Technical Guidance for Updating SEEMP Part II in Accordance with Appendix XI of MARPOL Annex VI

1- Introduction

The Ship Energy Efficiency Management Plan – Part II (SEEMP Part II) is a mandatory instrument required under regulation 26.2 of MARPOL Annex VI, forming the foundation for the collection, monitoring, and reporting of ship fuel oil consumption data in accordance with regulation 27 and the calculation of the attained annual operational Carbon Intensity Indicator (CII) in accordance with regulation 28. As the regulatory framework governing ship energy efficiency continues to evolve, ship-owners and ship operators must ensure that the methodologies, procedures, and data management arrangements described in their SEEMP Part II remain accurate, up to date, and fully aligned with the latest IMO requirements.

The introduction of the CII rating scheme, together with subsequent amendments to Appendix XI of MARPOL Annex VI, and the updated calculation and reporting methodologies reflected in resolutions such as MEPC.388 (81) and MEPC.396 (81) has created a clear need for companies to review, revise, and, where necessary, completely rewrite their SEEMP Part II. These updates include revisions to correction factors, reporting items, voyage adjustments, verification procedures, and the requirements for corrective action plans for ships with unsatisfactory CII ratings.

This Guidance Document has been developed to provide ship-owners, ship managers, Designated Persons Ashore (DPAs), and onboard management teams with a practical and structured approach to updating SEEMP Part II in line with the latest IMO instruments. While the official IMO guidelines—including the 2022 Guidelines for the Development of a SEEMP (resolution MEPC.346(78))—provide the regulatory basis and required content, companies often require a complementary document that translates these requirements into clear operational steps, templates, forms, and recommended practices that can be directly applied within company management systems and onboard vessels.

The objective of this Guidance is therefore to support companies in achieving consistent, verifiable, and compliant SEEMP Part II documentation by offering:

- Clarification of regulatory requirements;
- Explanation of updated data collection and reporting methodologies;
- A structured process for rewriting SEEMP Part II;
- Recommended formats, templates, and checklists;
- Practical instructions for implementation onboard and within the Safety Management System (SMS);
- Alignment with verification requirements of Flag Administrations and Recognized Organizations (ROs).

This Guidance is intended for all stakeholders involved in the development, implementation, and review of SEEMP Part II, including ship-owners, technical managers, DPAs, Masters and Chief Engineers, fleet performance teams, and service providers responsible for data monitoring and analysis. It does not replace or override any IMO instruments, Flag State instructions, or RO requirements; rather, it serves as a technical and operational aid to ensure that SEEMP Part II is developed and maintained in accordance with the regulatory expectations of MARPOL Annex VI and the evolving framework for carbon intensity reduction in international shipping.

2) Scope & Applicability

2.1 Applicability

This Guidance Document applies to all ships of 5,000 gross tonnage and above engaged in international voyages and required to comply with:

- Regulation 26.2 of MARPOL Annex VI (SEEMP Part II),
- Regulation 27 (Fuel Oil Consumption Data Collection),
- Regulation 28 (Attained Annual Operational CII and Rating),
- Appendix XI requirements for verification, reporting, and issuance of the Statement of Compliance.

It is intended for ship-owners and ship managers responsible for ensuring that their vessels maintain an accurate, up-to-date, and compliant SEEMP Part II.

2.2 Limitations

This Guidance does not replace or supersede:

- Mandatory requirements contained in MARPOL Annex VI,
- Official IMO Guidelines, including MEPC resolutions and circulars,
- Instructions or interpretations issued by Flag Administrations,

It serves solely as a technical and operational aid to support the development and revision of SEEMP Part II in line with the latest IMO requirements.

3) References

i. MARPOL Annex VI
ii. Adopted by resolution MEPC.346 (78)
iii. Revised CII Calculation Guidelines (2023) Adopted by resolution MEPC.388 (81)
iv. Amendments to MARPOL Annex VI and Appendix XI Adopted by resolution MEPC.396 (81)
v. Guidelines for Data Collection System (DCS) under Regulation 27 Adopted by Res. MEPC.374 (79)
vi. Guidelines on Correction Factors and Voyage Adjustments for CII Calculations Adopted by Res. MEPC.376 (79*)*

4) Definitions

For the purpose of this Guidance Document, the following definitions apply. Where terms are defined in MARPOL Annex VI or the 2022 SEEMP Guidelines (MEPC.346 (78)), such definitions shall take precedence.

4.1 Ship Fuel Oil Consumption Data: Means the data required to be collected and reported annually in accordance with regulation 27 and specified in Appendix IX to MARPOL Annex VI. This includes fuel oil consumed by main engines, auxiliary engines, boilers, inert gas generators, and any other consumer type, regardless of the ship's operational status.

4.2 Carbon Intensity Indicator (CII): A performance indicator by which the carbon intensity of a ship's operation is measured. The attained annual operational CII is calculated as required by regulation 28 and the applicable MEPC guidelines, considering relevant correction factors and voyage adjustments.

4.3 Attained Annual Operational CII: The actual carbon intensity achieved by the ship during a calendar year, determined using fuel consumption, distance travelled, and transport work metrics, as applicable to the ship type.

4.4 Required Annual Operational CII: The reference CII value a ship must meet for compliance, defined in regulation 28.6 of MARPOL Annex VI and determined based on ship type and size.

4.5 CII Rating: A rating (A, B, C, D, or E) assigned to a ship based on comparison of its attained annual operational CII with the required annual CII, as defined in the CII rating scheme under regulation 28.7.

