
Implementation of the Shipping MRV Regulation

Working Paper on monitoring plan

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1. Introduction

1.1. Background

The EU Regulation on the monitoring, reporting and verification of emissions of CO₂ from maritime transport ([EU 2015/757](#)) (hereafter: EU MRV Regulation) lays down rules for the accurate monitoring, reporting and verification of CO₂ emissions and other relevant information from ships above 5,000 GT calling at EU ports.

Article 4 of the EU MRV contains the principles for monitoring and reporting and Article 5 together with Annex I contain the methods for monitoring and reporting emissions of CO₂ emissions. Annex II contains rules on the monitoring of other relevant information including distance travelled, time spent at sea and cargo.

Article 6 establishes the minimum content and set requirements for the submission of monitoring plans. This article will be frequently referred to in this document and can therefore be read below.

Article 7 of the EU MRV Regulation specifies that companies shall evaluate the monitoring plan at least on annual basis and that the monitoring plan shall be updated based on certain pre-defined situations (e.g. in case of change of company).

This document has been prepared as a monitoring plan concept for ships in connection with the monitoring, reporting and verification of emissions of CO₂ from maritime transport. It comprises a draft of the future structure of monitoring plans, its contents and the motivation for data and level of detail requested. A monitoring plan is a description of how the company monitors and report emissions. The result of monitoring and reporting, the aggregated data will be input in the emissions report.

The aim of this paper is to facilitate the discussions of the Shipping MRV subgroup of experts on shipping MRV monitoring established under the European Sustainable Shipping Forum (ESSF) in view of the possible design of monitoring plans for the MRV Regulation.

Note: The “Vessel” monitoring plan (Draft MP) has been considered for the content of this Working Paper.

Disclaimer

The information and views set out in this paper are those of the author(s) and do not necessarily reflect the official opinion of the Commission.

Article 6

Content and submission of the monitoring plan

1. By 31 August 2017, companies shall submit to the verifiers a monitoring plan for each of their ships indicating the method chosen to monitor and report CO₂ emissions and other relevant information.
2. Notwithstanding paragraph 1, for ships falling under the scope of this Regulation for the first time after 31 August 2017, the company shall submit a monitoring plan to the verifier without undue delay and no later than two months after each ship's first call in a port under the jurisdiction of a Member State.
3. The monitoring plan shall consist of a complete and transparent documentation of the monitoring method for the ship concerned and shall contain at least the following elements:
 - (a) the identification and type of the ship, including its name, its IMO identification number, its port of registry or home port, and the name of the shipowner;
 - (b) the name of the company and the address, telephone and e-mail details of a contact person;
 - (c) a description of the following CO₂ emission sources on board the ship: main engines, auxiliary engines, gas turbines, boilers and inert gas generators, and the fuel types used;
 - (d) a description of the procedures, systems and responsibilities used to update the list of CO₂ emission sources over the reporting period;
 - (e) a description of the procedures used to monitor the completeness of the list of voyages;
 - (f) a description of the procedures for monitoring the fuel consumption of the ship, including:
 - (i) the method chosen from among those set out in Annex I for calculating the fuel consumption of each CO₂ emission source, including, where applicable, a description of the measuring equipment used,
 - (ii) the procedures for the measurement of fuel uplifts and fuel in tanks, a description of the measuring equipment used and the procedures for recording, retrieving, transmitting and storing information regarding measurements, as applicable,
 - (iii) the method chosen for the determination of density, where applicable,
 - (iv) a procedure to ensure that the total uncertainty of fuel measurements is consistent with the requirements of this Regulation, where possible referring to national laws, clauses in customer contracts or fuel supplier accuracy standards;
 - (g) single emission factors used for each fuel type, or in the case of alternative fuels, the methodologies for determining the emission factors, including the methodology for sampling, methods of analysis and a description of the laboratories used, with the ISO 17025 accreditation of those laboratories, if any;
 - (h) a description of the procedures used for determining activity data per voyage, including:

(i) the procedures, responsibilities and data sources for determining and recording the distance,

(ii) the procedures, responsibilities, formulae and data sources for determining and recording the cargo carried and the number of passengers, as applicable,

(iii) the procedures, responsibilities, formulae and data sources for determining and recording the time spent at sea between the port of departure and the port of arrival;

(i) a description of the method to be used to determine surrogate data for closing data gaps;

(j) a revision record sheet to record all the details of the revision history.

4. The monitoring plan may also contain information on the ice class of the ship and/or the procedures, responsibilities, formulae and data sources for determining and recording the distance travelled and the time spent at sea when navigating through ice.

5. Companies shall use standardised monitoring plans based on templates. Those templates, including the technical rules for their uniform application, shall be determined by the Commission by means of implementing acts. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 24(2).

1.2. Purpose and scope

Each year the company with responsibility on the ship's operations (referred to as 'company' in this document, as defined in Article 3 (d) of the MRV Regulation¹) has to report the results of previous year's annual monitoring of aggregated CO₂ emissions emitted and other relevant information. The EU MRV Regulation specifies certain rules to be followed in order to monitor and report the information to be included in the emissions report. ISO14064-1 is a relevant international standard on quantification of GHG emissions and specifies consistency as an important principle when reporting about GHG emissions. Companies need to design a monitoring system (based on current activities processes and systems) to ensure information to be included in the emissions report annually is reliable, compliant with the EU MRV Regulation and complete, accurate, consistent, transparent and relevant.

