, bioliquids or biomass fuels (and any EU ETS verifier) to gather assurance that a material complies with the applicable sustainability criteria.

Under the RED, Member States may use the possibility of Article 30(6) to notify a national scheme to the Commission for recognition. If such recognition is granted, the relevant information will be published on the Commission website[196], and all other Member States are required to accept the resulting certificates, like it is the case of voluntary international schemes recognised by the Commission. However, the use of international voluntary systems may be desirable in many cases where the biofuel, bioliquid or biomass fuel is not used in the Member State where it is produced (e.g. in the aviation sector).

9.2.4 Voluntary schemes

Details on all voluntary schemes recognised by the Commission can be found on the Commission's website[197]. Regarding schemes not [yet] recognised by the Commission, Member States may accept those schemes, if they come to their own conclusion that the scheme ensures compliance of the biomass with RED criteria. Under the same conditions, the Member States may continue the acceptance of certificates issued by schemes approved under the RED I. However, Member States may have also other specific provisions in their legislation, e.g. allowing only schemes that have been recognised by

[196] See footnote 197.

[197] https://energy.ec.europa.eu/topics/renewable-energy/biofuels/voluntary-schemes_en . Approvals are valid for 5 years. It is therefore necessary to check the validity period of the approval in the relevant Commission Decision.

the Commission. Hence, except when using schemes recognised by the Commission, shipping companies will always have to check with their competent authority or national legislation how to provide evidence that the biomass used complies with the RED criteria.

The most important aspect of the schemes recognised by the Commission is their applicability across the EU in a harmonised manner. This means that a biofuel, bioliquid or biomass fuel certified under such a recognised scheme will have to be recognised as sustainable in all Member States.

An operator or shipping company who purchases a biofuel, bioliquid or biomass fuel which has received a proof of sustainability from a recognised voluntary scheme (i.e. a certificate of compliance with that scheme's rules), may in any case assume that it can be considered sustainable under the RED, and can be used with an emission factor of zero in the EU ETS[198]. However, there are important limitations:

- The operator or shipping company has to be aware that some voluntary schemes are approved only for some fuel types, some of the required criteria (e.g. only the sustainability criteria or only the GHG savings criteria), or only regarding some steps of the value chain (e.g. only collecting and trading, or only the actual biofuel production or processing stage, etc.). If applicable, another proof must be obtained for the remaining criteria or missing parts of the value chain.
- In particular the GHG savings criteria are highly dependent on the distance of transport to the EU ETS installation, aerodrome or port (see default values in Annex VI of RED). Hence, if the economic operator under the certification scheme does not carry out the verification of the GHG savings criterion specifically for each site where the biomass is used, the operator or shipping company will have to provide its own evidence for this purpose and ensure appropriate verification, or request an economic operator under the certification scheme (e.g. the fuel supplier) to provide the missing certification. The latter may often be preferred by operators due to its simplicity, and may be required by the installation's Member State or aircraft operator's administering Member State, or the shipping company's administering authority.
- Some sustainability schemes cover a wider scope than just RED criteria. Many have an international background. Some have set up a specific version of the same overarching scheme for the purpose of demonstrating RED compliance. Only the latter is recognised by the Commission. operators, shipping companies, verifiers and competent authorities should be aware of these differences (where applicable), and use only certificates which explicitly refer to those "RED compliant versions" of the voluntary schemes as eligible for zero-rating in the EU ETS.
- Some schemes are recognised with limited geographical scope (e.g. if auditing services are available only in specific countries).
- The Commission's recognition of voluntary schemes are usually valid for five years. Furthermore, economic operators' certification can be suspended by the certification scheme. Only biofuels, bioliquids or biomass fuels covered by a valid recognition are eligible for zero-rating in the EU ETS.

Since all voluntary schemes are required to publish their rules, their certification bodies and the certificates issued on their website, operators of EU ETS installations, aircraft operators and shipping companies can obtain all the required information. In case of doubt, direct contact to the certification scheme operator should be sought.

[198] In case of mixed materials or fuels, obviously the zero-rating applies only to the biomass fraction.

9.2.5 How do RED certification schemes work?

Note: This section may apply to both, national or international schemes, which may be voluntary or required by Member States.

Guidance document No.3 contains details on this topic in section 3.4.5. It is assumed that shipping companies will rely on such RED schemes, but the level of detail in GD3 exceeds their needs. In short, the certifications schemes under the RED must comply with the Implementing Act[199] pursuant to Article 30(8) of the RED.

RED "Certificate" vs. "Proof of Sustainability"

A *certificate*[200] is what certifies that an economic operator complies with the rules of the certification scheme. The *Proof of Sustainability*[201] *(PoS)* is issued by the certified economic operator for confirming that a certain consignment of biomass material, biofuel, biogas, or biomass fuel fulfils the sustainability or GHG savings criteria.