4.6 Data Collection Plan (SEEMP Part II): The section of SEEMP describing the methodology for collecting, aggregating, and reporting ship fuel oil consumption data. Required for ships of 5,000 GT and above under regulation 26.2.

4.7 Statement of Compliance – Fuel Oil Consumption Reporting: A statutory certificate issued by the Administration or a Recognized Organization (RO) upon successful verification of the ship's reported fuel oil consumption data as per Appendix XI.

4.8 Correction Factors: Adjustment values applied to the calculation of the attained CII to correct for specific operating conditions, weather influences, deadweight variations, cargo conditions, or other parameters as defined in IMO CII calculation guidelines.

4.9 Consumer Type: A category of onboard machinery or systems consuming fuel oil, including Main engines, Auxiliary engine(s), Boilers, Fuel cells or specialized systems, As defined in the SEEMP guidelines.

4.10 Distance Travelled: The distance travelled over ground in nautical miles recorded in accordance with SOLAS regulation V/28.1. Only the distance "under way under the ship's own propulsion" is aggregated for annual reporting.

4.11 Hours Under Way: The aggregated number of hours during which the ship is under way under its own propulsion during the reporting year.

4.12 Data Gap: Any missing, incomplete, or questionable data within the monitoring period that must be identified, rectified, and documented through procedures described in the SEEMP Part II and company SMS.

4.13 Company: The owner of the ship or any other organization or person such as the manager or bareboat charterer who has assumed responsibility for the operation of the ship and is defined as the "Company" under paragraph 1.1.2 of the ISM Code.

5) Part II of the SEEMP: Ship Fuel Oil Consumption Data Collection Plan

5.1 General

The SEEMP Part II must present a clear and ship-specific explanation of how the vessel collects, consolidates, verifies, and reports its annual fuel oil consumption data in accordance with regulations 26.2 and 27 of MARPOL Annex VI. This description should reflect the actual practices followed on board and within the company, ensuring that all procedures are both practical and verifiable.

For ships of 5,000 GT and above, the Plan should set out the procedures that apply under all operational conditions—whether the vessel is at sea, alongside, undergoing cargo operations, or experiencing any unusual circumstances that could influence fuel consumption or the integrity of recorded data.

The Plan must also identify every significant fuel oil consumer on board. This typically includes the main and auxiliary engines, boilers, inert gas generators, gas turbines, and fuel cells, as well as any system that may use cargo as fuel, such as those found on LNG or LPG carriers. A complete and accurate list is essential to ensure that total annual consumption is correctly captured.

A detailed explanation of the method used to measure fuel oil consumption must be included. The Plan should specify which approved IMO methodology is applied—whether consumption is derived from bunker delivery notes, flow meters, tank soundings, LNG custody transfer systems, or cargo-as-fuel arrangements. Where necessary, it should also note any adjustments, such as density or temperature corrections. Whatever method or combination of methods is selected, it must be applied consistently and in a manner that allows for independent verification.

In addition to fuel measurements, the Plan should describe how the vessel collects and stores operational data, including distance travelled, hours under way, onshore power received, and transport work, where applicable. These procedures must be clearly documented and integrated into the ship's Safety Management System to ensure uniform application on board.

To safeguard the reliability of the data, the Plan must outline how data quality is maintained. This includes the calibration and upkeep of flow meters, the process for identifying and resolving data gaps, the validation of daily or voyage-specific entries, and the handling of unusual operating conditions. Any deviation from standard practice or corrective action taken must be properly recorded.

The Plan should also set out the responsibilities of personnel both on board and ashore. This typically involves defining the roles of the Master, Chief Engineer, DPA, technical superintendent, designated data reporting officers, and any other crew members involved in recording or verifying data.

Finally, SEEMP Part II must describe how the annual data will be compiled and submitted for verification. This includes the schedule, the reporting format, and the method by which the company transmits the required DCS information to the Administration or the Recognized Organization responsible for issuing the Statement of Compliance.

It should be noted that the IMO-recommended standardized format for SEEMP Part II is provided in Annex 1 of this Guidance. The template included in the annex corresponds to the official sample form issued by the Organization and contains all required elements, including ship particulars, the list of fuel oil consumers, the selected measurement methods, and the procedures for reporting and data verification.

5.2 Guidance on Methodology for Collecting Data on Fuel Oil Consumption, Distance Travelled and Hours Under Way and Other Items

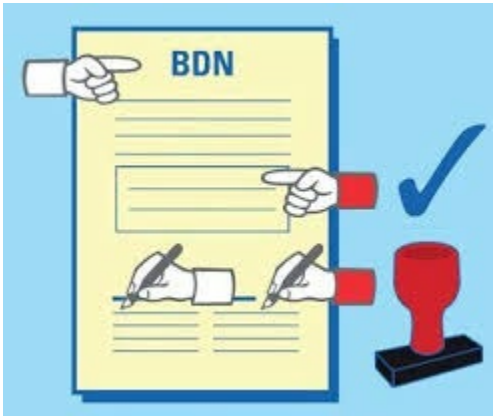
5.2.1 Total annual Fuel oil[1] consumption

SEEMP Part II must clearly describe the method used on board to determine the ship's annual fuel oil consumption. The chosen approach should reflect the vessel's actual equipment, the company's operational practices, and the IMO-approved measurement options. Whatever method is selected, it must be applied consistently throughout the reporting year and allow for transparent verification by the Administration or the Recognized Organization.