As indicated in the Regulation the Monitoring Plan shall consist of a complete and transparent documentation of the monitoring method for the ship concerned and shall contain at least the elements listed in Article 6 paragraph 3. The design of the monitoring system shall be documented in a so called monitoring plan (MP). For the purpose of the EU MRV Regulation the term monitoring plan is used.

Purpose

The purpose of the monitoring plan is to document how companies monitor & report CO₂ emissions and other relevant information in a systematic way on annual basis to enable:

- companies to ensure to monitor & report CO₂ emissions and other relevant information consistently and in compliance with the EU MRV Regulation;
- companies to store / share essential information for the purpose of complying with the EU MRV Regulation in a central place / document;
- companies to demonstrate to verifiers how the ship monitors & reports CO₂ emissions and other relevant information consistently and in compliance with the EU MRV Regulation.

The monitoring plan reflects the reporting criteria and will be used by verifiers to base their assessment of the emissions report on. The monitoring plan is to be assessed against the requirements of Article 6 and 7. Article 6.5 of the EU MRV Regulation specifies that the Commission shall determine monitoring plan templates, including technical rules on their uniform application, based on implementing acts. The use of a standardized template is mandatory for companies.

Scope

The scope of the monitoring plan should in principle include all information necessary for companies and verifiers to understand the design of the ship's monitoring & reporting system. This understanding forms the basis for adequate monitoring and reporting of emissions and provides the verifier with suitable criteria to verify the emissions report against. If the monitoring & reporting system is partly based on existing mechanisms, processes, procedures and controls, reference needs be made to documents describing these elements.

Article 6 of the EU MRV Regulation specifies the minimum content of the monitoring plan. These elements should therefore be included in the monitoring plan template.

When developing the monitoring plan template, the level of detail required to obtain a sufficient level of understanding is considered, as well as the need to limit the administrative burden for companies to prepare the monitoring plan. The content for the monitoring plan is based on Article 6 of the EU MRV Regulation.

Should the ship's monitoring plan not provide the level of detail required, the verifier needs to obtain this understanding by gathering sufficient information on the monitoring methodology in practice. This may result in a more time consuming verification compared to monitoring plans that contain the required level of detail. The better understanding verifiers have of the ships monitoring & reporting system upfront, the better verifiers are able to perform their risk assessment and plan for the required verification activities.

In the monitoring plan companies may also make references to particular procedures / systems implemented for existing management systems or elements of systems (e.g. ISM, SEEMP, ISO 14001 and ISO 50001 etc.).

¹ The shipowner or any other organisation or person, such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the shipowner. (Art. 3 (d) Regulation (EU) 2015/757)

Concerning the general concept, it could be appropriate for MRV purposes and less burdensome for companies if there are (optional) two sections of the Monitoring Plan – one section that needs to be prepared for every single ship and another section on company level, that only needs to be prepared once per company (containing e. g. management procedures).

Responsibilities

The company is responsible to produce an emissions report that is compliant with the EU MRV Regulation and free from material misstatements. The monitoring plan contains relevant information about how the company monitors and reports emissions and serves as a basis for the company to ensure monitoring and reporting is compliant. The monitoring plan will serve as reporting criteria for companies in preparing the emissions report. This mechanism ensures companies will report in a transparent and consistent manner.

The verifier is responsible to assess compliance of the monitoring plan with the EU MRV Regulation. The monitoring plan should therefore be detailed enough that a verifier can perform this assessment. The verifier is also responsible to verify that the emissions report is prepared in conformance with the monitoring plan and that the emissions are not materially misstatement. The monitoring plan therefore serves as criteria for verifiers for their verification.

1.3. Guidelines and conditions

Instructions prior to the preparation of individual monitoring plans

The monitoring plan template shall include the requirements defined in the EU MRV regulation to assist the operator in demonstrating compliance with the EU MRV regulation. Further requirements in the monitoring plan provide useful information for the verifier and the company. Before tailoring the monitoring plan template to the specific ship, companies will need to know whether the correct version of the template is used and how to use the template. For this purpose, the monitoring plan template should start with a section Guidelines and Conditions to inform companies about the version, status and guidelines for the use of the template.

Submission of the monitoring plan

Furthermore, information with regard to the submission of the monitoring plan should be accommodated in the template.

By 31 August 2017 at the latest, companies shall submit to the verifier a monitoring plan for each of their ships indicating the method chosen to monitor and report CO₂ emissions and other relevant parameters (cargo carried etc.). For ships falling under the scope of this Regulation for the first time after 31 August 2017, the company shall submit a monitoring plan no later than two months after each ship's first call in an EU port.

1.4. Monitoring plan format and revision record sheet

Basic format

According to Article 6, companies shall use standardized monitoring plans based on templates. Those templates including the rules for its uniform application shall be determined by the Commission by means of an implementing act.

For practical reasons, the Monitoring plan template could be provided in an electronic format with tables and text fields, e. g. MS Excel. Its design should allow responsible employees from companies to become familiar with it quickly. There can be a few functions which will guide companies through the form if they go through the template from start to end. The functions should depend on previous input, such as cells changing colour if an input is not needed.

In several fields companies should be able to choose from predefined inputs ("drop-down lists"). Some fields should allow companies to input their own text even if such drop-down list exists (drop-down lists containing empty list entries). It is suggested that the Monitoring plan template is kept in English as commercial language in the maritime sector in order to facilitate compliance for companies.

Revision record sheet – Article 6 (3) (j)

According to Article 6 (3) (j) of the MRV Regulation, Monitoring plans shall include a revision record sheet to record all the details of the revision history.

The revision history both refers to modifications that companies shall provide in the situations defined in Article 7 (2) and to revisions following Article 13 (1) of the MRV Regulation.