The role of a certification body is different from the EU ETS verifier in that not specific environmental data are verified, but the certification means that the **economic operator is certified as being capable** of managing the sustainability information, GHG savings data or the relevant mass balance system, depending on the certification scope. Depending on the certification scheme's rules, such certificate is valid for one year from the certification[202] (i.e. forward-looking, while EU ETS verification confirms data from the past). This does not mean that the auditor will not check data from specific consignments (batches) of biomass, but still the certificate proves that the economic operator is capable of issuing "proofs of sustainability" for the biomass material, biofuel, biogas or biomass fuel.

For the EU ETS shipping companies this means that **the evidence required is the "proof of sustainability"** for each of the consignments (batches) of biofuel used so that CO_2 emissions from biomass can be zero-rated in the annual emissions report. The evidence can be obtained by one of the following methods:

- The supplier[203] of the biofuel provides a proof of sustainability for the biofuel purchased by the shipping company. The shipping company (and EU ETS verifier) would only have to check if the full value chain[204] and all required RED criteria are covered. For the GHG savings criteria, emissions from transport to point of bunkering need to be included.
- For installations, other options exist, which are less likely to be applicable to aircraft operators and shipping companies, but theoretically possible:

[199] Commission Implementing Regulation (EU) 2022/996 of 14 June 2022 on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria, available from http://data.europa.eu/eli/reg_impl/2022/996/oj

[200] Article 2(4) of the implementing act defines "*'certificate' means a conformity statement by a certification body within the framework of a voluntary scheme, certifying that an economic operator complies with the requirements of Directive (EU) 2018/2001 [the RED II]*";

[201] Article 2(23) of the implementing act defines "*'proof of sustainability' means a declaration by an economic operator, made on the basis of a certificate issued by a certification body within the framework of a voluntary scheme certifying the compliance of a specific quantity of feedstock or fuels with the sustainability and greenhouse gas emissions savings criteria set out in Articles 25(2) and 29 of Directive (EU) 2018/2001* [the RED II]".

[202] The certificate has to give the validity period.

[203] As only certified operators can issue proofs of sustainability under the RED, the fuel supplier needs such certification.

[204] "Full value chain" means from cultivation/first gathering point to the gate of the installation, including applicable processing steps (e.g. production of a biofuel). The steps covered should be indicated on the proofs of sustainability provided by the fuel supplier in this case.

- If the operator of the EU ETS installation, aircraft operator or shipping company has obtained a certificate from a certification scheme, the operator can apply the processes it has established for obtaining the certification, and issue proofs of sustainability for the biomass in question, and manage its own mass balance system for this purpose.
- Alternatively, and if applicable, the operator, aircraft operator or shipping company can apply other processes or certification rules, e.g. rules provided by a national scheme or directly by the Member State's legislation, taking into account any specific rules for auditing provided by the Member State.

In case where a Proof of Sustainability is not available to the shipping company, an equivalent proof of compliance documentation[205] could be considered for acceptance by the Administering Authority.

[205] The requirements for equivalent proofs of compliance are under development and this guidance document will be updated accordingly once more details are available.

10 ANNEX IV

10.1 Acronyms

AA .....Administering Authority

AVR .....Accreditation and Verification Regulation (A&V Regulation)

B/L .....Bill of Lading

BDN .....Bunker Delivery Note

BoG.....boil-off gas

BoR.....Boil-off rate

BQS .....Bunker Quantity Survey

CA .....Competent Authority

CCS .....Carbon Capture and [geological] Storage

CCS/CCU ...Carbon Capture and Storage/Carbon Capture and Utilisation

CEMS .....Continuous Emission Measurement System

CER .....Company Emissions Report (fleet/company-specific, as required by Article 11a of the MRV Regulation)

COSS.....Committee on Safe Seas and the Prevention of Pollution from Ships

CTMS.....Custody transfer measurement system

ECA .....Emissions Control Area

ECDIS.....Electronic Chart Display and Information System

EEA.....European Economic Area

EEDI .....Energy Efficiency Design Index

EEXI.....Energy Efficiency Existing Ship Index

EFTA.....European Free Trade Association

EIV .....Estimated Index Value

ER.....(Annual) Emissions Report (ship-specific, as required by Article 11 of the MRV Regulation)

ESSF .....European Sustainable Shipping Forum

ETS2.....Emission Trading System 2

EU ETS.....EU Emission Trading System

FBoG .....Forced Boil Of Gas

GCU.....Gas Combustion Unit

GD .....Guidance Document

GHG.....Green House Gas

GMS.....Gas Management Systems

GMT.....Greenwich Mean Time

GT.....gross tonnage

GWP .....Global warming potential

HELCOM ....Helsinki Commission (Baltic Marine Environment Protection Commission)