5.2.1.1 Method using bunker delivery notes (BDNs):

When the ship uses the BDN-based method, the total fuel oil consumption for the year is determined primarily from the quantities shown on the bunker delivery notes. These notes are issued for every fuel delivery in accordance with regulation 18 of MARPOL Annex VI and must be kept on board for at least three years. SEEMP Part II should describe clearly how the ship summarizes the information from its BDNs and how tank measurements are taken to ensure that all fuel movements during the reporting period are properly accounted for.

Under this method, the ship's annual consumption is calculated by adding together the fuel quantities shown in all BDNs received during the year, then adjusting this figure based on the fuel remaining in the tanks. The amount of fuel left at the end of the previous reporting year is added, and the fuel remaining at the end of the current reporting year is deducted. In this way, the ship's consumption is based not only on delivered fuel but also on the change in tank inventory between the beginning and the end of the year.



[1] Regulation 2.1.14 of MARPOL Annex VI defines "fuel oil" as "fuel oil means any fuel delivered to and intended for combustion purposes for propulsion or operation on board a ship, including gas, distillate and residual fuels.

To establish these opening and closing quantities, tank readings must be taken at both the start and end of the reporting period. The ship may take these measurements using automated gauging equipment, manual soundings, or dip tapes, but the chosen method must be consistent and clearly described in the Plan.

If a voyage overlaps the boundary between two reporting periods—for example, a voyage that begins in late December and finishes in early January—tank readings should be taken at the port of departure and the port of arrival. If this is not practical, the ship may use a recognized statistical method, such as using the daily consumption average over the voyage, to determine the split between the two reporting periods.

The method must also take into account any fuel oil that is offloaded during the year. Any such transfer should be recorded in the ship's oil record book, and the quantity must be deducted from the year's total consumption. If any additional adjustments are needed—for example, to resolve discrepancies arising from tank measurement uncertainties or density variations—those adjustments must be supported by appropriate evidence and recorded in a transparent manner.

If any measurement equipment—such as flow meters, automated tank gauging systems, or other instruments requiring calibration—is used as part of the ship's fuel oil consumption measurement process, the SEEMP Part II must clearly specify how such equipment is controlled, maintained, and calibrated. The Plan should outline the calibration intervals, the responsible personnel, and the procedures for verifying the accuracy of measurements. It should also require that all calibration certificates, test records, and supporting documents are retained on board and made available for verification by the Administration or the Recognized Organization.

5.2.1.2 Method using flow meters:

When flow meters are installed on board, they can be used as the primary means of determining the ship's annual fuel oil consumption. In this approach, the consumption from each fuel oil consumer is measured directly through dedicated flow meters, and the annual total is calculated by summing the daily consumption values recorded throughout the reporting period.

SEEMP Part II should clearly describe the types of flow meters fitted on the ship, where they are installed, and how the recorded data is collected, stored, and processed at the end of the year.

Under normal operating conditions, the flow meter readings provide the daily fuel consumption of each relevant system, such as the main engine, auxiliary engines, boilers, inert gas generators, or any other machinery that uses fuel oil. By aggregating these daily figures, the company obtains the annual total consumption. The Plan should make clear that all fuel-consuming processes are covered, and the layout of the flow meters and their corresponding consumers is documented in a way that allows the Administration or the Recognized Organization to verify completeness.

If the flow meters are installed downstream of the daily service tank, any sludge or impurities will already have been removed, and the consumption values do not normally require correction for sludge content. This practical detail should be noted in the Plan to avoid unnecessary adjustments during data processing.

The SEEMP must also identify any fuel oil consumer that is not monitored by flow meter. In such cases, the Plan should state which alternative measurement method is used—typically tank readings, estimated consumption based on manufacturer data, or another approved procedure—and explain how the alternative figures are integrated into the daily and annual totals.

Because the accuracy of flow meter readings depends on proper calibration, the Plan must describe how and when calibration is carried out, who is responsible, and how calibration and maintenance records are kept. These records need to be available on board during verification activities, so that the Administration or RO can confirm that the measurement system is reliable and that the reported consumption figures are based on traceable, calibrated instruments.
If a flow meter fails or produces unreliable readings, the procedure for switching to the alternative measurement method should also be included in the SEEMP. This ensures the continuity and integrity of consumption data throughout the reporting year.

5.2.1.3 Method using bunker fuel oil tank monitoring onboard:

When the ship relies on tank monitoring to determine its fuel oil consumption, the annual total is calculated by adding together the daily measurements taken from the ship's fuel oil tanks during the reporting period. In this method, consumption is not taken from delivered quantities, but rather from the change in tank inventory over time. The SEEMP Part II should clearly describe how the readings are taken, which tanks are measured, and how the daily figures are recorded and summarized.

Daily tank readings are normally carried out while the vessel is at sea, using either automated tank gauging systems or traditional methods such as manual sounding or dip tapes. Measurements are also taken whenever bunkering or de-bunkering operations occur, ensuring that all fuel movements are captured. Each reading provides a snapshot of the quantity of fuel remaining in the tanks, and the difference between consecutive readings represents the fuel used during that period.

Over the course of the year, these individual consumption values are added together to determine the annual total. The SEEMP should explain the process for converting tank levels into mass, including any tables, calibration data or density values used in the calculation. It should also note the frequency of measurements and the roles of the crew responsible for performing and recording them.

A consolidated record containing all monitoring data must be kept on board. This record should include the raw tank readings, the calculated consumption values, and the supporting information needed for verification. The data must be presented in a way that allows the Administration or the Recognized Organization to trace the annual consumption back to individual recordings and confirm that all fuel movements have been properly accounted for.