A history of versions table is used for tracking the most recent version of a ship's monitoring plan. Each version of the monitoring plan should have a unique version number and a reference date.

The status of the monitoring plan at the reference date should be described in the "status" column.

| Version No | Reference date | Status at reference date | Reference to Chapters where revisions or modifications have been made, including a brief explanation of changes. |
|-------------------|-----------------------|---------------------------------|---|
| 0.1 | 31.03.2016 | Working Draft | (new monitoring plan) |
| | | | |
| | | | |

2. Basic data

2.1. Identification of the ship – Article 6 (3) (a)

The company will be asked to fill in basic information for the identification for the ship for which the monitoring plan is prepared.

Following information is required according to Article 6: 3(a) MRV Regulation:

Name of the ship

Name under which the ship is known to the company and/or which the ship carries on its hull.

IMO registration number

Unique seven digit IMO number as assigned by IHS Fairplay (or Lloyd's Register-Fairplay) and shown on the ship's hull, in accordance with SOLAS regulation XI/3.

Port of registry or home port

Port of registry as defined in the ship's registration documents and lettered on the stern of the ship's hull and the home port; the port at which the ship is based. The MRV Regulation requests either the port of registry or the home port. However, there are cases where a home port is not the same as the registered one (e.g. for ferries, cruises etc.). Hence, both port information is deemed relevant to report.

Name of the shipowner

Name of legal or natural person owning the ship.

Type of the ship

Ship type according to MARPOL Annex VI, Chapter 1, Regulation 2 and all ship types categorized for MRV purposes in the Working Paper on Cargo Parameters for Ships.

The information request described below concerns relevant information that is suggested to consider as additional voluntary items in the implementing Act.

Deadweight and Gross Tonnage

Two standard measures of ship size are deadweight tonnage and gross tonnage.

Classification Society (voluntary)

Voluntary field to enter the ship's Classification Society.

Ice-class (voluntary)

Voluntary field to enter the ship's ice-class.

Voluntary open description field for additional information about the characteristics of the ship (free format)

For example, this may concern certain information related to the characteristics of the (business activities of the) ship (based on its' type). This information may help to gain a better understanding of the potential fluctuation of CO₂ efficiency between certain voyages or reporting periods.

In addition, we suggest to include in the Implementing Act the information request with regard to the Flag State.

Additional capacity parameters that may be requested concern cargo space/tank volume, lane meters and other cargo capacity (such as weight, numbers of containers etc.) as well as passenger capacity, if applicable.

2.2. Company details – Article 6 (3) (b)

The MRV Regulation defines the ‘company’ as ‘the shipowner or any other organisation or person, such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the shipowner’.

Once the ship’s stakeholders have allocated the responsibility for the ship’s MRV compliance, according to Article 6 MRV Regulation, the company shall provide company and contact details:

Company details

| | |
|-----------------------|--|
| Name of the company | |
| Address Line 1 | |
| Address Line 2 | |
| City | |
| State/Province/Region | |
| Postcode/ZIP | |
| Country | |

Contact details

| | |
|------------------|--|
| Contact person | |
| Telephone number | |
| Email address | |

Company details

Name and address of the company (natural or legal person) which is responsible for the ship’s MRV compliance.

Contact Details

Name, position and contact details of responsible natural person(s) within the company as requested by Art. 6 (3) (b) of the MRV Regulation. In the case where companies prefer to appoint several contact persons, responsibilities need to be clearly allocated, with one person carrying overall responsibility for compliance with the EU MRV Regulation within the company.

2.3. Emission sources and fuel types used – Article 6 (3) (c)

Article 6 of EU 2015/757 requires that monitoring plans include a description of emission sources.

Companies shall provide information about all emission sources which are installed on-board the ship. Apart from the main engines this may include auxiliary engines, gas turbines, boilers and inert gas generators.

The information about installed emission sources includes a technical description of type, performance, year of installation and particularities. These are needed for plausibility checks regarding carbon emissions.

Also, an attribution of the fuel types to the CO₂ emission sources needs to be given.

Companies shall provide an overview of fuel types that the ship uses and might use. Since it is possible that fuel types used are not known in advance the monitoring plan should be updated later in accordance with Article 7 of the EU MRV Regulation. The company shall submit these updates to the monitoring plan to the verifier for assessment. Fuel types according to ISO 8217 (or other standards, if permitted) **can** include:

- **HFO:** Heavy Fuel Oil (e.g. ISO 8217 Grades RME through RMK)
- **LFO:** Light Fuel Oil (e.g. ISO 8217 Grades RMA through RM)
- **MDO/MGO:** Diesel/Gas Oil (e.g. ISO 8217 Grades DMX through DMB)
- **LPG:** Liquefied Petroleum Gas (Propane/Butane)
- **LNG:** Liquefied Natural Gas
- **Other ECA compliant fuels**
- **Other fuel types**

The specific fuel types provided by individual manufacturers named in the brackets are commonly used in the maritime sector. However, they are only examples and should just be considered as patterns.

The company may use the following table as a template for providing information on fuel types. A pre-defined list of standard fuels could be provided by the template.

It should be considered that emission sources can run on alternative fuels, which should be indicated in the table below. One needs to consider that for hybrid fuels (particularly the blends) relevant information from the manufacturers might not be fully available. In that case alternate information sources need to be used.