HFO .....Heavy Fuel Oil

HSQE.....Health, Safety, Quality and Environment

HVO .....Hydrotreated Vegetable Oil

ICE.....Internal Combustion Engine

IFO.....Intermediate Fuel Oil

IMO .....International Maritime Organisation

ISM .....International Safety Management

ISO.....International Organization for Standardization

LFO.....Liquefied Natural Gas

LNG .....Liquefied natural gas

MARPOL.....International Convention for the Prevention of Pollution from Ships

MDO .....Marine Diesel Oil

MEPC .....Maritime Environmental Protection Committee

MGO .....Marine Gas Oil (DMX, DMA grades as per ISO 8217)

MP .....Monitoring Plan

MPE .....Maximum Permissible Error (term usually used in national legal metrological control)

MRR.....Monitoring and Reporting Regulation (M&R Regulation)

MRV .....Monitoring, Reporting and Verification

MRV scope .Scope of activities covered by the MRV Maritime Regulation (see section 2.2)

MS .....Member State(s)

NBoG .....Natural boil-off gas

NG .....Natural Gas

OCT .....Overseas Countries and Territories

PMS .....Planned Maintenance System or Plant Management System

PoS .....Proof of Sustainability

RED .....Renewable Energy Directive

RFCs.....Recycled Carbon Fuels

RFNBOs .....Renewable Fuels of Non-Biological Origin

RO .....Recognised Organisation

ROB .....Remain On Board

Ro-pax .....Ro-ro and passenger (ship type)

Ro-ro.....Roll-on / roll-off (ship type)

SECA .....Sulphur Emission Control Area

SEEMP .....Ship Energy Efficiency Management Plan

SFOC.....Specific fuel oil consumption

SMS .....Ship Management system

SOLAS.....International Convention for the Safety of Life at Sea

TEU.....Twenty-foot equivalent units

TtW .....Tank-to-wake

VTS.....Vessel Traffic System

WtW .....Well-to-wake

10.2 Legislative texts

EU ETS Directive: Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, amended several times. Download of the consolidated version: **http://data.europa.eu/eli/dir/2003/87/2024-03-01**

MRV Maritime Regulation: Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC, **http://data.europa.eu/eli/reg/2015/757/2024-01-01**

RED: Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast). **http://data.europa.eu/eli/dir/2018/2001/2023-11-20**

Relevant implementing and delegated acts:

Administration of shipping companies: Commission Implementing Regulation (EU) **2023/2599** of 22 November 2023 laying down rules for the application of Directive 2003/87/EC of the European Parliament and of the Council as regards the administration of shipping companies by administering authorities in respect of a shipping company; **http://data.europa.eu/eli/reg_impl/2023/2599/oj**

Attribution of shipping companies to the administering authority: Commission Implementing Decision (EU) **2024/411** of 30 January 2024 on the list of shipping companies specifying the administering authority in respect of a shipping company in accordance with Directive 2003/87/EC of the European Parliament and of the Council; **http://data.europa.eu/eli/dec_impl/2024/411/oj**

Templates: Commission Implementing Regulation (EU) **2023/2449** of 6 November 2023 laying down rules for the application of Regulation (EU) 2015/757 of the European Parliament and of the Council as regards templates for monitoring plans, emissions reports, partial emissions reports, documents of compliance, and reports at company level, and repealing Commission Implementing Regulation (EU) 2016/1927; **http://data.europa.eu/eli/reg_impl/2023/2449/oj**

Transhipment ports: Commission Implementing Regulation (EU) **2023/2297** of 26 October 2023 identifying neighbouring container transhipment ports pursuant to Directive 2003/87/EC of the European Parliament and of the Council. **http://data.europa.eu/eli/reg_impl/2023/2297/oj**

Islands and PSOs (Public Service obligations): Commission Implementing Decision (EU) **2023/2895** of 19 December 2023 laying down the list of islands and ports referred to in Article 12(3-d) of Directive 2003/87/EC of the European Parliament and of the Council and the list of transnational public service contracts or transnational public service obligations referred to in Article 12(3-c) of that Directive; http://data.europa.eu/eli/dec_impl/2023/2895/oj

Update of MRV Annexes – Commission Delegated Regulation (EU) **2023/2776** of 12 October 2023 amending Regulation (EU) 2015/757 of the European Parliament and of the Council as regards the rules for monitoring greenhouse gas emissions and other relevant information from maritime transport; ELI: http://data.europa.eu/eli/reg_del/2023/2776/oj

A & V Rules: Commission Delegated Regulation (EU) **2023/2917** of 20 October 2023 on the verification activities, accreditation of verifiers and approval of monitoring plans by administering authorities pursuant to Regulation (EU) 2015/757 of the European Parliament and of the Council on the monitoring, reporting and verification of greenhouse gas emissions from maritime transport, and repealing Commission Delegated Regulation (EU) 2016/2072;
http://data.europa.eu/eli/reg_del/2023/2917/oj

Aggregated Company-level reporting: Commission Delegated Regulation (EU) **2023/2849** of 12 October 2023 supplementing Regulation (EU) 2015/757 of the European Parliament and of the Council as regards the rules for reporting and submission of the aggregated emissions data at company level; http://data.europa.eu/eli/reg_del/2023/2849/oj