Finally, the Plan should describe how the ship deals with any unusual circumstances—such as rapid consumption changes, periods at anchor, or discrepancies in measurements—and how these are documented. Establishing a clear and transparent process helps ensure that the results are reliable, consistent, and defensible during annual verification.

5.2.1.4 Method using LNG cargo tank monitoring onboard:

In LNG carriers, where the vessel may use its cargo as fuel, the annual consumption is determined by monitoring the change in cargo tank volumes using the Custody Transfer Monitoring System (CTMS). This system provides accurate measurements of the liquid LNG stored in the cargo tanks and is standard practice for recording quantities transferred during loading and discharging operations. The SEEMP Part II should explain how CTMS data is used to calculate fuel consumption when boil-off gas or cargo-derived fuel is used for propulsion or power generation on board.

To calculate the amount of LNG consumed, the recorded liquid volume is first converted into a mass value. For this purpose, the standard methane density of 422 kg/m³ is applied. This density reflects the condition at which LNG is stored—close to the boiling point of methane—where the methane fraction has vaporized while heavier hydrocarbons remain in liquid form. The use of this density ensures that the calculated mass represents the methane content that can be burned for energy generation.

In addition, the nitrogen content within the LNG must be accounted for. Since nitrogen does not contribute to CO_2 emissions when the fuel is burned, its mass is excluded from the final consumption calculation. For each laden voyage, the nitrogen content is subtracted from the total mass of LNG used. This step ensures that the reported fuel mass reflects only the combustible portion of the cargo that produces CO_2 emissions and is therefore relevant for the purposes of MARPOL Annex VI and CII calculations.

The SEEMP Part II should clearly describe the procedure for collecting CTMS data, converting volumes to mass, determining nitrogen content, and documenting the results. Any supporting documents—such as CTMS reports, cargo composition certificates, or calculation sheets—should be available on board to allow verification by the Administration or the Recognized Organization. The Plan should also explain how the ship handles conditions where composition varies, or where boil-off rates are influenced by operational settings such as forced vaporization or tank pressure management.

5.2.1.5 Method using cargo tank monitoring on board for ships using cargo other than LNG as a fuel:

On certain ship types, the cargo itself may be used as a fuel source during the voyage—for example, on vessels carrying gases or liquid fuels other than LNG. In these cases, the ship's fuel consumption is determined by monitoring the change in cargo tank quantities over time, rather than by measuring traditional bunker fuel oil. SEEMP Part II should describe how the tank levels are measured and converted into a daily consumption value, and how the data is recorded and accumulated over the reporting year.

Daily tank readings are normally carried out while the ship is at sea, using either automatic gauging systems or manual methods suitable for the cargo being used as fuel. Measurements are also taken whenever loading or discharging operations take place, to ensure that the full movement of cargo is captured. The difference between two consecutive readings represents the quantity of cargo converted into fuel during that period.

Because the precision of this method depends on accurate measurements, the SEEMP must specify the exact procedure used for tank readings—whether continuous monitoring through instrumentation or periodic gauging supported by density tables. It should also explain how recorded volumes are converted to mass, and what data sources are used (for example, cargo documentation or certificates of analysis). At the end of the reporting period, all daily consumption values are aggregated to produce the annual total.

A consolidated record of all monitoring data must be kept on board. This record should include the raw tank readings, the calculated fuel consumption values, and any supporting documents used in the conversion process. The Administration or the Recognized Organization must be able to trace the annual totals back to the individual readings to verify that the methodology has been applied correctly.

5.2.1.6 Documentation of Corrections and Adjustments

If any corrections are applied during the calculation of fuel consumption, they must be clearly recorded and supported by appropriate documentation. Such corrections may include adjustments for density or temperature differences, or the exclusion of non-combustible components such as nitrogen (as in the case of LNG). In all cases, the SEEMP should state which corrections are used, how they are calculated, and the source of the data supporting the adjustment.

These details are important because they allow the annual consumption figures to be checked and verified by the Administration or the Recognized Organization. Calibration certificates, density tables, cargo composition certificates, and other relevant evidence should be kept on board and linked to the reported consumption data. Recording these corrections transparently ensures that the reported emissions are accurate and consistent with the requirements of MARPOL Annex VI.

5.2.2 Fuel oil consumption per consumer type

For the collection of fuel oil consumption per consumer type (main engines, auxiliaries, boilers and others), the methods can include:

5.2.2.1 Method using flow meters:

When flow meters are installed on individual fuel oil consumers, they can be used to determine the annual consumption of each machinery type separately. In this approach, the ship records the daily fuel flow to each consumer—such as the main engine, auxiliary engines, boilers, or other systems—and the annual consumption is calculated by summing these daily values over the reporting period.

SEEMP Part II should describe the arrangement of flow meters on board, the process for collecting data from each meter, and the procedure used to consolidate and verify the figures at the end of the year.

To ensure that the results are complete, the Plan must explain how flow meters are positioned so that they capture all fuel delivered to each consumer type. The link between each meter and the corresponding consumer should be clearly documented, ideally supported by a system diagram or description of the piping arrangements. This allows the Administration or the Recognized Organization to confirm that the readings represent the full consumption of each system and that no equipment has been omitted.

If a flow meter is installed downstream of the daily service tank, any sludge or impurities will already have been removed prior to the measurement point. In these cases, no correction for sludge content is normally required, and the readings can be used directly in the consumption calculations. The Plan should note this detail to avoid unnecessary adjustments in the data.