The following table is expected to be filled in.

| Emission source reference no. | Emission source (name, type) | Technical description of emission source (information relevant to identify the emission source, for example performance/power, specific fuel oil consumption (SFOC), year of installation, identification number in case of multiple identical emission sources) | (Potential) Fuel types used |
|-------------------------------|----------------------------------|--|-----------------------------|
| 1 | Main Engine, manufactured by xxx | | |
| 2 | Auxiliary power engine, ... | | |
| 3 | ... | | |
| 4 | ... | | |
| 5 | ... | | |
| 6 | ... | | |
| ... | ... | ... | ... |

2.4. Emission factors - Article 6 (3) (g)

2.4.1. Standard CO₂ emission factors for commercial standard marine fuels

At the ESSF SG MRV Meetings it has been agreed to solely use the IMO CO₂ emission factors as outlined in the most recent CO₂ emission factors published by the Marine Environmental Protection Commission (MEPC) of IMO:

| Fuel type | IMO Values ² (in tonnes of CO ₂ /tonne fuel) |
|---|---|
| Heavy Fuel Oil (Reference: ISO 8217 Grades RME through RMK) | 3.114 |
| Light Fuel Oil (Reference: ISO 8217 Grades RMA through RMD) | 3.151 |
| Diesel/Gas Oil (Reference: ISO 8217 Grades DMX through DMB) | 3.206 |
| Liquefied Petroleum Gas (Propane) | 3.000 |
| Liquefied Petroleum Gas (Butane) | 3.030 |
| Liquefied Natural Gas | 2.750 |
| Hybrid fuel | |
| Other | |
| | |

The standard values can be contained in the monitoring plan template.

The exclusive use of always the latest IMO CO₂ emission factors will ensure that hybrids/alternative fuels will also be included in the future. In case IMO updates its emission factors, this may be reflected in an updated version of the MP template. The table can be expanded by companies, depending on the types of fuel used.

2.4.2. Use of Non-Standard emission factors

In the case of biofuels, alternative non-fossil fuels and other fuel types the monitoring plan should contain the methodologies for determining the emission factors, including the methodology for sampling, methods of analysis and a description of the laboratories used, with the ISO 17025 accreditation of those laboratories, if any.

² Currently, the latest IMO emission factors are published in MEPC 67/6 of 1 July 2014.

2.5. Procedures, systems and responsibilities used to update the completeness of emission sources – Article 6 (3) (d)

Article 6 (3) d) of the MRV Regulation requires companies to provide details about the systems, procedures and responsibilities used to track the completeness of the list of emission sources over the reporting period . In this context the following table may be used:

Guarantee of completeness of the list of emission sources

| | |
|---|--|
| Title of procedure | e.g. Managing the completeness of the list of emission sources |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV procedures if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

Where relevant, the company should make reference to procedures / systems implemented for existing management systems, such as the ISM Code, to the extent these procedures overlap with the EU MRV Requirements. This enables the company to prepare a monitoring plan more efficiently.

For each procedure, the company should mention in the monitoring plan who is responsible for designing, maintaining and executing the procedure. In order to avoid frequent updates to the monitoring plan to be required, the company should mention the name of the employee's function who is responsible. This enables to company to record responsibilities and identify whom to contact in case queries are raised about the procedure.

The location of where records are kept should be specified in the monitoring plan in order to ensure availability of information also in cases where the contact person for MRV purposes changes. Also, this will be included in the verifier's risk assessment and the decision on the necessity – and destination – of a site visit.

3. Activity data

Note: The content of this concept paper depends on the outcome of other work streams (Verification & Accreditation, ‘Monitoring’ and ‘Cargo carried’). It will be updated accordingly.

3.1. 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, performs more than 300 voyages during the reporting period, the company is exempt from the obligation to monitor the amount of fuel consumed on a per-voyage basis (Art. 9 (2) of MRV Regulation). It is up to the decision of the company to make use of the exemption.

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

As the exemption from per-voyage monitoring according to Article 9 (2) can only be fully exploited when its application is decided a priori to monitoring, it is suggested to include a dedicated section into the monitoring plan template. The aim is to check whether the conditions are fulfilled and whether the company intends to make use of this exemption.

Application of exemption related to Article 9.2

| Item | Confirmation field |
|---|-----------------------|
| Number of expected voyages per reporting period falling under the scope of the EU MRV Regulation according to the ship’s schedule (at the time of initial preparation of the monitoring plan) | [minimum number] |
| Number of expected voyages per reporting period not falling under the scope of the EU MRV regulation according to the ship’s schedule | [minimum number] |
| Conditions for derogation of Article 9.2 apply? | Yes/No |
| If yes, do you intend to make use of the derogation for monitoring the amount of fuel consumed on a per-voyage basis? | Yes/No/Not applicable |

3.2. Fuel consumption of the ship

Annex I contains a list of methods which can be applied to measure fuel consumption and CO₂ emissions:

- (a) Bunker Fuel Delivery Note (BDN) and periodic stock takes of fuel tanks;
- (b) Bunker fuel tank monitoring on board;
- (c) Flow meters for applicable combustion processes;
- (d) Direct emissions measurements.

In this Working Paper, the notion “measurement” of fuel consumption is used in accordance with the MRV Regulation, meaning the *determination* of fuel consumption as commonly used in the maritime industry. Equally, the notion “fuel uplift” will be used here, meaning the *bunkering* of fuel. The notion “fuel in tanks” refers to *fuel remaining on board*.

3.2.1. Method used to determine fuel consumption of each emission source – Article 6 (3) (f) (i)

The method described shall be used to measure and/or calculate the fuel consumption for each voyage (if applicable considering Article 9.2). Whilst choosing the method, completeness and timeliness of data as well as the level of uncertainty should be taken into consideration.