Where a particular consumer type is not fitted with a flow meter, the SEEMP must identify that consumer and specify which alternative method is used to determine its fuel consumption. Options may include tank readings, estimation based on manufacturer's performance data, or another approved method appropriate to the equipment. The approach should be described in a way that shows how the missing data is incorporated into the final figures without compromising accuracy.

Because accurate readings depend on proper instrument calibration, the SEEMP should outline how flow meters are maintained and calibrated, including the intervals for testing, the responsible personnel, and the procedures used to verify meter accuracy. Calibration certificates and maintenance records must be kept on board and made available during verification, so that the annual consumption derived from the flow meters can be traced to reliable and validated equipment.

If a flow meter becomes unavailable during the reporting year—for example due to a breakdown—the Plan should clearly state how the ship switches to the alternative measurement method and how continuity of data is ensured. This ensures that the reported annual consumption remains complete and verifiable, even when equipment failures occur.

5.2.2.2 Method using bunker fuel oil tank monitoring onboard:

On ships where individual fuel oil consumers are not equipped with flow meters, the annual consumption for each consumer type can be determined through tank monitoring. In this method, the ship relies on regular measurements of fuel oil levels in the relevant tanks, taken either by automated gauging systems or through manual techniques such as soundings or dip tapes. The SEEMP Part II should describe clearly how these measurements are taken, how often they occur, and how the consumption for each consumer is calculated from the recorded tank data.

Daily tank readings are typically performed while the ship is at sea. Additional readings are taken during bunkering or de-bunkering operations to capture changes in the tank contents. By comparing consecutive measurements, the ship determines how much fuel has been used over the measurement interval. These values are then assigned to the relevant consumer type based on the tank arrangements and the way fuel is supplied to each system. Over the course of the reporting year, the daily consumption figures are added together to arrive at the annual totals.

To ensure transparency, a consolidated record of all tank readings and calculated consumption values must be maintained on board. This record should show the measured fuel levels, the dates and times of readings, the method used to convert tank levels into mass, and the distribution of consumption among different machinery types. The Administration or the Recognized Organization must be able to follow the data trail from individual recordings through to the annual consumption figures.

The Plan should also explain how the ship deals with any issues that could affect the accuracy of tank readings—such as measurement uncertainties, variations in fuel density, or inconsistent consumption patterns during periods of maneuvering or standby. Clear documentation of these procedures helps ensure that the reported figures are robust, consistent, and suitable for external verification.

5.2.2.3 Other methods

In certain cases, the fuel oil consumption of a specific machinery type cannot be measured directly through flow meters or tank monitoring. This situation may occur when the equipment is not fitted with a dedicated meter, or where the tank arrangement does not allow reliable allocation of consumption to individual consumers. In such circumstances, the annual consumption for that consumer type should be calculated using an alternative, recognized method. SEEMP Part II must describe the chosen method in clear detail so that the result can be verified by the Administration or the Recognized Organization.

The alternative method may be based on subtraction, where the total fuel consumption of the ship is known from BDNs or tank measurements, and the consumption of all other consumer types can be measured directly. The remaining value is then assigned to the equipment that cannot be measured individually. Alternatively, the method may rely on estimation techniques, for example using manufacturer's performance data, historical fuel consumption records for similar operating conditions, or other validated engineering approaches. Regardless of the option chosen, the underlying assumptions and data sources must be transparent.

It is important to note that different consumer types on the same vessel may be measured using different methods. For example, the main engine may be monitored by flow meter, auxiliary engines by tank readings, and a boiler through estimation. SEEMP Part II should reflect this reality by listing each consumer type and specifying the exact method applied to each one. This level of detail ensures that the entire fuel consumption profile of the ship can be reconstructed and verified from the documentation held on board.

The description of alternative methods should also include the procedures for maintaining accuracy, such as the use of calibration data, correction factors, or cross-checks with operating logs. Supporting documents—including technical specifications, historical datasets, or calculation sheets—should be available on board during verification. By documenting the methodology clearly, the ship can demonstrate that even where direct measurement is not possible, the calculated consumption remains consistent, traceable, and suitable for reporting under MARPOL Annex VI.

5.2.2.3.1 Method using subtraction:

When the fuel consumption of all consumer types on board can be measured directly—except for one—its annual consumption may be determined by subtracting the consumption of the measured consumers from the ship's total annual fuel oil consumption. In practice, this means that the ship first establishes the total fuel consumption for the reporting period using one of the approved methods described in section 5.2.1, such as BDN-based calculations, flow meter data, or tank monitoring. The annual consumption values of all other consumer types, which have been measured directly, are then deducted from that total. The resulting figure represents the fuel used by the consumer type that cannot be measured individually.

This approach is only appropriate when there is a single unmeasured consumer type and when the consumption of all other consumers is based on reliable, verifiable data. The SEEMP Part II should describe the calculation clearly, including the way total consumption is established, how individual consumption values are obtained, and how the subtraction is performed. It should also explain any assumptions used, for example if operational logs or equipment running hours are used to confirm that the result is reasonable.

To support verification, the ship must retain the underlying data on board, including the records showing total consumption, the measured consumption of individual consumers, and the calculation that produces the remaining value. This enables the Administration or the Recognized Organization to trace the final figure back to the source data and confirm that the method has been applied correctly.

5.2.2.3.1 Method using estimated fuel oil consumption:

If none of the direct measurement methods described in sections 5.2.2.1 and 5.2.2.2 can be applied—and subtraction is not possible because more than one consumer type cannot be measured individually—the annual consumption for the remaining consumer type may be determined through a reasonable estimation method. This estimation must be acceptable to the Administration or the Recognized Organization and should be based on traceable technical information, rather than assumptions that cannot be verified.