Companies will be asked to specify the methodology used to measure fuel consumption of each emission source (see section 2.3.3) including a description of the measurement equipment used, as applicable.

Method to measure fuel consumption per emission source

| Emission source | Chosen Methodology for fuel measurement (A/B/C/D) |
|-----------------|---|
| | |

| | |
|--|--|
| | |
| | |

3.2.2. Procedures for determining fuel bunkered and fuel in tanks – Article 6 (3) (f) (ii)

The EU MRV Regulation mentions measuring fuel uplifts in Article 6 (3) (f) (ii). For the purpose of aligning with terminology used in the maritime industry, the heading of this section mentions determining fuel bunkered.

For the monitoring methods A and B, fuel tank readings may be carried out manually (sounding tapes or ullage), mechanically (e.g. floats or gauge glasses) or by automatic tank gauges.

The procedures for the measurement of fuel uplifts and fuel in tanks will need to be described, for example, by completion of the following table.

Procedures for measuring fuel uplifts and fuel in tanks

| | |
|---|---|
| Title of procedure | Measuring fuel uplift and fuel in tanks |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV procedures if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

Depending on the Method of fuel consumption calculation used companies need to complete the following table with information about the procedure used to ensure regular cross-checks between uplift quantity as provided by BDNs and uplift quantity indicated by on-board measurement, if applicable. If the company detects significant differences, it should investigate these and if errors are identified in the data reported, the company shall take corrective actions (correction of data and if possible solve the root cause, e.g. repair of measurement equipment).

In addition to the BDNs the vessel's oil record book may be used, in which also operations with regard to management of oil in machinery spaces, as fuel sludge and bilge waters are recorded, as established in MARPOL Annex I Regulation 17 and appendix III – if required.

Regular cross-checks between uplift quantity as provided by BDN and uplift quantity indicated by on-board measurement

| | |
|--|--|
| Title of procedure | Regular cross-checks between uplift quantity as provided by BDNs and uplift quantity indicated by on-board measurement |
| Reference to existing procedure | |
| Version of existing procedure | |
| Brief description of EU MRV Procedure if not already existing outside the MP | |
| Name of person or position responsible for procedure | |

Cross-checks could be considered regular if they are performed once per period, defined as the time between two port calls or time within a port, in line with Methods A, B and C for determining CO₂ emissions (Part B Annex I of MRV Regulation).

3.2.3. Description of the measurement instruments involved– Article 6 (3) (f) (ii)

For a description of the measuring instruments involved (relevant for methods A, B, C and D), companies will be asked to provide information as requested in the following table. This should also involve standards or regulations on which calibration requirements and intervals are based.

| Measurement equipment (name) | Elements applied to (e.g. emission sources, tanks) | Technical description (specification, age, maintenance intervals) |
|------------------------------|--|---|
| | | |
| | | |
| | | |

3.2.4. Procedures for recording, retrieving, transmitting and storing information regarding measurements– Article 6 (3) (f) (ii)

Companies will also need to provide information about the procedures for recording, retrieving, transmitting and storing information regarding measurements, if applicable.

This provides for a definition of the data flow of measurement information within the company, including interfaces, data storage (location) and history of handling and is applicable in case information used to report is based on measurement information.

Procedures for recording, retrieving, transmitting and storing information regarding measurements

| | |
|---|---|
| Title of procedure | Procedures for recording, retrieving, transmitting and storing information regarding measurements |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV procedures if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

3.2.5. Determination of density– Article 6 (3) (f) (iii)

According to Annex I of the MRV Regulation, in the case where the amount of fuel bunkered or the amount of fuel remaining in the tanks is determined in units of volume, expressed in litres, the company shall 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

| Fuel type/tank | Method to determine actual density values of fuel bunkered (method A/B/C) | Method to determine actual density values of fuel in tanks (method A/B/C) | |
|----------------|---|---|--|
| | Choose from: - Measurement equipment - Fuel supplier - Laboratory test | Choose from: - Measurement equipment - Fuel supplier - Laboratory test | |
| | | | |
| | | | |

3.3. List of voyages – Article 6 (3) (e)

Companies shall provide details about the systems, procedures and responsibilities used to ensure the completeness of the list of voyages over the reporting period.

The description of the procedure in place to keep an updated detailed list of voyages during the reporting period which are included/excluded from EU MRV must include the procedures in place to ensure completeness and non-duplication of data. In addition, the data flow procedures of recording voyages need to be described. The following table may be used.

Guarantee of completeness of activity data

| | |
|--|--|
| Title of procedure | Recording and safeguarding completeness of voyages |
| Reference to existing procedure | |
| Version of existing procedure | |
| Brief description of Description of procedure of voyage information management (including recording voyages, monitoring voyages etc.) if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Data sources and name of IT system used (where applicable) | |

3.4. Distance travelled – Article 6 (3) (h) (i)

Companies shall provide details about the procedures, responsibilities and data sources for determining and recording the distance per voyage.

Also the monitoring plan shall specify how distance is calculated. This concerns the choice of a method from two options available:

- a) Real distance travelled
- b) Most direct route between port of departure and port of arrival with use of conservative correction factor

In case of b), the value of the correction factor needs to be established.

In this document we used the term Real distance travelled as this is the terminology of the EU MRV Regulation. The meaning of Real distance in this context translates to the voyage distance from the logbook. Additional guidance is needed for companies about determination of distance, over ground or through water.

In cases of recording the distance travelled when navigating through ice the monitoring plan may also contain information on the procedures, formulae and data sources used for calculation.

The following table may be used for this purpose as well.

Procedure for distance per voyage made

| | |
|--|--|
| Title of procedure | Recording and determining the distance per voyage made |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV procedure (including recording and managing distance information) if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Data sources | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

3.5. Time spent at sea – Article 6 (3) (h) (iii)

Companies will be asked to provide details about the procedures, responsibilities and data sources for determining and recording the time spent at sea between the port of departure and the port of arrival.

In cases of recording the time spent at sea when navigating through ice the monitoring plan may also contain information on the procedures, formulae and data sources used for calculation.

Time spent at sea

| | |
|--|---|
| Title of procedure | Determining and recording the time spent at sea between the port of departure and the port of arrival |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV procedure (including recording and managing distance information)) if not already existing outside the MP | |
| Name of person or position | |

| | |
|---|--|
| responsible for this procedure | |
| Formulae and data sources | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

3.6. Amount of cargo carried & Number of passengers – Article 6 (3) (h) (ii)

Information about cargo carried will be gathered from ships under the MRV scope. Companies will be requested to provide information on how the amount of cargo carried will be compiled and calculated. Cargo carried may be reported in different units, depending on the outcome of the discussions and the results of the working paper related to Cargo Parameters.

Payload carried by cargo ships can be retrieved in different ways (refer to Working Paper on Cargo Parameters) and should all be described in the monitoring plan. Further guidance on this aspect might be useful.

Information about number of passengers will be gathered from ships under the MRV scope in order to determine the transport work (determined by multiplying the distance travelled with the amount of cargo carried), which is used for calculating the ship energy efficiency. For passenger ships, the number of passengers shall be used to express cargo carried.

Companies will be asked to provide details about the procedures, responsibilities and data sources for determining and recording the number of passengers, if applicable. The following table may be used.

Cargo carried and/or number of passengers

| Title of procedure | Recording and determining the amount of cargo carried or the number of passengers |
|--|---|
| Reference to existing procedure | |
| Version of existing procedure | |
| Brief description of EU MRV procedure (including recording and determining the amount of cargo carried and/or the number of passengers) if not already existing outside the MP | |
| Unit of cargo (Volume (m ³), Mass (metric tonnes), passengers (units), other | |
| Name of person or position responsible for this procedure | |
| Formulae and data sources | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

4. Quality and availability of data

4.1. Uncertainty assessment of carbon emissions from fuel types – Article 6 (3) (f) (iv)

Fuel quantity determination is inherently subject to uncertainty. In accordance with Annex 1 of the EU MRV, companies shall specify the estimated uncertainty associated with, where applicable:

- the BDN;
- the method for tank sounding;
- flow meters,
- direct CO₂ emissions measurement.

Article 6.3.f.iv specifies that companies shall develop a procedure to ensure the total uncertainty of fuel measurements is consistent with the requirements of the EU MRV Regulation.

Based on the discussions and conclusions of the subgroup for monitoring, a need for guidance is identified to develop default uncertainty values based on estimation for the elements mentioned above. Companies may use these values to include in their procedure in the monitoring plan. The use of default values is not mandatory. Ships may also use calculated uncertainty thresholds related to carbon emissions from fuel types themselves, provided that these calculations are appropriate and available for assessment by the verifier.

The monitoring plan could include the following;

Level of uncertainty associated with fuel monitoring

| Element of uncertainty | Estimated used | Value |
|------------------------|--|-------|
| Method A | Default value / ship specific estimate | |
| Method B | Default value / ship specific estimate | |
| Method C | Default value / ship specific estimate | |
| Method D | Default value / ship specific estimate | |

The table above specifies the technical uncertainty of the individual elements. Besides this, companies need to ensure the equipment is functioning properly. The monitoring plan could contain a section where the company describes how it ensures measurement equipment is functioning properly throughout the reporting period. In other words, the company should describe how it prevents measurement equipment from malfunctioning and thus prevent missing data. Where applicable the company may refer to procedures / systems implemented for existing management systems for which this is already described, e.g. the ISM Code.

Ensuring quality assurance of measuring equipment

| Title of procedure | Ensuring quality assurance of measuring equipment |
|--|---|
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV Procedure if not already existing outside the MP | |
| Department responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

4.2. Data gaps – Article 6 (3) (i)

The risk of the occurrence of data gaps or non-conformities should be minimized by developing an appropriate monitoring plan. However, it is not possible to completely exclude events that require the closure of a data gap. Where data relevant for the determination of ship emissions are missing, the operator shall use surrogate data calculated in accordance with an alternative method. In the monitoring plan a short description of the method to be used to estimate fuel consumption and other parameters should be provided. The reasons why the data gap methodology has been applied and the quantity of emissions for which such approach is used shall be specified in the emissions report.

Method A could be used as a fall back method for ships monitoring their fuel consumption using methods B,C or D. Other fall back methods than Method A when using one of the other methods as primary method may be developed by the company. When a ship uses Method A, the company shall develop a method to close potential data gaps based on estimations. Also for the determination of other parameters, data gap methods shall be developed.

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. Corrective measures 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 is available. This may be the case if information is missing, lost or found corrupt.

If the data gap occurs several times over a longer period of time, the verifier shall check whether the control activities to prevent missing data are functioning correctly. Refer to chapter 5.4.

4.2.1. Description of the method to be used to estimate fuel consumption

Companies will be asked to provide a brief description of the method to be used to estimate fuel consumption when data is missing. It should include a back-up solution for each fuel type and tank, depending on the chosen method(s) to measure fuel consumption. Also, it should include a formula/description of the calculation.