In practice, estimation may rely on manufacturer's performance data, such as specific fuel consumption curves, engine load profiles, or certified fuel rates under defined operating conditions. Alternatively, the ship may use historical consumption records for the same equipment when operated over a similar period and in comparable conditions. For example, if the consumer type has been operating consistently at a predictable load for several seasons, the average consumption over that period may be used as a basis for estimating annual use.

The SEEMP Part II must describe the estimation method in clear terms, including the data sources used, the calculation steps taken, and any assumptions applied. If manufacturer data is used, the relevant specifications should be referenced, and if historical data is used, the period covered and the reason for selecting it should be explained. The goal is to show that the method produces a realistic and defendable estimate of the fuel consumed.

To support verification, all documents used in the estimation—such as technical manuals, performance curves, historical logs, or calculation sheets—must be kept on board. The Administration or the Recognized Organization must be able to trace the estimated consumption back to the supporting evidence and confirm that the approach is transparent, reasonable, and consistent with the requirements of MARPOL Annex VI.

5.2.3 Conversion factor CF

In most cases, the calculation of annual fuel oil consumption for the purposes of MARPOL Annex VI and CII reporting is based on standard fuel types for which the conversion factor (CF) is already defined by IMO. These factors represent the amount of CO_2 emitted per tonne of fuel and are set out in the 2022 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (resolution MEPC. 364(79)). When a ship uses conventional fuels such as HFO, MGO, LNG, LPG, or methanol, the appropriate CF value is taken directly from those guidelines.

However, when a ship uses a fuel oil that does not fall into one of the defined categories—such as certain hybrid fuels, experimental blends, or products with non-standard compositions—the fuel may not have an assigned CF value. In such cases, it is the responsibility of the fuel supplier to provide a CF value specific to the product, supported by appropriate documentation. This evidence may include a certified carbon content analysis, a declaration of fuel composition, or other technical data that can be used to determine an accurate conversion factor for CO_2 emissions.

SEEMP Part II should make clear which CF value applies to each fuel used on board and should include the supporting documents provided by the supplier when a non-standard fuel is used. The Plan should also describe how the ship ensures that the CF value remains valid for the reporting period, especially if the delivered fuel batch has different properties. All related documentation should be kept on board for verification by the Administration or the Recognized Organization.

Using a traceable and documented CF value is essential, as it ensures that the calculated emissions reflect the actual characteristics of the fuel and meet the transparency and consistency requirements of MARPOL Annex VI.

5.2.4 Distance travelled

SEEMP Part II must describe how the ship determines and records the distance it travels during the reporting period, as this value is an essential component of the annual fuel oil data submission required by Appendix IX of MARPOL Annex VI.

The ethod used must be transparent, traceable, and consistent with the way distance is recorded in the ship's official logbooks. In line with SOLAS regulation V/28.1, the distance travelled over ground, expressed in nautical miles, should be recorded in the ship's logbook as part of the routine navigational records. This value represents the actual distance covered by thevessel over the Earth's surface, rather than a theoretical track line or speed-based estimate, and provides the most accurate basis for annual aggregation.

Only the distance travelled while the ship is under way under its own propulsion should be included in the total reported for the calendar year. Periods spent at anchor, drifting without propulsion, alongside in port, or otherwise not making way under the ship's engines are excluded from the aggregated value. SEEMP Part II should describe how the ship distinguishes between these operational states and how the relevant entries are taken from the logbook or other navigational sources.

If the ship uses an alternative method accepted by the Administration—for example, data from an electronic chart system (ECS), voyage data recorder (VDR), or GPS-based tracking—the SEEMP must describe the method in detail. This includes the equipment used, how the data is extracted, and the procedures used to confirm the accuracy of the recorded distances. Any such method must produce results consistent with SOLAS requirements and be supported by documentation held on board.

For reporting and performance analysis purposes, the Plan should also explain how laden distance is calculated. Laden distance refers to the distance travelled while the ship is carrying cargo. The SEEMP should describe how loaded voyages are identified and how the corresponding distance values are recorded and aggregated over the reporting period. This supports the calculation of operational carbon intensity and other performance indicators.

By documenting these procedures clearly, the ship ensures that its reported distance travelled can be verified by the Administration or the Recognized Organization through a straightforward review of the ship's logbooks, electronic records, and supporting data.

5.2.5 Hours under way

SEEMP Part II must describe how the ship determines and records its hours under way, as this value is one of the data elements required to be submitted annually under Appendix IX of MARPOL Annex VI. The term "hours under way" refers to the total time during which the ship is making way through the water under its own propulsion, regardless of its speed or voyage condition.

For reporting purposes, the aggregated duration of all such periods over the calendar year is calculated and submitted to the Administration. Time spent alongside, at anchor, drifting without propulsion, or otherwise not moving under the ship's engines is excluded from this total. SEEMP Part II should therefore explain how the crew distinguishes between these operational states, and how the relevant data is extracted from the ship's logbooks or other navigational records.