Standard data gap calculation(s)/formula(e) companies may use (in the case of data gaps regarding fuel consumption of individual ships in a specific period of time) might be provided by best practise/ guidance documents.

Standard methods will not be mandatory but only provided in order to facilitate the process for those companies who are willing to use them.

4.2.2. Description of the methodology to treat data gaps regarding other parameters than fuel consumption (i.e. distance, cargo carried etc.)

Companies will be asked to provide a brief 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) if applicable. It should include a back-up solution for each parameter and a formula/description of the calculation.

5. Management

Article 6 of the EU MRV Regulation sets out rules for the content of the monitoring plan and this is mainly focused on obtaining relevant information per voyage. The emissions report contains information on aggregated data. Also, the emissions report will be prepared after the ending of the report year. This requires adequate retention and control of data throughout the year. Companies should take this into consideration when designing the monitoring & reporting system.

Based on the experience of the project team, the risk of mistakes in the process of aggregating the information for the emissions report is equal to the risk of errors in the data per voyage. Companies are responsible for the content of the emissions report. This is also described in the harmonized standard ISO14064-1.

Therefore, it is suggested to include a section in the monitoring plan template about management, including data management in addition to the requirements of the EU MRV Regulation. Companies could make use of procedures / systems implemented for existing management systems, e.g. ISO 14001 or ISO 50001 when describing about management.

Ensuring adequate data management will help companies in potentially detecting errors before the verifier by their verification activities. The experience is that companies that are in control about the entire process from primary data to the aggregated information in the emissions report have little difficulties in preparing the emissions report. Also the verification process will be more efficient and therefore less costly.

The following elements should be considered to include in the monitoring plan template:

- General responsibilities (how are roles and tasks appointed in the process?);
- Data flow activities (are data collected, processed and stored in a controlled way (e.g. references can be made to other management systems)? What is getting done with the data? And who takes the data from where?);
- Control activities (what kind of checks does the company perform on whether data is complete and accurate?);
- Corrections and corrective actions (How does the company deal with correcting errors?).

5.1. General responsibilities

Regular assessment of the adequacy of the monitoring plan

According to Art. 7 (1) MRV Regulation “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.” Details need to be provided about procedures in place for the regular assessment of the adequacy of the monitoring plan and potential improvements of the monitoring method(s). This procedure should at least include the following activities:

- To review the list of emissions sources and to determine whether they are complete and whether all relevant changes have been considered in the monitoring plan;
- To assess potential measures to improve the monitoring methodology

These could be outlined by completion of the following table.

Procedure for regular assessment of the adequacy of the monitoring plan

| Title of procedure | Regular assessment of the adequacy of the monitoring plan |
|--|---|
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV Procedure if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |

| | |
|--|--|
| Name of IT system used (where applicable) | |
|--|--|

5.2. Data flow activities

For monitoring and reporting emissions it is important for companies to ensure that data are produced, collected, processed and stored in a controlled way. Although fuel consumption data gathering is not new for the maritime industry, the EU MRV Regulation includes specific requirements and includes more than information about fuel consumption. To obtain a clear picture of how data about fuel consumption, transport work and other relevant information is collected from various sources and aggregated for the emissions report in accordance with the requirements of the EU MRV Regulation a clear description of the data flow (transfer of information from first source to the emissions report including). Preparing simple process flow charts provide an efficient mean to obtain a good overview of data exchange between departments / locations.

In the monitoring plan companies may also make references to particular procedures / systems implemented for existing management systems (e.g. ISM, SEEMP, ISO 14001 and ISO 50001 etc.).

5.2.1. Description and visualization of data flows

For a data flow description in "Brief description of procedure" in the monitoring plan, no specific template is to be used. Relatively simple data flows may be described in a few words, whereas complex activities may require a data flow diagram, which is useful for assessing and/or setting up data flow procedures.

Where a number of procedures are used, details of an overarching procedure should be provided which cover the main steps of data flow activities along with a diagram showing how the data management procedures link together. Alternatively details of additional relevant procedures should be provided.

Under "Description of the relevant processing steps", each step in the data flow from primary data to annual emissions should be identified which reflect the sequence and interaction between data flow activities and include the formulas and data used to determine emissions from the primary data. Details of any relevant electronic data processing and storage systems and other inputs (including manual inputs) and confirmations how outputs of data flow activities are recorded should be included.

Examples for data flow activities include reading from instruments, aggregating data, calculating the emissions from various parameters, and storing all relevant information for later use.

Data flow diagram

Data flow description shall be based on the common elements: activity, input and output. This is common instrument for more complex data flows.

Task list

A task list may be used to translate the data flow diagram into instructions for staff and as a check list throughout the monitoring period. Sufficient instrument for relatively simple data flows.

Written procedures

Activities which are too complex to be described in a simple task list should be described in the form of written procedures outside the monitoring plan.

Companies should consider making use of tools such as data / process flows to create insight in more complex EU MRV monitoring and reporting systems and methods. However, this should not be a mandatory part of the monitoring plan.

5.3. Control activities

An effective control system consists of two elements:

- An assessment of risk, and
- Control activities for mitigating the risks identified.

The elements that should be covered concern:

- Quality assurance of the measuring equipment and the IT system used for data flow activities (if applicable)
- Internal reviews and validation of data
- Control of outsourced activities
- Keeping records and documentation including the management of document versions

Note: Typically most of these elements are expected to be the same for all ships operated by a company.

5.3.1. Performance of a risk assessment

Companies should carry out control activities performed in order to establish an effective control system in accordance with ISO 14064-1. In order to develop an efficient way to monitor and report emissions and other relevant information, companies should take a risk based approach. If a company knows where and how errors could occur, they can tailor procedures and checks (control activities) to prevent such events from happening.

Control activities to be performed based on a risk assessment

| | |
|--|--|
| Title of procedure | Performance of a risk assessment and identification of relevant control activities |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV Procedure if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

5.3.2. Quality assurance of information technology

Companies will be asked to provide details about the procedures used to ensure quality assurance of information technology used for data flow activities. The brief description should identify how information technology is tested and controlled, including access control, back-up, recovery and security. When setting up the monitoring plan, companies may refer to procedures / systems implemented for existing management systems, for example according to ISO9001, ISO14001 and ISO50001.

Control activities: Quality assurance and reliability of information technology

| | |
|---|--|
| Title of procedure | Information Technology Management (e.g. access controls, back up, recovery and security) |
| Reference for procedure | |
| Brief description of procedure | |
| Name of person or position responsible for data maintenance | |
| Location where records are kept | |
| Name of system used (where applicable) | |
| List of relevant existing management systems | |

5.3.3. Internal reviews and validation of data

In order to enable effective and efficient monitoring, reporting and verification of the information for the EU MRV Regulation, companies should assess the quality of the information in the aggregated report before submitting the report to the verifiers. A brief description should identify that the review and validation process includes a check on whether data is complete, comparisons with data over previous years, comparison of fuel consumption reported with purchase records and factors obtained for fuel suppliers with international reference factors, if applicable, and criteria for rejecting data.

Control activities: Internal reviews and validation of EU MRV relevant data

| | |
|--|--|
| Title of procedure | |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV Procedure if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

A regular review of the data collected throughout the year is intended to prevent situations where errors or data gaps are detected very late in the process, and corrective actions are difficult to perform. Written procedures in place lay down checks to be performed. Minimum review check may include:

- Data completeness check
- Trend analysis (comparison of the data over several years)
- Comparison of data resulting from different operational data collection systems
- Comparison of calculation factors that have been determined by analysis, calculated or obtained from the supplier with (inter)national reference factors of comparable fuels/materials

Control procedures shall contain criteria or thresholds for correcting/rejecting data.

5.4. Corrections and corrective actions

In accordance with ISO 14065:2013[E] International Standard on Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition, companies should provide details about the procedures used to handle corrections and corrective actions. This is relevant in the context of the operator’s risk mitigation activities. Corrective actions are part of the procedure to mitigate the risks related to the monitoring and reporting process. The operator shall monitor the effectiveness of the control system, which consists of an operator’s assessment of inherent risks and control risks and how deal with those.

The brief description should outline what appropriate actions are undertaken if data flow activities and control activities are found not to function effectively – for example if a meter is not working properly. The procedure should outline how the validity of the outputs is assessed, the process of determining the cause of the error and of correcting it. This will help the company to improve effectiveness and efficiency in reporting.

Control activities: Corrections and corrective actions

| | |
|--|--|
| Title of procedure | |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV Procedure if not already existing outside the MP | |

| | |
|---|--|
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

It needs to be considered that corrective actions may have an impact on the monitoring plan and/or its procedures, which can result in updates of the monitoring plan.

5.4.1. Outsourced activities

In case companies outsource parts of the procedures to collect data for the EU MRV Regulation, they should be aware of the risks related to the quality of information. Therefore companies should consider how to gain control over the activities that are outsourced. A brief description should identify how data flow activities and control activities of outsourced processes are checked and what checks are undertaken on the quality of the resulting data.

Control activities: Outsourced activities (optional if applicable)

| | |
|--|--|
| Title of procedure | |
| Reference to existing procedure | |
| Version of existing procedure | |
| Description of EU MRV Procedure if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records are kept | |
| Name of IT system used (where applicable) | |

Information about out-sourced processes is requested since operators are responsible for the functioning of any data collection or processing steps which have been outsourced (e.g. maintenance of measuring equipment). Hence, out-sourced processes must be included in the control-system (e.g. in reviewing results etc.).

5.4.2. Documentation

Companies will be asked to provide details about the procedures used to manage record keeping and documentation by filling in the following table. IMO Res. A.916 (22) Guidelines for the recording of events related to navigation requires (in accordance with the Flag Administration) that for each voyage records must be kept in order to be able to restore complete record of the voyage” can be restored.

The brief description should identify the process of document retention, and to how the data is stored such that information is made readily available upon request.

Control activities: Documentation

| | |
|--|--|
| Title of procedure | |
| Reference to existing procedure | |
| Description of EU MRV Procedure if not already existing outside the MP | |
| Name of person or position responsible for this procedure | |
| Location where records | |

| | |
|--|--|
| are kept | |
| Name of IT system used (where applicable) | |

The operator is required to keep records of all relevant data and information for 3 years (refer to the Working Paper *Verification and Accreditation*). IT systems must be designed such that the data can be retrieved for the period required.

6. Further information

6.1. List of definitions and abbreviations

Companies should list any (individual) abbreviations, acronyms or definitions that they have used in completing this monitoring plan.

| Abbreviation, Acronym, Definition | Explanation |
|--|--------------------|
| | |
| | |
| | |

6.2. Additional individual 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.

7. Need for additional guidance identified

7.1. Determination of voyage distance

In order to determine the real distance travelled based on the voyage logbook, its it not specified whether this distance should be based on distance over ground or through water. Further guidance is needed to clarify how companies should determine the real distance travelled.