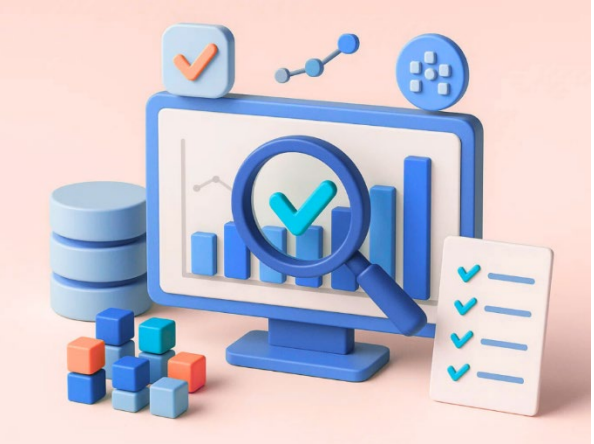
In practice, the ship's logbook is the primary source for determining hours under way. Standard navigational entries record the time when propulsion is commenced and stopped, as well as any periods when propulsion is temporarily interrupted during a voyage. The Plan should describe the process for reviewing these entries and converting them into a consolidated annual total. If electronic systems such as VDR or ECDIS tracking are used to assist in this calculation, the method should be described, along with any procedures used to confirm consistency with the logbook.

By documenting the approach clearly, SEEMP Part II ensures that the reported hours under way can be verified by the Administration or the Recognized Organization through a straightforward review of the ship's operational records.

5.2.6 Data quality

SEEMP Part II must include clear measures to ensure the quality and integrity of the data used for annual fuel oil consumption reporting. These data quality procedures should be integrated into the ship's existing Safety Management System (SMS), rather than treated as a separate, isolated process. By embedding data control within routine operations, the ship can demonstrate that its reporting is consistent, traceable, and reliable.

The Data Collection Plan should describe how the crew identifies and corrects any data gaps, such as missing daily entries, inconsistencies between records, or situations where the measurement method fails to produce a result. This procedure should include defined steps for investigating the cause of the gap, documenting the circumstances, and applying a correction method that is transparent and acceptable to the Administration or the Recognized Organization.



The Plan must also explain how the ship deals with missing data caused by equipment failures, such as a flow meter malfunction or a disruption in automated tank monitoring. In such cases, the SEEMP should specify the fallback method—for example, manual tank readings, temporary estimation based on recent consumption patterns, or another approved approach—and describe how the alternative data is documented and later incorporated into the aggregated totals.

In addition to corrective actions, the data quality procedure should clarify roles and responsibilities on board, including who reviews daily records, who validates monthly summaries, and how results are reconciled with logbooks and other operational documents. This ensures that any irregularities are identified early and resolved before the annual submission is made.

By describing these measures clearly, SEEMP Part II provides confidence that the ship's reported fuel consumption data is complete, accurate, and suitable for verification under MARPOL Annex VI.

5.2.7 Total amount of onshore power supplied

Where the ship receives electrical power from shore while alongside, the total amount of onshore power supplied during the reporting year must be calculated and reported as required under Appendix IX of MARPOL Annex VI. This value is expressed in kilowatt-hours (kWh) and represents the total electrical energy provided to the ship from onshore sources, replacing energy that would otherwise have been generated by the ship's fuel-consuming machinery.

For reporting purposes, the annual total should be calculated by adding together the amounts supplied during each connection period over the calendar year. The SEEMP Part II should describe how this information is obtained, typically from the official documentation issued by the port or electricity provider. This documentation may include invoices, connection summaries, or metering reports that show the total kWh delivered during each shore power session.

The Plan should specify how these documents are recorded and retained on board, and how the data is transferred into the ship's electronic records or fuel data summary. Supporting documents showing the delivered energy, including billing statements, may be included directly in the electronic record used for the annual data submission. Retaining these records ensures that the total value can be easily verified by the Administration or the Recognized Organization.

By documenting the procedure clearly, SEEMP Part II provides a transparent and traceable method for capturing onshore power usage, ensuring consistency with the reporting requirements of MARPOL Annex VI.

5.2.8 Total transport work

SEEMP Part II must explain how the ship determines and reports total transport work, as this value is used to assess the operational carbon intensity of the vessel under MARPOL Annex VI. Total transport work represents the contribution of each voyage to the ship's annual transport performance and is

calculated by multiplying the distance sailed on each voyage by the corresponding cargo carried during that voyage.

For the reporting period, the ship should calculate the transport work for each voyage separately and then sum these values to obtain the annual total. The SEEMP should describe how “distance sailed” and “cargo carried” are defined for the ship, and how the source data is recorded—for example through cargo documentation, bill of lading information, or stability and loading records. The Plan should also mention any standard practices used by the company to verify the consistency of the calculations, such as cross-checking against loading records or noon reports.

Because different ship types carry cargo in different ways, the relevant transport work metric differs accordingly. For example, bulk carriers typically use deadweight tonnage of cargo carried, while container ships use TEU capacity or weight-based cargo records depending on the reporting requirements. To ensure that each ship uses the correct metric, the applicable values are defined by ship type in Table 1 below.

Table 1: Transport work to be reported per ship type

Ship type	Transport work metric
bulk carriers, tankers, combination carriers, gas carriers, LNG carriers, general cargo ships, ro-ro cargo ships (vehicle carriers), ro-ro cargo ships	$\sum_v (cargo\_mass_v \times distance_v)$
containerships	$\sum_v ((cargo\_mass_v + container\_mass_v) \times distance_v))$ and $\sum_v (No\_of\_TEU_v \times distance_v)$
cruise passenger ships	$\sum_v (No\_of\_passengers_v \times distance_v)$
ro-ro passenger ships	$\sum_v (No\_of\_passengers_v \times distance_v)$ and $\sum_v (cargo\_mass_v \times distance_v)$

5.2.9 A standardized data reporting format

Regulation 27.3 of MARPOL Annex VI requires that the fuel oil consumption data and associated operational parameters identified in Appendix IX must be submitted electronically using a standardized reporting format developed by the International Maritime Organization. This requirement ensures that all ships subject to the regulation present their data in a uniform way, allowing Administrations and the Organization to process and compare the information consistently.

SEEMP Part II should therefore specify that the ship's collected data will be reported to the Administration using the IMO standardized form. The Plan should outline how the ship extracts the relevant information from its daily records, logbooks, or electronic reporting systems and enters it into the standardized reporting format. It should also describe who is responsible for completing the form, how the data is checked before submission, and how the electronic communication with the Administration or the Recognized Organization is carried out.

By using the standardized format, the ship ensures that the required data fields—such as total fuel consumption, distance travelled, hours under way, and transport work—are presented in a manner consistent with the reporting expectations of MARPOL Annex VI. The form also captures essential ship identification data and other details needed for the issuance of the Statement of Compliance.

The SEEMP should make clear that any supporting documentation used in preparing the standardized form, including calibration records, cargo certificates, or power supply statements, must be retained on board and made available during verification. This ensures that the reported values can be traced back to their original sources and reinforces the transparency and reliability of the data submitted to the Administration.

5.2.10 DIRECT CO2 EMISSIONS MEASUREMENT

Under the current requirements of MARPOL Annex VI, direct measurement of CO_2 emissions is not required for compliance with regulation 27. The fuel oil consumption data and associated operational parameters collected under SEEMP Part II remain the recognized basis for calculating annual emissions. However, if a ship uses direct CO_2 measurement equipment as part of its internal monitoring or performance analysis, the SEEMP should briefly explain how that system operates and how the data is controlled.

When direct CO_2 measurement is applied, the method is based on determining the flow of CO_2 in the exhaust gas stream. This is achieved by measuring the CO_2 concentration within the exhaust gas and multiplying it by the exhaust gas flow rate. Together, these two values provide the mass flow of CO_2 emitted over a given period. The SEEMP should describe the type of equipment installed, the monitoring points, and how the readings are recorded and processed.

To obtain complete results, the measurement equipment must be located in a way that captures all CO_2 emissions from the ship's engines and other fuel-consuming systems. The monitoring plan should identify these locations clearly and indicate how the different sources are combined to produce a total emission value. If the ship has multiple exhaust outlets or machinery types, the arrangement and aggregation method should be described to ensure transparency.

As with any measurement equipment, calibration is critical to ensure that results are accurate and traceable. SEEMP Part II should specify the calibration procedures for the CO_2 measurement system, including the intervals for testing, the responsible personnel, and the standards or reference materials used. Calibration certificates and maintenance records must be retained on board and made available during verification or audit.

If the direct measurement system is unavailable or produces unreliable readings—due to equipment failure or maintenance interruption—the ship must revert to the approved fuel consumption-based methods described earlier in Section 5.2. In such cases, fallback procedures such as manual tank readings or other approved methods ensure the continuity of data collection and maintain the reliability of the annual reporting.

Although direct CO_2 measurement can provide useful insights into a ship's emissions profile, the SEEMP should make clear that it is supplementary rather than mandatory, and does not replace the reporting requirements under regulation 27 of MARPOL Annex VI.

Appendix 1
SAMPLE FORM OF SHIP FUEL OIL CONSUMPTION DATA COLLECTION PLAN (PART II OF THE SEEMP)

Review and update log

Date/timeline	Updated parts	Developed by	Implemented by

1 Ship particulars

Name of ship	
IMO number	
Company	
Flag	
Year of delivery	
Ship type	
Gross tonnage	
NT	
DWT	
Attained EEDI (if applicable)	
Attained EEXI (if applicable)	
Ice class	

2 Record of revision of Fuel Oil Consumption Data Collection Plan

Date of revision	Revised provision

3 Ship engines and other fuel oil consumers and fuel oil types used

	Engines or other fuel oil consumers	Power	Fuel oil types
1	Type/model of main engine	(kW)	
2	Type/model of auxiliary engine	(kW)	
3	Boiler	(…)	
4	Inert gas generator	(…)	
5	Others (Specify)	(…)	

4 Emission factor

C_F is a non-dimensional conversion factor between fuel oil consumption and CO_2 emission in the *2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships* (resolution MEPC.308(73)), as amended. The annual total amount of CO_2 is calculated by multiplying annual fuel oil consumption and C_F for the type of fuel.

Fuel oil type	*CF* (t-CO_2 / t-Fuel)
Diesel/Gas oil (e.g. ISO 8217 grades DMX through DMB)	3.206
Light fuel oil (LFO) (e.g. ISO 8217 grades RMA through RMD)	3.151
Heavy fuel oil (HFO) (e.g. ISO 8217 grades RME through RMK)	3.114
Liquefied petroleum gas (LPG) (Propane)	3.000
Liquefied petroleum gas (LPG) (Butane)	3.030
Liquefied natural gas (LNG)	2.750
Methanol	1.375
Ethanol	1.913
Other (……)	(….)

5 Method to measure fuel oil consumption

The applied methods for measurement for each consumer type of this ship are given below. The description explains the procedure for measuring data and calculating annual values, measurement equipment involved, etc.

Engines or other fuel oil consumer type	Method	Description
Type/model of main engine		
Type/model of auxiliary engine		
Boiler		
Others (Specify)		

6 Method to measure distance travelled

Description

7 Method to measure hours under way

Description

8 Processes that will be used to report the data to the Administration

Description

9 Data quality

Description

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